SCIENTIFIC JOURNAL OF SPORT AND PERFORMANCE

ORIGINAL ARTICLE

Quantifying the Impact of basketball performance metrics on winning in professional and collegiate basketball

Alp Aslan Uysal . *Department of Exercise Science. East Tennessee State University. United States of America.*
Kevin Carroll. *Department of Exercise Science. East Tennessee State University. United States of America.*
Alan Huebner. *Department of Applied and Computational Mathematics and Statistics. University of Notre Dame. United States of America.*
Anna Krush. *Department of Applied and Computational Mathematics and Statistics. University of Notre Dame. United States of America.*
Michael Henry Stone. *Department of Exercise Science. East Tennessee State University. United States of America.*

ABSTRACT

The aim of the investigators was to statistically analyze the relationships between basketball performance metrics and winning percentage (WIN%) in professional and collegiate basketball. Game data from 10 seasons between 2014 and 2024 were analyzed from the NBA, WNBA, NCAA, and NCAAW leagues. Basketball performance metrics included the number of possessions, points scored (PTS), three-point percentage (3P%), two-point percentage (2P%), number of free throw attempts (FTA), free throw percentage (FT%), offensive rebound percentage (OREB%), defensive rebound percentage (DREB%), turnover ratio (TOV%), assists (AST), steals (STL), blocks (BLK), personal fouls (PF), relative offensive (ORtg±) and defensive (DRtg±) ratings. Among the statistically significant relationships between WIN% and basketball performance metrics, 3P% had the strongest relationship with WIN% in NBA, whereas BLK had the strongest relationship with WIN% in WNBA and NCAA. AST had the strongest relationship with WIN% in NCAAW and was not statistically related to WIN% in NBA. The only league in which DRtg± was not statistically related to WIN% was the NBA. NBA is an offense-oriented league where creating individual scoring opportunities had a stronger impact on winning. In contrast, offensive and defensive performance showed a closer balance in their contributions to team success in the other leagues analyzed.

Keywords: Performance analysis, Basketball performance, Professional basketball, Collegiate basketball, NBA, NCAA.

Cite this article as:
Uysal, A. A., Carroll, K., Huebner, A., Krush, A., & Stone, M. H. (2026). Quantifying the Impact of basketball performance metrics on winning in professional and collegiate basketball. *Scientific Journal of Sport and Performance*, *5*(2), 298-307. https://doi.org/10.55860/DHNF1439

Corresponding author. *East Tennessee State University Department of Exercise, Box 70671, Johnson City, TN. United States of America.*
E-mail: uysala@etsu.edu
Submitted for publication November 25, 2025.
Accepted for publication January 09, 2026.
Published February 21, 2026.
Scientific Journal of Sport and Performance. ISSN 2794-0586.

doi: https://doi.org/10.55860/DHNF1439

INTRODUCTION

While much attention has been given to the details of various performance metrics in sports, the main goal is simple: to win the competition. In basketball, traditional performance metrics at the team level include points scored, field goal and free throw statistics, offensive and defensive rebounds, assists, steals, blocks, turnovers, and fouls (Kubatko et al., 2007). In addition to traditional statistics, some advanced statistics are used to evaluate offensive and defensive efficiency of the teams, such as offensive rating and defensive rating, while others measure the pace of the game by quantifying the number of possessions (Oliver, 2024). To understand how much each performance metric contributes to winning, it is important to statistically analyse the relationship between performance metrics and winning percentage of the team (WIN%) (Hummel & Sligo, 1971). Statistically determining this relationship in a specific league may help basketball coaches focus on improving the most important performance metrics for that league, thereby mathematically increasing their chances of winning more games.

Various investigators have proposed comprehensive models or formulas to evaluate basketball players' individual performance (Bellotti, 1990; Berri, 1999; Claerbaut, 1994; Heeren, 1993; Hollinger, 2002; Manley, 1988; Trupin & Couzens, 1989). However, such approaches have conceptual limitations, as Oliver (Oliver, 2024) emphasized: "*the ideal player rating statistic is just not possible; no matter how smart the person is putting together a player rating, there is always going to be uncertainty in the rating*." Oliver (Oliver, 2024) also noted that a player's performance depends on many factors, since the influence of teammates and coaching can make a player perform better or worse. Therefore, constructing a comprehensive model to evaluate individual basketball performance may not accurately reflect the complex dynamics of the game.

