ORIGINAL ARTICLE

Game-related statistics and performance trends in the FIBA Under-17 Basketball World Cup

Akash Tom Mattakottil . *Department of Physical Education and Sports. Central University of Tamil Nadu. India.*
Dhayalan Kumar. *Department of Physical Education. Central University of Tamil Nadu. India.*
Jayaraman Sundara Raja Perumal. *Department of Physical Education and Sports. Central University of Tamil Nadu. India.*
Viswanath Sundar. *Department of Physical Education and Sports Science. Visva-Bharathi Central University. West Bengal, India.*
Kittu Vengadachalam Narayanasamy. *Department of Physical Education and Sports. Central University of Tamil Nadu. India.*

ABSTRACT

The FIBA Under-17 Basketball World Cup showcases elite youth talent and shapes international basketball's future. This study identified game-related performance indicators differentiating winning from losing teams in different (Group, Second, and Final) rounds of the Under-17 Men World Cup. Data from 122 games across two consecutive Under-17 Men World Cups (Malaga 2022, Istanbul 2024) were analysed, classifying matches as closed, balanced, or unbalanced based on final score differences. Descriptive statistics quantified performance differences, while linear discriminant analysis identified key predictors of game outcomes. In the group stage, first-quarter scoring consistently predicted victory across all game types. Closed games were primarily influenced by three-point field goals made and assists, while balanced games were determined by defensive rebounds and turnovers. Second-round analysis revealed different predictors: points from turnovers in closed games, bench scoring in balanced games, and points from the paint in unbalanced games. The final round showed that points scored in the first and fourth quarters, alongside fast-break points, were consistent predictors regardless of game classification. These findings provide valuable insights for coaches developing tournament preparation strategies. Understanding how different performance indicators influence game outcomes across tournament rounds, enables tactical adjustments that maximize success probability in international youth basketball competitions.

Keywords: Performance analysis, Under-17 basketball, Discriminant analysis, Tournament trends, Performance indicators, Sport analysis.

Cite this article as:
Mattakottil, A. T., Kumar, D., Perumal, J. S. R., Sundar, V., & Narayanasamy, K. V. (2025). Game-related statistics and performance trends in the FIBA Under-17 Basketball World Cup. *Journal of Human Sport and Exercise, 20*(3), 867-882. https://doi.org/10.55860/p9tpwp04

Corresponding author. *Department of Physical Education and Sports. Central University of Tamil Nadu. India.*
E-mail: akashtom0987@gmail.com

Submitted for publication March 12, 2025.
Accepted for publication May 05, 2025.
Published May 29, 2025.
Journal of Human Sport and Exercise. ISSN 1988-5202.

doi: https://doi.org/10.55860/p9tpwp04

INTRODUCTION

The Under 17 basketball World Cup is one of the most prestigious international tournaments that bring together the most promising young players around the globe. This tournament not only serves as a platform for these players to showcase their skills and potential but also provides valuable insights into the factors that contribute to success at the youth level (Nughes et al., 2020). This tournament features national teams composed of players aged 16 and younger, allowing for the identification and development of the next generation of basketball stars (Derri et al., 1998). Game-related statistics serve multiple analytical purposes in basketball, including the evaluation of teams as well as individual players (Gasperi et al., 2020; Sampaio et al., 2006). These statistics are utilized in different contexts: during tournaments (Stavropoulos et al., 2021a) throughout the seasons (Giovanini et al., 2021), and in comparison between playoff and non-playoff teams (Akinci, 2023). Furthermore, (Ibáñez et al., 2018; Madarame, 2018a) facilitate comparative studies of the performances of teams cutting across different genders and continents.

A study by (Lorenzo et al., 2010) on junior basketball players under the age of sixteen found that assists and turnovers are important variables in close games, while defensive rebounds and successful two-point field goals are important in balanced games. In unbalanced games, successful two-point field goals are the main differentiators between winning and losing teams. Similarly, (Karasek & Mikić, 2024) compared under 17 matches of men and women of Triglav Cadet League of Serbia, and found that in close games, successful two-point field goals, defensive rebounds, and assists were the predictors in both sexes and offensive rebounds were the discriminant factors between winning and losing men's teams, whereas in balanced games, successful 2-point field goals for women's teams and assists for both sexes were discriminating factors. In unbalanced games assists for both sexes, defensive rebounds for men's teams, and successful 2-point field goals for women's teams were discriminating factors. Similarly, (Abd El-Hamid Belal, 2014) identified player height, defensive rebounds, efficiency percentage, free throws made, field goals made and attempted, effective field goal percentage, and two-point attempts as crucial factors in distinguishing winning from losing teams during the Under-17 World Cup 2012. (Madarame, 2018a) found that successful free throws rather than assists defined winners and losers in under 17 balanced games. In addition (Sampaio et al., 2004) compared junior teams with senior teams and found that the junior teams differ from senior teams by their lower percentage of assists and higher percentage of turnovers. (Madarame, 2018b) analysed Under-18 Continental Championships and pointed out different playing patterns across different regions. The African Championship was characterized by a high number of free throws. In the European Championship, teams displayed high numbers of both ball possessions and assists. The Asian Championship featured a high number of ball possessions but a lower number of assists. The American Championship showed high numbers in both possessions and assists from the findings, the author concluded that youth basketball games are played differently across various regions of the world.

At present, the number of studies focusing on the highly competitive Under-17 Basketball World Cup is sparse. Basketball is a game that is continuously evolving in the form of changes in the pace of the game, modification of rules, and players trying new skills. This rapid evolution of the game demands the reassessment of the key performance indicators in multiple phases of the tournaments (Stavropoulos et al., 2021a). This study mainly focused on finding the discriminant factors associated with winning and losing teams across the three stages of the World Cup: the group stage, second round, and final round. A total of 21 key performance indicators were analysed, with some newly introduced variables, such as points scored in the 1st, 2nd, 3rd, and 4th quarters, points from turnovers, fast breaks, second chances, paint, and bench contributions. To the best of the researcher's knowledge, no prior studies have examined discriminants between winning and losing teams in the Under-17 category across different tournament stages. The findings

from this study will provide valuable insights for coaches and players regarding current trends in basketball, enabling them to evaluate team performance and make strategies during the game. The primary objective of this paper is to identify the predictors influencing winning teams, progression to subsequent rounds, and competing for medals in the Malaga 2022 and Istanbul 2024, Men Under-17 Basketball World Cup.

MATERIALS AND METHOD

Sample and variables

This study analysed a total of 112 games from the Men Under-17 World Cup held between Malanga 2022 (n = 56) and Istanbul 2024 (n = 56), involving 16 teams in each tournament. Data was selected from the public available data from the official box scores of the FIBA Basketball website: https://www.fiba.basketball/en/events/fiba-u17-basketball-world-cup-2024/teams. The key performance indicators used in this research include: first-quarter score (1Q), second-quarter score (2Q), third-quarter score (3Q), fourth-quarter score (4Q), wo-point try (2PTry), two-point shots made (2PMade), three-point try (3P Try), three-point shots made (3PMade), free throw try (FTT), free throws made (FTM), offensive rebounds (OFR), defensive rebounds (DFR), total rebounds (RBO), assists (AST), personal fouls (PF), turnovers (TRN), steals (STL), blocks (BLK), points from turnovers (PTO), points from fast breaks (PFF), points from second chances (PFSC), points scored from the paint (PFP), and points from the bench (PFBU).

