

Analysis of the effectiveness of different play types in the end of game possessions of close EuroLeague matches

PANAGIOTIS FOTEINAKIS¹ ✉, STEFANIA PAVLIDOU¹, NIKOLAOS STAVROPOULOS²

¹Department of Physical Education and Sport Science. Democritus University of Thrace. Komotini, Greece.

²Laboratory of Biological Evaluation of Human Performance. School of Physical Education and Sport Sciences. Aristotle University of Thessaloniki. Thessaloniki, Greece.

ABSTRACT

End-of-game possessions during the final minutes of a game often have a significant impact on the final result of the match. The purpose of the present study was to analyse the structure and efficacy of possession play types in the last two minutes of the fourth quarter and overtime of EuroLeague close matches and relate them to the result of the game. The offensive play types of 90 EuroLeague games were analysed. 955 end-of-game possessions were analysed and categorized into 11 predefined play types. Sport Scout STA software was used as the observation instrument. The results indicated that the isolation (ISO) play type (23.6%) had the highest frequency, while Hand-Off (0.63%) was the least frequent play type. Cut (CUT) play type was the most effective (82.4%), producing 1.58 Points Per Possession (PPP), followed by PB (69%), and 1.33 PPP. Post Up, ISO, and Spot Up play types were the least effective, producing 0.78–0.98 PPP. Winning teams had longer-lasting possessions compared to defeated teams. Longer-lasting possessions were less effective than possessions that lasted less than 6 seconds. More cooperative play types increased the efficacy of possessions at the end of the game.

Keywords: Performance analysis, Sports performance, Basketball, Offensive actions, Crunch-time, Efficacy, EuroLeague.

Cite this article as:

Foteinakis, P., Pavlidou, S., & Stavropoulos, N. (2024). Analysis of the effectiveness of different play types in the end of game possessions of close EuroLeague matches. *Journal of Human Sport and Exercise*, 19(2), 617-630. <https://doi.org/10.14198/jhse.2024.192.16>



Corresponding author. Department of Physical Education and Sport Science. Democritus University of Thrace. Komotini, Greece.

E-mail: pfotinak@phyed.duth.gr

Submitted for publication January 16, 2024.

Accepted for publication January 19, 2024.

Published April 01, 2024 (*in press* March 04, 2024).

JOURNAL OF HUMAN SPORT & EXERCISE ISSN 1988-5202.

© Faculty of Education. University of Alicante.

doi: 10.14198/jhse.2024.192.16

INTRODUCTION

End-of-game possessions in basketball have become more and more important in the last few seasons. According to EuroLeague, 42% of the regular season games were decided by two possessions or fewer in season 2022-2023 (Euroleague.net). The offense is arguably one of the major components of the game, especially at the end, where a single shot can determine the result of the game. Game management from the coach and the selection of a certain play type may be critical to the team's win or loss (Christmann et al., 2018). Knowing the time and score and how to handle the end-of-game possessions in close games will usually determine the outcome of the game, changing the impact of the fan's perceptions regarding how a team played (Bashuk, 2012).

Once the clock hits the last two minutes of the fourth quarter, the offensive demeanour changes. Coaches, along with the players, organize their offensive actions to maximize the offensive chances for scoring points (Peraica, 2022). Identifying these offensive play types can become a determining factor in improving decision-making and tactical performance during the match, as it will create the best opportunities to find the most efficient and repeatable ways of scoring with the least opposition, thus creating uncontested shots or reasonably high percentage shots (Christmann et al., 2018, Matulaitis and Bietkis, 2021, Skinner, 2012). These offensive strategies usually involve planned or improvised technical and tactical manoeuvres that are trying to disrupt the defensive setup (Peraica, 2022).

Previous research has evaluated offensive performance through statistical and observational analysis. Besides studies observing parameters that distinguish winning and losing teams (Csataljay et al., 2012, Sampaio and Janeira, 2003, Çene, 2018, Stavropoulos et al., 2021, Karipidis et al., 2001, Fotinakis et al., 2000), other studies analysed the efficacy of offensive actions and their effect on the outcome of the game, such as transition (TR) (Christmann et al., 2018, Matulaitis and Bietkis, 2021, Fotinakis et al., 2002, Tsamourtzis et al., 2005), Pick and Roll (PnR) ball-handler (PnRBH) and screener (PnRSC) actions (Gómez et al., 2015, Marmarinos et al., 2016, Vaquera et al., 2016, Koutsouridis et al., 2018, Polykratis et al., 2010), isolation (ISO) actions (Christmann et al., 2018, Matulaitis and Bietkis, 2021, Zukolo et al., 2019, Garefis et al., 2006), off-ball screen (OBS) actions (Matulaitis and Bietkis, 2021, Gómez et al., 2015, Stavropoulos et al., 2021), hand-off (HO), cuts (CUT), spot-up (SUP) plays and post up (PUP) actions (Christmann et al., 2018, Zukolo et al., 2019), and inbound (IN) plays (Christmann et al., 2018).