Individual player performance models cannot include the team's WIN% as an outcome measure, since a single player does not solely determine the result of a team game. On the other hand, WIN% can be used as an output metric at the team level, as it directly reflects the primary objective of sport, which is winning the competition. Therefore, examining how performance variables are associated with WIN% allows us to determine which aspects of performance are most important for team success. Numerous studies have investigated the association between basketball performance statistics and winning percentage (Angel Gómez et al., 2008; Cabarkapa et al., 2022, 2024; Conte et al., 2018; Csataljay et al., 2009; García et al., 2013; Ibáñez et al., 2008; Lorenzo et al., 2010; Melnick, 2001; Mikołajec et al., 2013), using data from European leagues (Angel Gómez et al., 2008; García et al., 2013; Ibáñez et al., 2008; Lorenzo et al., 2010) or U.S.-based leagues such as the NBA (Cabarkapa et al., 2022; Melnick, 2001; Mikołajec et al., 2013) and the NCAA (Cabarkapa et al., 2024; Conte et al., 2018). Most previous studies have highlighted shooting efficiency and rebounding as among the strongest predictors of winning (Angel Gómez et al., 2008; Cabarkapa et al., 2022, 2024; Conte et al., 2018; García et al., 2013). However, the existing research has largely been limited to single leagues or a restricted number of seasons. Generalizing results from the relationship between WIN% and performance parameters within a single league may be misleading, as the relative importance of each performance metric for success may differ across playing levels and leagues. There are physical and physiological differences between college and professional players (Latin et al., 1994) as well as between male and female basketball players (Ziv & Lidor, 2009), which may change the strategy of the game and make certain performance metrics more important in each league. The present study addresses this gap by analysing ten consecutive seasons (2014–2024) of recent data from the NBA, WNBA, NCAA Division I men's, and NCAA Division I women's basketball to determine which performance parameters most consistently explain winning percentage in each of these leagues.

The primary aim of the study was to explore straightforward, univariate relationships between team-level performance metrics and WIN% in the NBA, WNBA, NCAA, and NCAAW, allowing for easily interpretable, reader-friendly information for coaches. The secondary aim was to compare the results across the NBA, WNBA, NCAA, and NCAAW leagues and discuss potential alterations in coaches' strategies within each league based on these results.

METHODS

Experimental approach to the problem

This was a retrospective, observational study analysing historical team-level performance data and their relationship with WIN% from 2014-2015 to 2023-2024 seasons in the NBA, WNBA, NCAA, and NCAAW, covering 10 seasons for each league. Team-level performance data included the number of possessions, points scored (PTS), three-point percentage (3P%), two-point percentage (2P%), number of attempted free throws (FTA), free throw percentage (FT%), offensive rebound percentage (OREB%), and defensive rebound percentage (DREB%), turnover ratio (TOV%), assists (AST), steals (STL), blocks (BLK), personal fouls (PF), offensive rating (ORtg) and defensive rating (DRtg). ORtg is calculated as points scored multiplied by 100, divided by the number of possessions. DRtg is calculated as points allowed multiplied by 100, divided by the number of possessions. ORtg± and DRtg± represent standardized versions of ORtg and DRtg, expressing a team's performance relative to the league average. TOV% is calculated as turnovers multiplied by 100, divided by the number of possessions (Oliver, 2024). WIN% was the dependent variable in all analyses, while all other performance metrics were independent variables.

Subjects

All 30 NBA teams, 12 WNBA teams, and 65 collegiate teams from the Power Five conferences of NCAA and NCAAW were included in the analysis from the 2014-2015 season to the 2023-2024 season, covering a total of 10 seasons across all leagues.

Power Five conferences included Big Ten, Big 12, ACC, SEC and Pac-12. At the Big 12 Conference, there were 10 teams prior to the 2023–2024 season. Since four new teams were added in 2023–2024, the data for those four new teams from the 2023–2024 season were excluded to maintain consistency with previous years. In the WNBA, two teams have changed names and locations, one team at the beginning of the 2015-2016 season and the other team at the beginning of the 2017-2018 season. Between 2014 and the years when those two teams changed their names (2015 and 2017), data were collected from those teams under their previous names, as they were the same teams with different brand names.