All collected variables are normalized to ball possession (BP) multiplied by 100 (Zhou et al., 2024). Ball possession was calculated using the formula BP = (field goals attempted) – (offensive rebounds) + (turnovers) – 0.4 × (free throws attempted (Oliver, D. (2004). The matches were categorized into three types based on the final score difference: Closed games (final score difference of fewer than 10 points), balanced games (final score difference between 10 and 20 points), and unbalanced games (final score difference exceeding 20 points) (De Saá Guerra et al., 2013).

Statistical analysis

The descriptive statistics for winning and losing teams were presented as means and standard deviations for each round. Univariate differences among the predictor variables for winning and losing teams were evaluated using independent-sample t-tests. For the group stage, the second round, and the final round, a linear discriminant function was estimated for each game type (closed, balanced, or unbalanced), including, all predictors to identify the factors most significantly associated with the outcomes of specific game types. The cut of value for structure coefficients (SC) was established at an absolute value of 0.3 (*Finch, H. (2009*). The assumption of equality of covariance matrices was examined utilizing Box's M-test. A stepwise discriminant analysis was conducted to identify the predictors that optimally distinguished between winning and losing teams, employing subsequent F-tests as criteria for inclusion or exclusion, with *p*-values set at .05 and .1, respectively. The linear discriminant equation was applied to assign a discriminant score (D) to each team's game, represented by the equation $D = \beta X$, where β denotes the vector of estimated unstandardized discriminant function coefficients, and X represents the vector of obtained game-related statistics. The models' accuracy was assessed through leave-one-out classification (Iduseri & Osemwenkhae, 2015). Statistical analyses were carried out using the statistical package (IBM SPSS ver 26, Armonk, NY), and a significance level of 5% was established for all tests.

RESULT

The combined descriptive results of the 112 games of the Under-17 Basketball World Cup 2022 and 2024 are presented in Table 1.

Table 1. Descriptive statistics about the type of game per round.

Game Type	Group Stage		Second Round		Final Round	
	n = 49	%	n = 39	%	n = 24	%
Closed games	13	26.53%	11	28.20%	9	37.50%
Balanced games	10	20.40%	12	30.76%	6	25%
Unbalanced games	26	53.06%	16	41.02%	9	37.50%

The results of the group-stage matches of the Basketball World Cup showed that 53.06% (n = 26) of the games were unbalanced, 26.53% (n = 13) were closed, and 20.40% (n = 10) of the games were balanced. Furthermore, in the second round of the Basketball World Cup, the majority of games (n = 16) were unbalanced, while (n = 12) games were balanced and (n = 11) games were closed. Further, regarding the final round, 37.50% (n = 9) of the games were closed, 37.50% (n = 9) were unbalanced and 25% (n = 6) were balanced games.

Table 2: The Group Stage's key performance indicators with mean values (SD).

Performance Indicators	Closed (n = 13)		Balanced (n = 10)		Unbalanced (n = 24)	
	Winner	Loser	Winner	Loser	Winner	Loser
1Q#	25.20 (6.46)	26.24 (8.35)	36.415 (13.546)	25.43 (12.60)	38.72 (10.86)	19.88 (7.28)
2Q #	33.39 (18.28)	30.63 (11.37)	49.39 (19.9)	39.85 (16.02)	59.54 (20.08)	31.71 (13.87)
3Q #	43.88 (30.00)	35.76 (19.84)	72.75 (32.26)	56.50 (28.31)	78.76 (39.56)	41.57 (22.27)
4Q #	56.42 (46.83)	43.92 (36.38)	89.74 (47.64)	77.51 (44.74)	100.72 (59.24)	50.51 (30.96)
2P Try #	47.9 (18.66)	41.61 (10.72)	53.196 (6.40)	50.15 (15.47)	84.72 (14.68)	61.05 (12.20)
2P Made #	48.40 (13.02)	43.81 (19.42)	56.55 (23.23)	55.22 (24.27)	97.98 (54.50)	23.221 (9.093)
3 P Try #	33.08 (8.41)	33.17 (14.73)	41.19 (9.90)	34.00(8.46)	38.94 (7.58)	33.38 (10.26)
3 P Made#	20.19 (11.07)	27.2 (12.07)	28.122 (15.38)	26.11 (16.18)	12.36 (4.23)	6.10 (3.24)
FT Try #	17.81 (18.69)	13.21 (7.16)	26.06 (26.8)	17.24 (17.82)	36.98 (18.43)	25.65 (21.19)
FT Made#	27.17 (11.29)	24.16 (11.29)	31.0 (19.26)	31.22 (18.61)	24.33 (11.95)	15.451 (11.99)
OFR #	21.18(8.71)	17.62 (8.83)	20.99 (8.20)	20.24 (10.22)	31.29 (8.64)	18.67 (8.40)
DFR #	30.89 (24.69)	23.40 (13.22)	36.01 (18.13)	27.05 (9.02)	54.35 (12.99)	35.08 (11.69)
RBO(*,#)	53.83(28.59)	40.29 (14.013)	63.48 (19.91)	47.54 (11.01)	85.64 (17.83)	53.76 (17.83)
AST #	63.96 (39.03)	42.13 (15.425)	58.26 (27.26)	43.19 (25.77)	39.99 (10.88)	15.20 (6.40)
PF *	23.33 (7.34)	25.70 (6.90)	29.86 (12.35)	25.33 (12.84)	27.55 (12.44)	25.90 (9.35)
TRN(*,#)	25.30 (6.47)	23.03 (7.23)	35.65 (8.830)	27.21 (8.20)	22.42 (7.729)	34.49 (11.66)
STL #	17.26 (8.52)	19.37 (8.25)	21.18 (9.94)	26.11 (6.95)	22.99 (9.38)	11.82 (4.50)
BLK #	8.39 (5.55)	9.85 (5.65)	14.26 (6.00)	11.90(8.52)	9.33 (3.37)	5.27 (3.67)
PFT #	8.94 (7.31)	12.34 (12.83)	16.21 (10.66)	16.83 (15.424)	46.572 (21.18)	15.30 (8.29)
PFF #	20.006 (6.38)	19.911 (9.46)	31.64 (13.93)	19.96 (9.71)	44.82 (25.71)	17.59 (8.83)
PFSC #	22.84 (7.76)	18.757 (12.218	25.72 (11.27)	21.12 (6.4)	28.94 (11.420	15.17 (8.93
PFP #	27.977 (20.495)	21.132 (13.415)	36.58 (20.37)	33.14 (22.79)	83.97 (27.7)	43.58 (20.84)
PFBU #	35.063 (25.324)	40.923 (16.576)	60.45 (16.6)	51.74 (18.61)	76.66 922.72)	31.07 (15.54)

Note. Significant univariate differences between winning and losing teams in closed games ($), balanced games (*), and unbalanced games (#) ($p < .05$).