All games in the regular seasons were analysed in all leagues, while playoff games were excluded from the analysis to maintain consistent conditions across teams, where each of those teams plays against a similar number of opponents at a similar level. To enable comparison between leagues with different game durations, NBA statistics (excluding percentages, which are unaffected by playing time) were adjusted to a 40-minute basis by multiplying 48-minute values by 40/48, and the adjusted values were presented in a separate column in Table 1 alongside the original 48-minute statistics. Game performance data for each team were gathered from publicly available official online sources (*ESPN Official Website*, n.d.; *NBA Official Website*, n.d.; *Sports Reference Official Website*, n.d.). Ethical approval was not required for this study as it involved analysis of publicly available data.

Statistical analysis

Statistical analyses of this study were conducted in R (4.4.2) using the lme4 package (Bates et al., 2015). The relationship between team performance indicators and WIN% was examined using linear mixed-effects models with team code included as a random intercept to account for repeated measurements across seasons. Each predictor was analysed using a univariate model. To obtain robust estimates without relying on normality assumptions, regression coefficients (β) were evaluated using clustered bootstrap resampling to generate 95% confidence intervals, and permutation testing to compute empirical p-values.

p-values ≤ .05 were considered to be statistically significant. When *p*-values were reported as .000 in the results, that does not indicate that the p-value exactly equals 0, but that it rounds to zero when rounded to three digits (*p*-value < 1e-4). In the univariate models, each β coefficient represents the estimated change in WIN% associated with a one-unit increase in the predictor. For example, when the β coefficient for 3P% is 5.36, then increasing a team's three-point percentage from 35% to 36% is associated with an estimated 5.36-point increase in WIN% (e.g., from 50% to 55.36%).

RESULTS

Table 1 presents the average performance statistics from 2014 to 2024 across four major basketball leagues.

Table 1. Average performance statistics from 2014 to 2024 across four major basketball leagues.

Performance parameters	NBA 48-min (mean+SD)	NBA 40-min (mean+SD)	WNBA (mean+SD)	NCAA (mean+SD)	NCAAW (mean+SD)
Possessions	100.9 ± 2.9	84.1 ± 2.4	81.7 ± 2.0	68.1 ± 2.8	70.9 ± 2.7
Points	108.9 ± 6.1	90.8 ± 5.1	81.0 ± 4.6	72.9 ± 5.3	69.8 ± 6.7
ORtg	107.9 ± 4.4	107.9 ± 4.4	99.2 ± 4.9	107.0 ± 5.9	98.3 ± 8.0
DRtg	107.9 ± 5.2	107.9 ± 5.2	99.2 ± 4.1	101.5 ± 4.9	90.9 ± 6.3
3P%	35.8 ± 1.6	35.8 ± 1.6	34.0 ± 2.4	34.5 ± 2.7	32.7 ± 3.3
2P%	51.9 ± 2.8	51.9 ± 2.8	47.9 ± 2.9	50.3 ± 2.9	46.5 ± 3.7
FTA	22.6 ± 2.0	18.8 ± 1.7	18.6 ± 2.5	19.6 ± 2.8	17.5 ± 2.4
FT%	77.1 ± 3.0	77.1 ± 3.0	79.8 ± 3.2	71.4 ± 3.6	70.8 ± 4.2
OREB%	27.6 ± 2.3	27.6 ± 2.3	30.0 ± 3.6	30.6 ± 4.0	33.8 ± 4.4
DREB%	72.4 ± 1.7	72.4 ± 1.7	70.0 ± 2.6	71.1 ± 2.7	68.9 ± 3.3
TOV%	14.0 ± 1.1	14.0 ± 1.1	17.3 ± 1.5	17.9 ± 2.0	21.3 ± 2.7
AST	24.1 ± 2.4	20.0 ± 2.0	18.8 ± 2.1	13.7 ± 1.8	14.4 ± 2.2
STL	7.6 ± 0.8	6.4 ± 0.7	7.3 ± 1.0	6.4 ± 1.2	7.8 ± 1.6
BLK	4.9 ± 0.7	4.0 ± 0.6	4.0 ± 0.8	3.9 ± 1.0	3.9 ± 1.1
PF	20.0 ± 1.4	16.6 ± 1.2	18.1 ± 1.6	17.3 ± 1.8	16.7 ± 1.8

Note. ORtg: offensive rating; DRtg: defensive rating; 3P%: three-point percentage; 2P%: two-point percentage; FTA: free-throw attempt; FT%: free-throw percentage; OREB%: offensive rebound percentage; DREB%: defensive rebound percentage; TOV%: turnover percentage; AST: assists; STL: steals; BLK: blocks; PF: personal fouls.