Group stage

The performance indicators of all the games from the group stage matches are listed in Table 2. From the univariate analysis of 13 closed games, it has been found that there was no significant difference between the winning and losing team's games in the group matches. The teams that dominated in a closed game to win the group stage averaged 2.76 points in the second quarter, 8.12 points in the third, and 12.5 points in the fourth. The descriptive result showed that the field goal try (p = .010), rebound (p = .040), turnover (p = .040), and point from fast break (p = .043) were the most significant indicators in the case of balanced games. In unbalanced games, all the indicators except personal foul (PF) have significant difference between winning and losing teams in the group stage.

Table 3. Structure coefficients of predictors at the Group Stage according to game type (closed, balanced, or unbalanced).

Performance Indicators	Closed game	Balanced game	Unbalanced game
1Q	**0.5**	**0.52**	**0.489**
2Q	-0.256	0.259	0.204
3Q	-0.003	0.121	0.09
4Q	**-0.432**	0.037	0.066
Field Goal Try	0.285	0.266	**0.319**
Field Goal Made	**0.465**	0.089	**0.655**
2P Try	**-0.326**	0.144	**0.342**
2P Made	-0.062	0.137	0.15
3P Try	**-0.433**	0.084	-0.05
3P Made	**0.573**	-0.077	**0.318**
FT Try	**0.394**	**0.447**	0.11
FT Made	0.081	**0.314**	0.134
OFR	0.181	**0.694**	0.202
DFR	0.079	**0.522**	0.299
RBO	**0.481**	1	**0.308**
AST	**0.466**	0.233	**0.537**
PF	**0.38**	0.109	0.028
TRN	**0.321**	**0.55**	-0.159
STL	0.051	-240	0.291
BLK	0.114	**0.314**	0.244
PFT	0.151	-0.183	0.212
PFF	0.117	0.275	**0.484**
PFSC	0.099	**0.425**	0.18
PFP	-0.021	0.189	**0.382**
PFBU	**-0.516**	-0.092	0.266
Eigenvalue	0.803	0.458	7.051
Wilks lambda	0.555	0.686	0.124
Canonical correlation	0.667	0.56	0.936
Chi Square	8.842	6.596	99.077
p-value	.012	<.001	<.001

Note. Bold Numbers represent SC>.30.

Bold Numbers represent SC>.30

Table 3 shows the structural coefficient of the predictor in all the types of games. Points in the fourth quarter (SC = -0.432), field goals made (SC = 0.465), two-point tries (SC = -0.326), three-point tries (SC = -0.433), three-point made (SC = 0.573), rebounds (SC = 0.481), assists (SC = 0.466), turnovers (SC = 0.321), and points from the bunch (SC = -0.516) were the factors associated with winning closed games in the group stages.

For the closed games, the step-wise discriminate function was statistically significant and provided 69.20% of the overall variance of the game's outcome (Wilks' lambda = .555, $p < .001$). The standardized discriminant function of this reduced model, which included first-quarter scores and three points scored, revealed two predictors that best predict the game's outcome:

$$Dc = -7.036 + 0.150 \cdot 1Q + 0.109 \cdot 3PTM$$

The factors associated with winning balanced games in the group stage were the free throw try (SC = 0.447), offensive rebound (SC = 0.694), defensive rebound (SC = 0.522), the number of blocks (SC = 0.314), free throw made (SC = 0.314) and the points from the bench (SC = 0.425). For balanced games, the step-wise

discriminant function was statistically significant and explained 70% of the overall variance in the game's outcome (Wilks' lambda = .686, $p < .001$). One predictor, the number of rebounds, was included in the reduced model, as indicated by the F-statistic. The discriminant function is:

$$Db = -3.880 + 0.058 \cdot REB$$

During the group stage, field goals made (SC = 0.655), assists (SC = 0.537), points scored in the first quarter (SC = 0.489), points from fast breaks (SC = 0.484), points scored in the paint (SC = 0.382), two-point field goal try (SC = 0.342), field goal made (SC = 0.319), and total rebounds (SC = 0.308) were the factors that contributed to winning the unbalanced games. The stepwise discriminant function analysis for unbalanced games was discovered to be statistically significant, accounting for 100% of the variance in game outcomes (Wilks' lambda = 0.124, $p < .001$). This model identified four key predictors that most effectively predict the game outcome, and the standardized discriminant function is as follows:

$$Dub = -8.283 + 0.083 \cdot FGM + 0.137 \cdot 3PTM - 0.025 \cdot Fttry + 0.058 \cdot DREB + 0.084 \cdot STL$$

The results showed that the discriminant function for closed games had a classification accuracy of 65.4% for the original group and 69.2% for the cross-validated data in terms of model accuracy. 75% of the original matches and 70% of the cross-validated data were correctly classified by the discriminant function for balanced games. Both the original group and the cross-validated group had 100% classification accuracy in the case of unbalanced games. The discriminant score histograms for winning and losing teams in closed, balanced, and unbalanced games are shown in Figure 1.

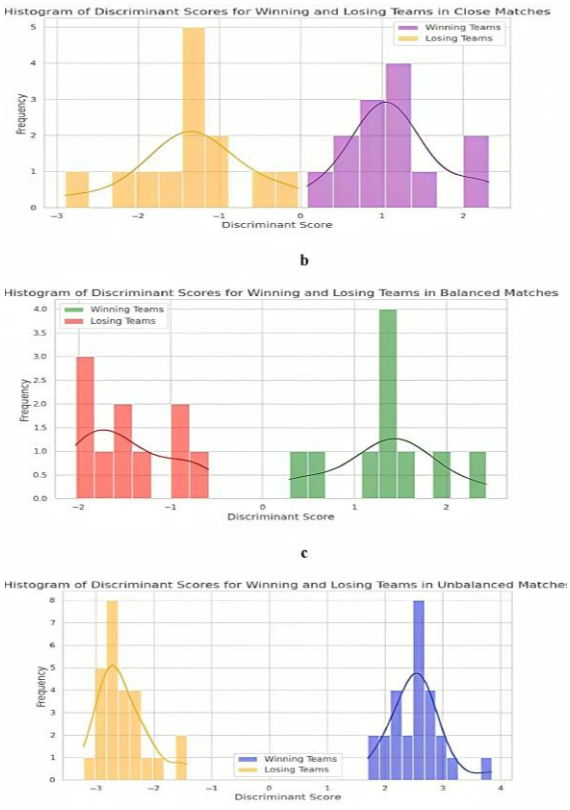

Figure 1. Discriminant scores for winning and losing teams in group stage games that are closed (a), balanced (b), and unbalanced (c)

Second round

The univariate differences of the predictor variables between winning and losing games of closed, balanced, and unbalanced games in the second round are shown in Table 4. The second-quarter scores of the teams indicated a higher trend for winning the game (p = .021). To be more precise, it was found that teams that dominated in a closed game scored 9.59 points higher on average in the second quarter. The significant difference in turnover (p = .024) and points from the bunch (.029) highlights the importance of ball control and bench strength in determining game outcomes. In balanced games, the univariate difference found that there was a significant difference in performance between the winning and losing teams in the performance indicators points scored in the first and third quarter (p = .027, p = .031), field goals made (p = .003), rebounds (REB) (p = .045) and assists (AST) (p = .042). This emphasizes the importance of both offensive and defensive contributions in-game success. In unbalanced games, the majority of key parameters showed significant differences between the winning and losing teams, except for three-point try, free throw try, free throw made, personal foul, and block.