In the NBA and WNBA, since each team played the same number of games against the same opponents in each season, the ORtg and DRtg results were identical. However, in the NCAA and NCAAW, teams may play a different number of games and follow slightly different schedules because non-conference games were also included in the seasonal analysis. Therefore, the ORtg and DRtg results differ in the NCAA and NCAAW. For the same reason, the sum of offensive and defensive rebound percentages equals 100% in the NBA and WNBA, whereas it exceeds 100% in the NCAA and NCAAW.

The following comparisons in this paragraph exclude "*NBA 48-minute*" column from Table 1 to equalize game time between leagues. NBA, when adjusted to 40 minutes, had the highest number of possessions, points, league ratings (ORtg and DRtg), 3P%, 2P%, DREB%, and assists, and the lowest TOV% among the four major leagues investigated in this study. WNBA recorded the highest FT% and PF values. NCAA had the highest FTA, whereas NCAAW showed the highest OREB% and steals, while the number of blocks showed little variation across leagues.

Table 2 summarizes the univariate associations between performance parameters and WIN% in each league.

Table 2. Associations between performance parameters and winning percentage.

Performance	**NBA**		**WNBA**		**NCAA**		**NCAAW**	
parameters	β coefficient	*p*-value	β coefficient	*p*-value	β coefficient	*p*-value	β coefficient	*p*-value
Possessions	-0.072	.770	-0.215	.795	-0.103	.605	0.329	.150
Points	0.867**	.000	2.427**	.000	1.548**	.000	1.809**	.000
Opp. points	-0.127	.380	-2.263**	.000	-1.340**	.000	-1.824**	.000
ORtg ±	3.437**	.000	3.211**	.000	2.187**	.000	1.921**	.000
DRtg ±	-0.247	.305	-3.632**	.000	-2.099**	.000	-2.161**	.000
3P%	5.360**	.000	3.826**	.000	2.225**	.000	2.049**	.000
2P%	2.082**	.000	3.381**	.000	2.428**	.000	2.946**	.000
FTA	0.499	.205	1.606**	.005	1.111**	.000	1.920**	.000
FT%	1.008**	.000	2.133**	.000	0.790**	.000	0.850**	.000
OREB%	0.148	.700	0.372	.445	1.370**	.000	1.474**	.000
DREB%	2.225**	.000	2.433**	.000	1.364**	.000	2.397**	.000
TOV%	-1.429	.070	-5.551**	.000	-2.583**	.000	-2.995**	.000
AST	0.130	.680	4.024**	.000	3.897**	.000	4.591**	.000
STL	0.331	.770	7.062**	.000	2.584**	.000	2.868**	.000
BLK	-1.445	.205	7.257**	.000	4.369**	.000	4.165**	.000
PF	-0.799	.170	-5.116**	.000	-1.157*	.010	-2.156**	.000

*Note. * p < .05; **p < .01; possessions: number of possessions; opp. points: opponent points; Ortg ±: offensive rating relative to league average; DRtg ±: defensive rating relative to league average; 3P%: three-point percentage; 2P%: two-point percentage; FTA: free-throw attempts; FT%: free-throw percentage; OREB%: offensive rebound percentage; DREB%: defensive rebound percentage; TOV%: turnover percentage; AST: number of assists; STL: number of steals; BLK: number of blocks; PF: number of personal fouls.*

Among the statistically significant associations between performance parameters and WIN%: 3P% had the strongest relationship with WIN% in NBA, BLK had the strongest relationship with WIN% in WNBA and NCAA, and AST had the strongest relationship with WIN% in NCAAW.

DISCUSSION

This study analysed how basketball performance metrics relate to WIN% across ten recent seasons (2014–2024) in the NBA, WNBA, NCAA, and NCAAW. Results showed clear league-specific patterns: in the NBA, 3P% and ORtg± were strongly related to WIN%, while DRtg± and AST showed no significant association with WIN%, indicating an offense-oriented style that relies on creating individual scoring opportunities. In all other leagues except the NBA, AST showed a statistically significant association with WIN%, reflecting the importance of teamwork in offensive play. WNBA was the most defence-oriented league among the four leagues analysed: defensive indicators such as DRtg±, BLK, and STL in the WNBA were more important than in any other league in terms of their contribution to WIN%. In collegiate leagues, OREB% was

significantly associated with WIN%, whereas in professional basketball this relationship was not significant, emphasizing the importance of gaining extra plays under longer shot-clock conditions in collegiate basketball. Overall, the results show that teams in each league achieve success in different ways.

Across all leagues, ORtg± demonstrated a stronger association with WIN% than total points scored (see Table 2). In other words, scoring more points per possession showed a closer relationship with team success than simply accumulating more total points. Similarly, allowing fewer points per possession served as a better indicator of team success than raw opponent points allowed. The only league in which defensive efficiency (DRtg±) was not statistically associated with winning was the NBA, while the NBA also exhibited the strongest association between ORtg± and winning. This is consistent with Weisfeld's earlier observations (Weisfeld, n.d.) that the NBA is an offense-oriented league. In the other leagues analysed, the contributions of offensive and defensive efficiencies to winning were much more balanced than in the NBA.

In addition to examining the associations between performance parameters and WIN%, analysis of league averages from 2014–2024 (see Table 1) revealed that ORtg was highest and DRtg was lowest in the NBA. Furthermore, turnover rate was the lowest in the NBA compared to the other leagues as well. Two possible explanations may account for these findings: NBA players may possess superior offensive skills, or defensive challenges in the NBA may be less demanding than in the other leagues. Although defensive pressure cannot be directly quantified with the available statistics, NBA teams also recorded the highest 2P% and 3P% across all leagues, which may reflect either greater shooting ability or more frequent open shot opportunities resulting from a potential lower defensive intensity. This distinction cannot be fully resolved, as traditional team statistics do not give enough information about the opponent's defensive intensity (Oliver, 2024). Regardless, these data indicate scoring efficiency as a key differentiator in the NBA.

It is important to note that lower DRtg in NBA does not indicate that the quality of defence in NBA is lower than in the other three leagues; DRtg may be lower in NBA because of the superior offensive skills of the players despite high quality defence. For example, although it is reasonable to assume that professional players have better shooting ability than collegiate players, NCAA players have better 3P% and 2P% compared to WNBA players. In addition, the differences in shooting success between NBA and NCAA players were very small, with 3P% and 2P% only slightly higher in the NBA. On the other hand, FT% of NBA and WNBA players was much higher compared to that of collegiate players. Because free throws occur without any defensive pressure, they may partially reflect a player's mid-range shooting ability, as they are not influenced by the opponent's defensive pressure during gameplay. The substantial difference in free-throw success rates between professional and collegiate players, compared with the much smaller differences in 2P% and 3P%, may suggest that NBA and WNBA players possess superior shooting ability, but face stronger defensive opposition during gameplay than collegiate teams. However, this interpretation should be considered speculative, as defensive intensity cannot be directly measured using traditional team statistics (Oliver, 2024).

When examining shooting contributions to winning, NBA teams demonstrated a substantially stronger association between 3P% and WIN% compared to all other leagues. On the other hand, although the association between 2P% and WIN% was statistically significant in the NBA, the magnitude of the relationship was weaker than in any other league. This suggests that three-point shooting is particularly decisive in the NBA. The growing importance of 3-point shots in the NBA in recent years was highlighted by Schuhmann in his article on nba.com (Schuhmann, 2021). In contrast, collegiate basketball (NCAA and NCAAW) showed a slightly stronger association between 2P% and WIN% compared to 3P%, indicating that close-range scoring remains crucial in collegiate basketball. Accordingly, in the NBA, offensive strategies that prioritize three-

point shot creation and the recruitment of players with strong perimeter shooting ability appear particularly important, whereas in collegiate basketball, greater emphasis should be placed on inside scoring alongside three-point shooting.