Table 4. The Second-Round key performance indicators with mean values (SD).

Performance	Closed (n = 11)		Balanced (n = 12)		Unbalanced (n = 16)	
Indicators	Winner	Loser	Winner	Loser	Winner	Loser
1Q (#,*)	23.48(7.04)	25.08(5.02)	36.48(11.830	26.45(8.62)	38.12 (9.19)	18.21 (6.62)
2Q ($,*	31.22 (10.54)	21.63 (7.08)	34.87 (9.08)	36.00(13.54)	56.61 (23.85)	31.510 (12.51)
3Q (#,*)	24.86 (6.58)	24.06 (5.30)	28.97 (7.42)	46.11 (24.72)	76.50 (39.31)	46.45 (21.06)
4Q *	29.11 (6.47)	26.04 (10.08)	34.50 (8.99)	56.62 (36.58)	97.51 (55.22)	58.711(31.34)
2P Try*	49.31 (21.1)	49.76 (17.95)	65.19 (14.51)	60.59 (11.01)	70.63 (18.83)	56.20 (12.93)
2P Made *	38.84 (10.53)	44.53 (19.56)	34.64 (11.81)	28.65 (8.58)	114.85 (69.16)	22.83 (7.3)
3P Try	31.40 (12.98)	34.73 (8.28)	45.90 (15.13)	40.38 (11.12)	39.467 (10.05)	34.41 (10.85)
3P Made (#,*)	22.07 (11.71)	22.90 (13.97)	15.66 (6.7)	10.39 (4.5)	14.27 (5.110	7.9 (3.6)
FT Try	22.93 (17.6)	14.72 (11.6)	28.36 (12.29)	25.23 (13.17)	23.56 (11.27)	19.80 (12.10)
FT Made *	29.38 (9.1)	20.13 (11.63)	18.56 (8.38)	17.89 (10.16)	14.99 (8.03)	12.71 (9.24)
OFR *	22.78 (8.02)	19.78 (9.00)	23..05 99.01)	17.56 (7.98)	23.30 (9.44)	13.11 (5.42)
DFR *	31.28 (21.49)	35.49 (17.52)	47.59 (12.38)	40.82 (9.27)	49.24 (7.20)	34.99 (8.30)
RBO (#,*)	50.80(24.79)	52.90 (25.13)	70.64 (16.900	58.39 (10.63)	72.55 (12.78)	48.10 (11.55)
AST (#,*)	62.69 (29.67)	40.46 (21.78)	31.64(6.72)	25.41 (7.3)	33.94 (6.24)	16.92 (6.300)
PF	22.20 (6.27)	26.39(9.90)	24.52 (6.10)	25.52 (7.86)	21.86 (7.93)	22.02 (7.5)
TRN ($,*)	22.24 (4.25)	28.21 (6.89)	23.83 (7.48)	26.68 (11.64)	22.62 (8.6)	30.41 (10.26)
STL (*	18.10 (7.13)	16.39 (6.77)	14.67 (6.9)	13.56 (4.411)	18.95 (6.65)	12.30 (6.02)
BLK	9.5 (4.18)	8.33 (5.29)	6.49 (3.28)	4.44 (1.510)	7.09 (2.70)	5.38 (2.36)
PFT *	18.53 (16.23)	9.66 (9.81)	34.65 (15.80)	18.76 (6.99)	38.54 (18.22)	16.97 (9.82)
PFF *	21.47 (7.5)	19.16 (6.35)	26.53 (11.00)	22.014 (6.43)	31.63 (16.22)	13.29 (6.51)
PFSC *	21.88 (12.30)	23.15 (9.88)	20.20 (11.86)	14.35 (12.21)	25.46 (14.21)	11.49 (7.49)
PFP *	31.82 (22.245)	28.349 (15.22)	58.04 (18.15)	53.53 (16.30)	72.47 (26.13)	39.44 (13.57)
PFBU(#,*)	21.176 (20.27)	40.87 (19.04)	54.10 (22.21)	34.41 (25.8)	66.18 (17.27)	26.31 (13.51)

Note. Significant univariate differences between winning and losing teams in closed games ($), balanced games (*), and unbalanced games (#) ($p < .05$)

The structure coefficients of the discriminant function for the second round are presented in Table 5. An analysis of closed and balanced games revealed that no structural coefficients surpassed the established threshold of 0.30, suggesting that no individual factor had a predominant effect on game outcomes. In contrast, the factors associated with winning unbalanced games in the second round included field goals made (SC = 0.595), assists (SC = 0.522), points scored in the first quarter (SC = 0.478), points from the paint (SC = 0.470), points scored in the second quarter (SC = 0.450), turnovers (SC = -0.414), field goal try (SC = 0.372), two-point shots made (SC = 0.360), point from second chance (SC = 0.357), personal fouls (SC = -0.347), and points scored in the third and fourth quarters (SC = 0.331 and SC = 0.333, respectively).

Table 5. Structure coefficients of predictors at the Second Round according to game type (closed, balanced, or unbalanced).

Performance Indicators	Closed Game	Balanced game	Unbalanced game
1Q	-0.213	0.105	**0.478**
2Q	-0.074	-0.189	**0.45**
3Q	0.066	0.065	**0.331**
4Q	0.101	0.076	**0.333**
Field Goal Try	-0.116	0.112	**0.372**
Field Goal Made	0.15	0.218	**0.595**
2P Try	-0.034	-0.031	0.25
2P Made	0.117	0.086	**0.36**
3P Try	-0.258	0.15	0.083
3P Made	0.167	0.153	-0.009
FT Try	-0.154	0.039	-0.06
FT Made	-0.229	-0.094	-0.109
OFR	0.052	0.18	0.163
DFR	-0.135	0.036	0.298
RBO	-0.134	0.137	0.294
AST	-0.083	0.238	**0.522**
PF	0.069	0.129	**-0.347**
TRN	0.27	0.06	**-0.414**
STL	-0.158	-0.07	0.164
BLK	-0.063	-0.11	0.259
PFT	-0.25	0.205	0.137
PFF	0.127	0.154	0.282
PFSC	-0.201	-0.007	**0.357**
PFP	-0.074	0.041	**0.47**
PFBU	0.259	-0.03	0.263
Eigenvalue	4.099	11.006	7.212
Wilks lambda	0.196	0.083	0.122
Canonical correlation	0.897	0.957	0.937
Chi Square	29.322	47.223	60.01
p-value	<.001	<.001	<.001

Note. Bold Numbers represent SC>.30.