In the WNBA, the magnitude of the negative association between PF and WIN% was substantially stronger than that in the other leagues. This suggests that poor defence leading to excessive fouling may be a critical disadvantage in the WNBA. Supporting this interpretation, DRtg± had a substantially stronger association with WIN% in the WNBA than in any other league, indicating that effective defence is especially decisive for success in that league. To further support this claim, both TOV% and STLs were more strongly related to WIN% in the WNBA than in any of the other leagues, with TOV% showing a negative and STLs a positive association. This underscores the extra importance of forcing turnovers through defensive schemes in the WNBA. Coaches in this league may benefit from designing aggressive defensive plays, such as double teams and trap defences, which could increase steal opportunities and facilitate rapid transitions into scoring situations. Placing greater emphasis on defensive training in the WNBA, while encouraging players to minimize fouling during defensive drills, appears to be a crucial strategy for optimizing performance outcomes in this league. In addition, strength and conditioning coaches in the WNBA may implement agility drills using real-game defensive scenarios to physically prepare their players to execute high quality defence.

In the WNBA, BLK had the strongest magnitude of association with WIN% among all performance parameters across all leagues analysed in this study. Within the collegiate leagues, blocks exhibited the strongest relationship with WIN% in the NCAA and the second strongest in the NCAAW. This highlights the importance of recruiting post players with strong shot-blocking ability and implementing strength and conditioning drills that enhance reactive jumping performance to improve blocking skills, particularly in the WNBA and in collegiate basketball. By contrast, blocking was not a decisive parameter for winning in the NBA.

Assists per game were highest in the NBA (including 40-minute adjusted values); however, the number of assists was not associated with WIN% in the NBA, suggesting that a higher volume of assists did not necessarily translate into more victories in this league. The findings of Mikolajec et al. (Mikołajec et al., 2013), who investigated the relationship between game-related statistics and winning percentage in the NBA between 2003 and 2011, support our findings; no significant relationship was found between assists and winning percentage in the NBA. On the other hand, Melnick (Melnick, 2001) reported a significant relationship between assists and winning in NBA from the 1993–1994 to 1997–1998 seasons. Cabarkapa (Cabarkapa et al., 2022) also stated statistically significant relationships between assists and winning in NBA between 2016-2019. The mixed effects modelling and resampling procedures used in the present study provide more conservative estimates than the simpler correlation and mean based analyses employed in the mentioned studies (Cabarkapa et al., 2022; Melnick, 2001), which may partly explain the absence of a significant relationship between assists and team success in the NBA. In addition, our dataset was more recent and covered a greater number of seasons. On the other hand, higher number of assists were significantly associated with winning in all other leagues, indicating that team-oriented offensive play may be more influential in those leagues. Conversely, the ability to create individual scoring opportunities appeared to have a stronger impact on winning in the NBA.

NCAAW teams recorded the highest OREB% (and correspondingly the lowest DREB%; see Table 1), while OREB% also showed the strongest association with WIN% in that league. This finding underscores the importance of offensive rebounding for generating additional scoring opportunities, as well as defensive rebounding for limiting opponents' second-chance plays in NCAAW. OREB% was significantly associated with winning in the NCAA as well, but not in the professional basketball leagues analysed in this study. One

possible explanation is that college teams receive a 20-second shot clock reset following an offensive rebound, compared with 14 seconds in professional leagues, representing a 43% longer possession extension (*2023-2024 and 2024-2025 NCAA Women's Basketball Rules*, 2023; *2023-2024 NCAA Men's Basketball Rules*, 2023; *OFFICIAL RULES OF THE WOMEN'S NATIONAL BASKETBALL ASSOCIATION*, 2025; *RULE NO. 7: Shot Clock*, n.d.). Therefore, coaches in collegiate basketball may benefit from emphasizing both offensive and defensive rebounding drills to maximize possession control. In the present analysis, OREB% was not significantly associated with WIN% in the NBA or WNBA, whereas DREB% was significant in all leagues. This is not contradictory, as there is no mathematical necessity for OREB%–WIN% and DREB%–WIN% associations to be similar. Pursuing offensive rebounds may compromise transition defence and may reduce the net impact of OREB% on winning, whereas securing defensive rebounds guarantees possession and initiates offensive opportunities.

Pace, measured by the number of possessions, was substantially greater in the NBA and WNBA compared with the NCAA and NCAAW. The pace difference between professional and collegiate leagues mainly results from shot-clock differences, as each offensive possession is limited to 24 seconds in the NBA and WNBA, whereas it is 30 seconds in the NCAA and NCAAW. Therefore, professional teams inevitably have more possessions within the same game duration due to the shorter shot clock.