For the unbalanced games in the second round, the stepwise discriminant function was statistically significant and explained all of the variance in the game's outcome (Wilks' lambda = .122, $p < .001$). Three predictors were found to be the most accurate in predicting the game's outcome by this reduced model: points scored in the first quarter, assists, and a 2-point try. The discriminant function is:

$$Dub = -6.4420.073 \cdot 1^{st}Q + 0.124 \cdot AST + 0.018 \cdot 2PT$$

The results showed that the discriminant function could accurately predict 95.5% of the original and cross-validated closed games in terms of model accuracy. For the balanced games, the discriminant function correctly classified 95.8% of the cross-validated data and 100% of the original matches; for the unbalanced games, the cross-validated classification accuracy was 100%. Figure 2 displays the discriminant score histograms for winning and losing teams in closed, balanced, and unbalanced games.

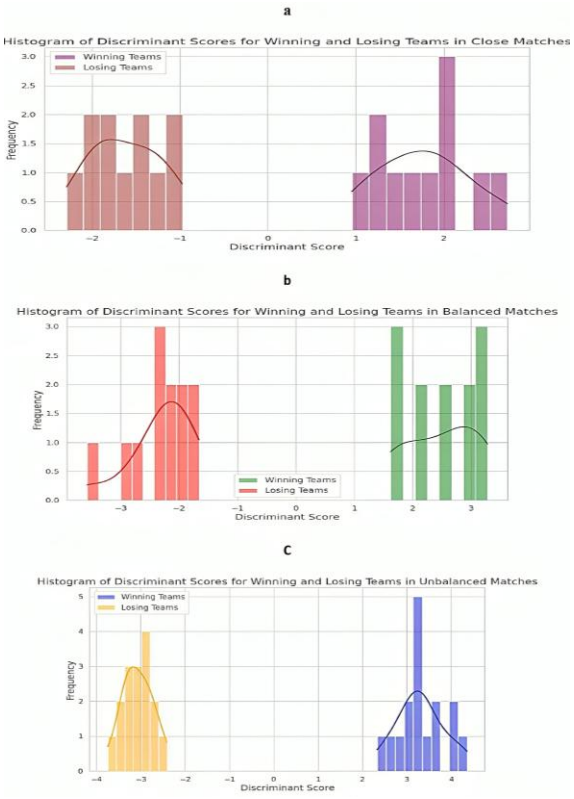

Figure 2. Discriminant scores for winning and losing teams in second-round games that are closed (a), balanced (b), and unbalanced (c).

Table 6. The Final Round key performance indicators with mean values (SD).

Performance Indicators	Closed (n = 9)		Balanced (n = 6)		Unbalanced (n = 9)	
	Winner	Loser	Winner	Loser	Winner	Loser
1Q *	29.14 (8.43)	26.89 (5.21)	32.37 (10.19)	27.78 (4.513)	40.73 (11.61)	22.78 (8.42)
2Q *	24.72 (7.49)	24.25 (6.17)	32.19 (9.34)	31.24 (13.03)	38.33 (10.63)	19.87 (8.43)
3Q *	27.85 (7.12)	23.65 (5.10)	36.21 (6.62)	37.76 (31.26)	42.43 (7.10)	25.233 (11.15)
4Q	26.14 (6.71)	23.27 (4.49)	41.91 (12.07)	37.76(31.26)	39.244 (10.12)	32.21 (11.58)
2P Try*	53.57 (22.62)	47.93 (14.75)	75.13 (17.96)	75.191 (13.79)	83.870 (9.49)	61.73 (12.43)
2P Made (#,*)	46.83 (18.04)	52.73(20.56)	39.44 (8.36)	30.08 (5.040)	103.24 (90.86)	25.60 (7.27)
3P Try *	28.67 (10.11)	30.75 (6.06)	32.831 (11.90)	37.25 (6.66)	37.53 (14.48)	37.16(4.84)
3P Made *	22.41 (12.01)	24.53 (16.52)	11.86 (5.870	8.63 (3.9831)	14.551 (6.26)	9.87 (3.81)
FT Try	20.11(14.4)	11.18 (6.280)	42.20 (21.13)	33.91 (13.95)	41.72 (23.04)	30.34 (26.17)
FT Made	25.59 (10.98)	19.68 (12.35)	28.22 (13.40)	21.67 (8.39)	27.69 (16.76)	18.92 (17.91)
OFR *	20.95 (10.95)	16.44 (4.148)	23.76 (6.99)	22.70 (5.74)	27.13 (7.411)	18.49 (7.37)
DFR(#,*)	26.64 (14.07)	32.27 (11.6)	59.21 (17.67)	37.51 (9.37)	52.12 (8.43)	39.18 (13.35)
RBO *	51.49 (14.60)	50.57 (15.37)	82.98 (22.07)	60.21 (12.00)	76.30 (16.74)	57.68(17.40)
AST (#,*)	74.57 (51.2)	47.60 (30.49)	33.34 (8.80)	21.85 (6.33)	41.17 (13.13)	25.00 (10.78)
PF	26.43 (5.64)	25.23 (4.45)	32.68 (8.78)	23.86 (8.79)	26.24 (13.44)	29.91 (11.66)
TRN *	24.44 (6.23)	29.28 (6.744)	14.03 (6.151)	17.72 (4.62)	22.42 (5.30)	31.74 (5.63)
STL *	21.00 (7.79)	16.65 (7.73)	17.72 (4.62)	9.85 (3.281)	23.93 (10.88)	10.77 (2.37)
BLK	11.86 (6.53)	12.29 (6.12)	9.85 (3.2)	6.15 (4.96)	8.32 (3.835)	6.67 (3.75)
PFT *	19.25 (18.04)	11.24 (6.33)	31.98 (9.06)	26.06 (11.05)	50.41 (22.33)	20.40 (10.23)
PFF*	20.21 (5.11)	16.40 (7.52)	29.92 (8.18)	21.86 (8.36)	54.52 (28.54)	22.63 (16.76)
PFSC *	19.70 (8.29)	21.98 (8.00)	19.19 (7.85)	22.51 (5.00)	25.64 (10.72)	14.546 (8.61)
PFP (#,*)	33.13 (26.021)	39.38 (21.66)	75.07 (16.20)	51.97 (7.63)	81.54 (29.06)	44.15 (15.43)
PFBU ($,*)	26.42(25.92)	47.60 (11.26)	61.77 (11.65)	43.02 (21.50)	67.27 (23.21)	37.90 (22.32)

Note. Univariate significant differences between winning and losing teams in closed games ($), balanced games (*), and unbalanced games (#) ($p < .05$)

Final round

In the final round, 24 matches were examined and divided into three groups: closed (n = 9), balanced (n = 6), and unbalanced (n = 9). Table 6, summarizes the performance metrics for the last round, contrasting the winning and losing teams. According to a univariate analysis of the nine closed games, the winning teams' bench players scored significantly fewer points on average (26.42) than the losing teams (47.60). The statistical analysis revealed a significant difference in scoring contributions from bench players between winning and losing teams (p = .031), suggesting that losing teams depend more on their bench players for scoring. In balanced games, the number of successful field goals differed significantly between winning and losing teams, with winning teams averaging 12.59 more successful field goals in the final round (p = .002). Additionally, the winning team recorded a greater number of defensive rebounds (p = .024), assists (p = .027), and points from the paint (p = .010). In unbalanced matches, all key performance parameters, except for fourth quarter score (p = .189), free throw try (p = .342), and made (p = .299), personal fouls (p = .545), and blocks (p = .372), did not have a significant impact on the outcomes of the games.