This study is not without its limitations. Defensive performance in basketball cannot be measured solely by traditional statistics. Additionally, variations in opposition or in the strength of non-conference schedules among the Power Five conferences in the NCAA and NCAAW from year to year were not considered, although their impact is likely minimal given that non-conference games comprise a relatively small portion of the season and their effects tend to average out across multiple years. Moreover, to provide reader-friendly results for coaches, the study used only univariate analyses and therefore did not account for multicollinearity or the combined influence of multiple performance metrics, limiting the ability to determine the unique contribution of each factor. Furthermore, the leagues investigated in this study are based solely on collegiate or professional leagues. Future studies may examine international competitions, such as the Olympics, where national teams have limited time to train together, which may alter the relative importance of certain performance parameters in this type of competition.

Finally, it should be noted that larger regression coefficients do not imply that one skill is inherently more important than another in basketball but rather that the variable has a stronger statistical association with WIN% within the analysed leagues.

CONCLUSIONS

This study found that the performance parameters associated with team success vary across the basketball leagues analysed. Offensive and defensive efficiencies were stronger indicators of success than raw scoring totals, with the NBA relying more on offense, while the WNBA and collegiate leagues demonstrated a more balanced contribution of both. In the NBA, success was most strongly associated with three-point shooting efficiency, whereas in collegiate basketball, blocks and assists were more decisive, reflecting the importance of interior defence and team-oriented offense. Offensive rebounding also showed a stronger association with winning in collegiate basketball than in professional leagues, emphasizing its greater tactical value for maintaining possession and generating second-chance opportunities. Among all leagues analysed, defensive performance was most critical for success in the WNBA. Overall, these results show that the key factors for success differ between leagues and should guide league-specific training and game strategies.

AUTHOR CONTRIBUTIONS

Alp Aslan Uysal identified the research topic, collected the data, and wrote the manuscript. Alan Huebner and Anna Krush designed and conducted the statistical analyses. Kevin Carroll and Michael Henry Stone critically reviewed the manuscript and provided substantial intellectual contributions. All authors read and approved the final version of the manuscript.

SUPPORTING AGENCIES

No funding agencies were reported by the authors.

DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

REFERENCES

2023-2024 and 2024-2025 NCAA Women's Basketball Rules. (2023). The National Collegiate Athletic Association. Retrieved from [Accessed 2026, 12 February]: https://cdn1.sportngin.com/attachments/document/b906-2810917/2023-2024_Womens_BBall_Rules_Book.pdf

2023-2024 NCAA Men's Basketball Rules. (2023). The National Collegiate Athletic Association. Retrieved from [Accessed 2026, 12 February]: https://ncaapublications.com/products/2023-24-mens-basketball-rules-book-online-only

Angel Gómez, M., Lorenzo, A., Sampaio, J., Ibáñez, S. J., & Ortega, E. (2008). Game-related statistics that discriminated winning and losing teams from the Spanish men's professional basketball teams. Collegium Antropologicum, 32(2), 451-456.

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting Linear Mixed-Effects Models Using lme4. Journal of Statistical Software, 67(1). https://doi.org/10.18637/jss.v067.i01

Bellotti, B. (1990). Basketball's Best and Worst. Scarborough House.

Berri, D. J. (1999). Who is "Most Valuable"? Measuring the Player's Production of Wins in the National Basketball Association. Managerial and Decision Economics, 20(8), 411-427. https://doi.org/10.1002/mde.1028

Cabarkapa, D., Cabarkapa, D. V., & Fry, A. C. (2024). Game-related statistics that discriminate winning from losing in NCAA Division-I men's basketball. Frontiers in Sports and Active Living, 6, 1387918. https://doi.org/10.3389/fspor.2024.1387918

Cabarkapa, D., Deane, M. A., Fry, A. C., Jones, G. T., Cabarkapa, D. V., Philipp, N. M., & Yu, D. (2022). Game statistics that discriminate winning and losing at the NBA level of basketball competition. PLOS ONE, 17(8), e0273427. https://doi.org/10.1371/journal.pone.0273427

Claerbaut, D. E. (1994). The NBA Analyst. Visible Ink Press.