Table 7. Structure coefficients of predictors at the Second Round according to game type (closed, balanced, or unbalanced).

Performance Indicators	Closed Game	Balance Game	Unbalance Game
1Q	**-0.372**	**0.48**	**0.348**
2Q	**0.394**	0.151	**0.397**
3Q	0.023	0.214	**0.313**
4Q	**0.441**	**0.552**	**0.509**
Field Goal Try	**0.392**	-0.109	**0.375**
Field Goal Made	**0.477**	**0.757**	**0.742**
2P Try	**0.622**	-0.224	**0.633**
2P Made	**0.774**	0.249	0.086
3P Try	**0.636**	0.022	-0.184
3P Made	**-0.353**	**0.473**	-0.29
FT Try	**-0.459**	0.044	0.253
FT Made	**-0.346**	0.109	0.236
OFR	**-0.505**	-0.238	0.057
DFR	-0.04	0.068	0.065
RBO	-0.002	0.028	-0.046
AST	-0.017	**0.386**	**0.374**
PF	**-0.325**	-0.043	0.235
TRN	0.081	0.213	**0.381**
STL	-0.34	-0.45	0.053
BLK	**0.491**	-0.217	0.138
PFT	0.236	-0.021	**0.359**
PFF	**0.558**	**-0.337**	**0.417**
PFSC	0.133	0.13	**0.352**
PFP	0.099	**0.372**	**0.715**
PFBU	**0.712**	**0.541**	0.223
Eigenvalue	2.28	2.832	3.639
Wilks lambda	0.305	0.261	0.216
Canonical correlation	0.834	0.86	0.886
Chi Square	8.315	12.09	23.018
p-value	.016	.002	<.001

Note. Bold Numbers represent SC>.30.

The linear discriminant model, which included all parameters, found several factors related to winning closed matches in the final round (Table 7). These factors included two-point shots made (SC = 0.774), points scored from the bench (SC = 0.712), three-point try (SC = 0.636), two-point try (SC = 0.622), points from fast breaks

(SC = 0.558), offensive rebounds (SC = 0.510), blocks (SC = 0.491), free throw try (SC = -0.460), fourth quarter score (SC = 0.441), second quarter score (SC = 0.394), field goal try (SC = 0.392), first quarter score (SC = -0.370), three-point shots made (SC = -0.350), free throws made (SC = -0.350), and personal fouls (SC = -0.330). The stepwise discriminant function analysis for close games was statistically significant, explaining 100% of the total variance in-game outcomes (Wilks' lambda = 0.305, p = .016). This streamlined model identified two key predictors that most effectively forecast the game outcome: field goals made and total rebounds. The standardized discriminant function is as follows:

$$Dc = - 9.105 + 0.155\ FGM - 0.139\ REB$$

In the balanced games, the factors that influence winning the games were field goals made (SC = 0.757), points scored in the fourth quarter (SC = 0.552), points scored from the bunch (SC = 0.541), first quarter score (SC = 0.480), three-point made (SC = 0.473), Steal (SC = -0.450), points scored from assist (SC = 0.386), points from the paint (SC = 0.372), and the points from the fast break (SC = -0.337). For the balanced games, the stepwise discriminant function was statistically significant and explained all of the variance in the game's outcome (Wilks' lambda = .261, p = .002). The field goals try, and the field goal made is the two predictors that this reduced model found to be the most accurate in predicting the game's outcome. The standardized discriminant function is:

$$Db = - 3.525 - 0.059 \cdot FGTry + 0.223\ FGM$$

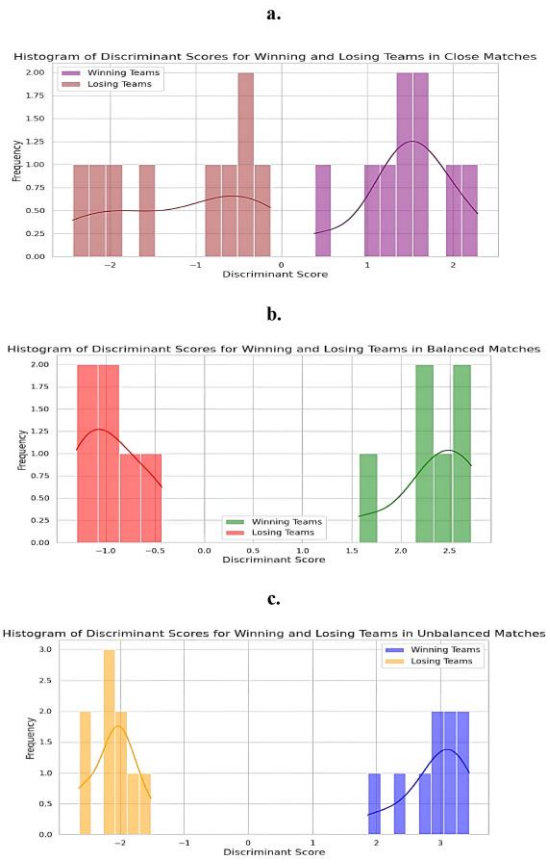

Figure 3. Discriminant scores for winning and losing teams in second-round games that are closed (a), balanced (b), and unbalanced (c).

For the unbalanced games in the final round main factors that influence the winning team are field goal try (SC = 0.742), point from the paint (SC = 0.715), two-point try (SC = 0.633), point scored in the fourth quarter (SC = 0.509), point from fast break (SC = 0.417), second quarter score (SC = 0.397), turnover (SC = -0.381), field goal try (SC = 0.375), assist (SC = 0.374), point scored from turnover (SC = 0.359), second chance point (SC = 0.352), point scored in the first and the third quarter (SC = 0.348), (SC = 0.313). For the unbalanced games, the stepwise discriminant function was statistically significant and explained all of the variance in the game's outcome (Wilks' lambda = .216, $p < .001$). The field goal made and the assist were the two predictors that this reduced model found to be the most accurate in predicting the game's outcome. The standardized discriminant function is:

$$Dub = - 7.060 + 0.238\ FGM - 0.127\ AST$$

The results showed that the discriminant function can accurately predict 72.2% of the original and 77.8% of the cross-validated closed games in terms of model accuracy. While the original cases and cross-validated classification for the unbalanced games were 100% and 94.4%, respectively, the discriminant function for the balanced games correctly classified 91.7% of the original and cross-validated data. The discriminant score histograms for winning and losing teams in closed, balanced, and unbalanced games are displayed in Figure 3.

DISCUSSION

The purpose of this investigation was to find the key performance indicators that discriminate across different stages (group, second, and final round) of the under-17 basketball World Cups of 2022 and 2024. The analysis considered closed, balanced, and unbalanced games, allowing for an exact understanding of how different performance indicators contributed to game outcomes at various stages and identifying the primary predictor separating winning and losing teams. The study employed both descriptive analysis and stepwise discriminant function as methodology.

In closed games during the group stage, the dominant factors associated with the game's outcome are 3-point shots made, assists, and points scored in the fourth quarter. There was an interesting observation that the losing team made more 3-pointers (27.2) than the winning teams (20.19). These performance indicators highlighted that the trailing teams frequently employed a high-risk, high-reward tactic of increased three-point attempts to rapidly reduce the point gap. Furthermore, my finding was supported by (Csataljay et al., 2012). The winning team had a higher number of assists than the losing team in closed matches i.e. 42.13 versus 63.96 for the winning team. (Lorenzo et al., 2010) also mentioned the importance of assists in closed games. Victorious teams likely exhibit more effective passing strategies, creating better scoring opportunities and promoting a more offensive approach. This collaborative play style not only leads to more assists but also typically results in higher-percentage shots, contributing to the team's overall success in closed contests (Mukherjee et al., 2018). Furthermore, in closed matches in group stages, the winning team scored more points in the fourth quarter, 43.92, versus 56.42 for the winning. This pattern indicates that winning teams showed a high level of endurance and strategic execution in the crucial final period, maintaining momentum and building on their early lead. Particularly, in the last quarter, the winning team scored an average of 13 points more than the losing team.

Regarding the balanced games, the highest difference was found in the defensive rebound, points scored in the first quarter, and turnover. In balanced games in the group stages winning team took more defensive rebounds compared to the losing team. (Lorenzo et al., 2010; Çene, 2018) also found the importance of

defensive rebounds in balanced games. Strong defensive rebounding enables teams to increase their offensive possessions while cutting their opponents' second-chance scoring opportunities. The points scored in the first quarter have also been a factor in winning the matches in balanced games. The team that establishes a strong lead early can maintain control throughout the game. The number of turnovers also showed an increase in the number for the winning team, which could be due to aggressive offensive strategies, resulting in errors. This confirms the earlier finding of (Madarame, 2018a) that teams that emphasize rapid transitions and employ high-pressure tactics frequently produce more turnovers; however, they can still achieve victory (Lorenzo et al., 2010).

In the group stage, unbalanced games were more unstable than closed and balanced games, and the winning team scored much higher on nearly every game indicator. The main difference was in the number of points from assists, rebounds, and fast breaks.

In contrast to the findings of (Stavropoulos et al., 2021b) regarding the 2019 Men's World Cup, which highlighted a combination of closed and balanced matches while excluding unbalanced ones due to fewer total matches in the second round, the under-17 World Cup has a different picture. In the second round of the U17 Men's World Cup, there was no clear dominant factor distinguishing closed and balanced games. This contradicts (Stavropoulos et al., 2021b) conclusions. In the context of unbalanced matches, key performance indicators such as assists and points from the paint emerged as critical discriminants for team success. The number of assists also showed an increase in the winning team, with seventeen assists more, on average, per game in the unbalanced game in the second round. It highlights the offensive capabilities of the team that wins the match but also underscores the importance of ball movement (García et al., 2014; Csataljay et al., 2012). In the first quarter, winning teams scored 38.12 points on average, while losing teams only scored 18.21 points, giving the winning teams a significant advantage of 19.91 points in unbalanced games. Successful teams, according to this trend, place a high priority on building early leads because it gives them an advantage in subsequent quarters.

In the final round, regardless of the game, the most important predictor was the points scored in the first and the fourth quarter, and the points from the fast break. The winning team scored higher in both the first and fourth quarters. Scoring early can boost confidence and influence subsequent play styles, which suggests that teams with a strong start tend to maintain momentum. In all kinds of games—closed, balanced, and unbalanced—points scored in the fourth quarter came as a predictor for winning the final rounds in a 2019 senior World Cup study (Stavropoulos et al., 2021b). The same pattern was observed in the present study. Points scored from fast breaks proved to be a significant predictor across all games. (Ortega et al., 2007). also found the importance of fast breaks in under 16 categories. Teams that were quick at fast breaks were able to switch from defence to offense, creating scoring opportunities before the opposing team could take up defensive positions. Fast breaks were a key element in deciding match results throughout the tournament; thus, the teams not only improved scoring efficiency but also controlled the game's overall tempo.

Beyond our primary findings, we identified several secondary determinants influencing match outcomes. Analysis of group-stage matches revealed that first-quarter scoring performance emerged as a crucial predictor of success in all types of games (closed, balanced, and unbalanced). Teams establishing an early scoring advantage demonstrated enhanced confidence and momentum, enabling them to focus more on scoring points in the upcoming quarters, which increased the probability of winning the game.

In the second round of closed matches winning team scored 18.53 points from turnover versus 9.66 points by the losing one. This supports the finding of (Lorenzo et al., 2010). Winners demonstrated a great ability to

take advantage of their opponent's mistakes, with this significant difference in turnover points ultimately helping secure their victory. In balanced games, the most notable statistical disparity was observed in bench scoring performance (point from bunch). The winning teams' bench players scored an average of 54.10 points, while the losing teams' substitutes only scored 34.41 points. Maintaining a strong secondary unit and putting in place efficient rotation management techniques were strategically crucial, as evidenced by this notable 19.69-point difference. Points scored in the paint were found to be the secondary differentiator in unbalanced games. Winning teams had tried scoring close to the basket and relied less on shooting from the outside. Compared to the losing team, which scored 39.44 points, the winning team averaged 72.47 points inside the paint. The winning team, on average, scored 72.47 points from inside pain compared to the losing team, which scored 39.44 points in a single match.

In the final round of closed matches, the winning team won more fouls and had a higher free-throw success rate. It supports (Madarame, 2018a), who found that successful free throws discriminate between winners and losers in under 17 games. In balanced games, a higher difference was found in the number of steals. The Winning team has an average of 17.72 steals compared to the losing team of 9.85. Successful stealing not only breaks up the offensive flow of the opposition but gives the winning team a transition opportunity so they can take advantage of fast breaks. Furthermore, in unbalanced games, points from the paint came to be a secondary predictor.

CONCLUSIONS

In the group stage, first-quarter scoring was a consistent predictor of success across all game types. Closed games were influenced by three-point made and assists, while defensive rebounds and turnovers played crucial roles in balanced games. In unbalanced games, nearly all performance indicators, except personal fouls, showed significant differences between winners and losers. In the second round, points from turnovers were key determinants in closed games, while points from the bench had a strong association with winning balanced games. Unbalanced games were primarily influenced by points from the paint and assist, reinforcing the importance of inside scoring and ball distribution. In the final round, scoring in the first and fourth quarters, as well as fast-break points, emerged as deciding factors across all game types. The ability to start strong and maintain momentum in crucial phases of the game was a clear differentiator between winning and losing teams. These findings provide valuable insights for coaches and analysts to refine game strategies and targeted training programs. The study also highlights the evolving nature of youth basketball, where performance indicators shift across tournament rounds. Future research could explore these trends across different age groups and genders, incorporating additional variables such as player efficiency and tactical variations.

AUTHOR CONTRIBUTIONS

Akash Tom Mattakottil contributed to the conceptualization, methodology, investigation, data collection, formal analysis, and drafting of the original manuscript. Dhayalan K assisted with data collection and formal analysis. Dr. S. Jayaraman contributed to the review and editing of the manuscript, along with methodological insights and investigation. Dr. Viswanath Sundar provided validation, visualization, and formal analysis support. Kittu V.N. contributed to the formal analysis. All authors reviewed and approved the final manuscript.