Conte, D., Tessitore, A., Gjullin, A., Mackinnon, D., Lupo, C., & Favero, T. (2018). Investigating the game-related statistics and tactical profile in NCAAdivision I men's basketball games. Biology of Sport, 35(2), 137-143. https://doi.org/10.5114/biolsport.2018.71602

Csataljay, G., O'Donoghue, P., Hughes, M., & Dancs, H. (2009). Performance indicators that distinguish winning and losing teams in basketball. International Journal of Performance Analysis in Sport, 9(1), 60-66. https://doi.org/10.1080/24748668.2009.11868464

ESPN Official Website. (n.d.). Retrieved from [Accessed 2026, 12 February]: https://www.espn.com

García, J., Ibáñez, S. J., De Santos, R. M., Leite, N., & Sampaio, J. (2013). Identifying basketball performance indicators in regular season and playoff games. Journal of Human Kinetics, 36, 161-168. https://doi.org/10.2478/hukin-2013-0016

Heeren, D. (1993). The Basketball Abstract: The NBA Statistical Bible. Prentice Hall.

Hollinger, J. (2002). Pro Basketball Forecast: 2002-03 Edition. Brassey's.

Hummel, T. J., & Sligo, J. R. (1971). Empirical comparison of univariate and multivariate analysis of variance procedures. Psychological Bulletin, 76(1), 49-57. https://doi.org/10.1037/h0031323

Ibáñez, S. J., Sampaio, J., Feu, S., Lorenzo, A., Gómez, M. A., & Ortega, E. (2008). Basketball game-related statistics that discriminate between teams' season-long success. European Journal of Sport Science, 8(6), 369-372. https://doi.org/10.1080/17461390802261470

Kubatko, J., Oliver, D., Pelton, K., & Rosenbaum, D. T. (2007). A Starting Point for Analyzing Basketball Statistics. Journal of Quantitative Analysis in Sports, 3(3). https://doi.org/10.2202/1559-0410.1070

Latin, R., Berg, C., & Baechle, T. (1994). Physical and Performance Characteristics of NCAA Division I Male Basketball Players. Journal of Strength and Conditioning Research, 8(4), 214-218. https://doi.org/10.1519/00124278-199411000-00002

Lorenzo, A., Gómez, M. Á., Ortega, E., Ibáñez, S. J., & Sampaio, J. (2010). Game related statistics which discriminate between winning and losing under-16 male basketball games. Journal of Sports Science & Medicine, 9(4), 664-668.

Manley, M. (1988). Basketball Heaven. Self-published.

Melnick, M. J. (2001). Relationship between Team Assists and Win-Loss Record in the National Basketball Association. Perceptual and Motor Skills, 92(2), 595-602. https://doi.org/10.2466/pms.2001.92.2.595

Mikołajec, K., Maszczyk, A., & Zając, T. (2013). Game Indicators Determining Sports Performance in the NBA. Journal of Human Kinetics, 37, 145-151. https://doi.org/10.2478/hukin-2013-0035

NBA Official Website. (n.d.). Retrieved from [Accessed 2026, 12 February]: https://www.nba.com

Official rules of the Women's National Basketball Association. (2025). WNBA. Retrieved from [Accessed 2026, 12 February]: https://cdn.wnba.com/sites/4/2025/04/2025-WNBA-Official-Rule-Book.pdf

Oliver, D. (2024). Basketball on paper: Rules and tools for performance analysis. University of Nebraska Press.

Rule Nº. 7: Shot Clock. (n.d.). NBA Official. Retrieved from [Accessed 2026, 12 February]: https://official.nba.com/rule-no-7-24-second-clock/

Schuhmann, J. (2021, October 14). NBA's 3-point revolution: How 1 shot is changing the game. NBA. Retrieved from [Accessed 2026, 12 February]: https://www.nba.com/news/3-point-era-nba-75

Sports Reference Official Website. (n.d.). Retrieved from [Accessed 2026, 12 February]: https://www.sports-reference.com

Trupin, J., & Couzens, G. S. (1989). Hoopstats: The Basketball Book for Statisticians, Coaches, and Fans. Sterling Publishing.

Weisfeld, O. (n.d.). 'Defense is a lost art': Has the NBA's offensive explosion gone too far? The Guardian. Retrieved from [Accessed 2026, 12 February]: https://www.theguardian.com/sport/2023/feb/03/nba-offensive-revolution-scoring-defense

Ziv, G., & Lidor, R. (2009). Physical Attributes, Physiological Characteristics, On-Court Performances and Nutritional Strategies of Female and Male Basketball Players: Sports Medicine, 39(7), 547-568. https://doi.org/10.2165/00007256-200939070-00003