SUPPORTING AGENCIES

No funding agencies were reported by the authors.

DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

REFERENCES

Abd El-Hamid Belal, Dr. M. (2014). Study of Game-Related Statistics Which Discriminate Between Winning and Losing Basketball Junior Teams U-17 in World Championship. Alaxandriya University, 4(3), 47-57. https://doi.org/10.21608/jass.2014.84754

Akinci, Y. (2023). Examining the Differences Between Playoff Teams and Non-Playoff Teams in Men's Euroleague; Play-Type Statistics Perspective. Sage Open, 13(4), 21582440231220155. https://doi.org/10.1177/21582440231220155

Çene, E. (2018). What is the difference between a winning and a losing team: Insights from Euroleague basketball. International Journal of Performance Analysis in Sport, 18(1), 55-68. https://doi.org/10.1080/24748668.2018.1446234

Csataljay, G., James, N., Hughes, M., & Dancs, H. (2012). Performance differences between winning and losing basketball teams during close, balanced and unbalanced quarters. Journal of Human Sport and Exercise, 7(2), 356-364. https://doi.org/10.4100/jhse.2012.72.02

De Saá Guerra, Y., Martín Gonzalez, J. M., Sarmiento Montesdeoca, S., Rodriguez Ruiz, D., Arjonilla López, N., & García-Manso, J. M. (2013). Basketball scoring in NBA games: An example of complexity. Journal of Systems Science and Complexity, 26(1), 94-103. https://doi.org/10.1007/s11424-013-2282-3

Derri, V., Kioumourtzoglou, E., & Tzetzis, G. (1998). Assessment of Abilities in Basketball: A Preliminary Study. Perceptual and Motor Skills, 87(1), 91-95. https://doi.org/10.2466/pms.1998.87.1.91

FIBA List of Teams. Retrieved from [Accessed 2025, May 14]: https://www.fiba.basketball/en/events/fiba-u17-basketball-world-cup-2024/teams(n.d.).

Finch, H. (2009). Identification of Variables Associated With Group Separation in Descriptive Discriminant Analysis: Comparison of Methods for Interpreting Structure Coefficients. The Journal of Experimental Education, 78(1), 26-52. https://doi.org/10.1080/00220970903224602

García, J., Ibáñez, J. S., Gómez, A. M., & Sampaio, J. (2014). Basketball Game-related statistics discriminating ACB league teams according to game location, game outcome and final score differences. International Journal of Performance Analysis in Sport, 14(2), 443-452. https://doi.org/10.1080/24748668.2014.11868733

Gasperi, L., Conte, D., Leicht, A., & Gómez-Ruano, M.-Á. (2020). Game Related Statistics Discriminate National and Foreign Players According to Playing Position and Team Ability in the Women's Basketball EuroLeague. International Journal of Environmental Research and Public Health, 17(15), 5507. https://doi.org/10.3390/ijerph17155507

Giovanini, B., Conte, D., Ferreira-Junior, A., & Nascimento, V. B. (2021). Assessing the key game-related statistics in Brazilian professional basketball according to season phase and final score difference. International Journal of Performance Analysis in Sport, 21(2), 295-305. https://doi.org/10.1080/24748668.2021.1881358

Ibáñez, S. J., González-Espinosa, S., Feu, S., & García-Rubio, J. (2018). Basketball without borders? Similarities and differences among Continental Basketball Championships. [¿Baloncesto sin fronteras? Similitudes y diferencias entre los Campeonatos Continentales de baloncesto]. RICYDE. Revista Internacional de Ciencias Del Deporte, 14(51), 42-54. https://doi.org/10.5232/ricyde2018.05104

Iduseri, A., & Osemwenkhae, J. E. (2015). An Efficient Variable Selection Method for Predictive Discriminant Analysis. Annals of Data Science, 2(4), 489-504. https://doi.org/10.1007/s40745-015-0061-9

Karasek, B., & Mikić, M. (2024). Game-related statistics that discriminate between winning and losing u-17 men's and women's basketball teams. Exercise and Quality of Life, 16(2), 41-48. https://doi.org/10.31382/eqol.241206

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.

Madarame, H. (2018a). Age and sex differences in game-related statistics which discriminate winners from losers in elite basketball games. Motriz: Revista de Educação Física, 24(1). https://doi.org/10.1590/s1980-6574201800010001

Madarame, H. (2018b). Are regional differences in basketball already established in under-18 games? Motriz: Revista de Educação Física, 24(3). https://doi.org/10.1590/s1980-657420180003e0055-18

Mukherjee, S., Huang, Y., Neidhardt, J., Uzzi, B., & Contractor, N. (2018). Prior shared success predicts victory in team competitions. Nature Human Behaviour, 3(1), 74-81. https://doi.org/10.1038/s41562-018-0460-y

Nughes, E., Rago, V., Aquino, R., Ermidis, G., Randers, M. B., & Ardigò, L. P. (2020). Anthropometric and Functional Profile of Selected vs. Non-Selected 13-to-17-Year-Old Soccer Players. Sports, 8(8), 111. https://doi.org/10.3390/sports8080111

Ortega, E., Palao, J. M., Gómez, M. Á., Lorenzo, A., & Cárdenas, D. (2007). Analysis of the Efficacy of Possessions in Boys' 16-And-Under Basketball Teams: Differences between Winning and Losing Teams. Perceptual and Motor Skills, 104(3), 961-964. https://doi.org/10.2466/pms.104.3.961-964

Sampaio, J., Godoy, S. I., & Feu, S. (2004). Discriminative power of basketball game-related statistics by level of competition and sex. Perceptual and Motor Skills, 99(3 Pt 2), 1231-1238. https://doi.org/10.2466/pms.99.3f.1231-1238

Sampaio, J., Ibáñez, S., Lorenzo, A., & Gómez, M. (2006). Discriminative game-related statistics between basketball starters and nonstarters when related to team quality and game outcome. Perceptual and Motor Skills, 103(2), 486-494. https://doi.org/10.2466/pms.103.2.486-494

Stavropoulos, N., Kolias, P., Papadopoulou, A., & Stavropoulou, G. (2021a). Game related predictors discriminating between winning and losing teams in preliminary, second and final round of basketball world cup 2019. International Journal of Performance Analysis in Sport, 21(3), 383-395. https://doi.org/10.1080/24748668.2021.1901437

Stavropoulos, N., Kolias, P., Papadopoulou, A., & Stavropoulou, G. (2021b). Game related predictors discriminating between winning and losing teams in preliminary, second and final round of basketball world cup 2019. International Journal of Performance Analysis in Sport, 21(3), 383-395. https://doi.org/10.1080/24748668.2021.1901437

Zhou, W., Sansone, P., Jia, Z., Gomez, M.-A., & Li, F. (2024). Determining the key performance indicators on game outcomes in NBA based on quantile regression analysis. International Journal of Performance Analysis in Sport, 1-16. https://doi.org/10.1080/24748668.2024.2325846