Through the categorization of the play types, we can better understand the interactions of the players during the games and the contribution of each play type to the result of the offense. These patterns or actions are designed by the coaches, heavily practiced by the players, and then repeated in the game (Chen et al., 2023). Understanding how teams generate successful scoring throughout the play types is practically and theoretically pivotal (Christmann et al., 2018).

Situations in the end phase of the game are evaluated as highly critical, and the decision-making behaviour of the players is of lower quality compared with situations that are characterized as low-critical situations (Bar-Eli and Tractinsky, 2000). According to Christmann et al (2018), *"The crunch time is not only spectacular and thrilling; it is also particularly competitive and ensures, perhaps unlike some 'blowout' games, the full effort of all players on the floor"*. Combined also, with the increased criticality of the end-of-game possessions in games with a balanced score (close games), since they are decisive for the outcome, it is crucial to gain knowledge of the successful play types at the end of the game. Understanding how these play types contribute to offensive success provides a framework for refining strategies, optimizing player strengths, and addressing weaknesses, serving as a powerful tool for dissecting basketball dynamics, enhancing decision-

making, and ultimately influencing the positive outcome of offensive sequences (Lamas et al., 2015, Remmert, 2003).

Despite the increased interest in providing insights regarding the play types that are used during the game, there is a lack of research regarding what is effective or problematic in the last possessions of the game. Studies specifically examining end-of-game situations within close games are rare (Christmann et al., 2018, Prieto-Lage et al., 2022). The purpose of the present study was to analyse the structure and efficacy of the possession play types that the teams are using in the last two minutes of the fourth quarter and overtime of EuroLeague close games, relate types of play to scoring outcomes, and classify their effectiveness regarding the result of the game.

MATERIAL AND METHODS

Participants and data collection

The sample consisted of 90 close games from the 2022-2023 (n = 45) and 2023-2024 (n = 45) regular seasons of the EuroLeague. The games were recorded from the publicly acceded EuroLeague TV (<https://tv.euroleague.net/>). The selected games were up to a 5-point score differential at the end of the game (close games). All the possessions (n = 1138) that finished within the last 2 minutes of the fourth quarter and overtime (crunch time) of the games were recorded. 183 possessions were categorized as Miscellaneous play types, involved possessions stopped by defenders' intentional fouls or errant passes before the initiation of a play type, or involved possessions with no identifiable play type, which were omitted from play type analyses. The remaining 955 possessions were analysed.

The sample involved all EuroLeague teams. As this study did not involve experimentation of any kind, it was an observational study in a natural environment, and the collected data were publicly accessible, it was not necessary to obtain the informed consent of the competitors (American Psychological Association Ethical principles of psychologists and code of conduct, 2002).

Measures

The categorization of every offensive possession by play type and the variables examined are presented in Table 1. Those play types are actions that are considered standardized and cover all the possible scoring attempts in the game, while they can translate the team's tactical decisions into accountable data (Christmann et al., 2018, Chen et al., 2023, Božović, 2021, McBasketball, 2017).

For the evaluation of the efficacy of the play types, the following variables were analysed during the observation of each end-of-game possession of the games: The result of the game (win-loss), the duration of the different play types possessions (1-24 seconds), the status at the moment of the possession (win, lose, deuce), and the outcome of the possession (made or missed 2-point & 3-point, foul without free throws bonus (FO), foul with bonus free throws (FT), goal fouls (2PF, 3PF) and turnovers (including offensive fouls).

A possession according to the outcome was considered successful in the case that the team scored for two (2p) or three (3p) points, a basket and foul for 2p or 3p (2pF, 3pF), and when the offense received a foul with no bonus free throws (FO) or a foul with bonus free throws (FT1, FT2, FT3). A possession was considered unsuccessful in case the team made a missed shot (-3p, -2p), made a turnover of any kind (TU), and had a blocked shot (BL).

Table 1. Definition and description of the examined play types, the game status at the onset of the crunch time, and the offensive outcome of the possession.

Variables	Definition and description
Offensive Outcome	
Successful	Possession ending event finished with a made Field Goal for 2 or 3 points (2P, 3P), a basket and foul for 2-p or 3p (2PF, 3PF), and when the offense received a foul with no bonus Free Throws (FO) or a foul with bonus Free Throws (FT1, FT2, FT3).
Unsuccessful	Possession ending event finished with a missed shot (-3P, -2P), made a turnover of any kind (TU, including offensive fouls), and had a blocked shot (BL).
Game status at the onset of the crunch time (120 seconds before the end of the game)	
Win	The team is leading in the score.
Lose	The team is behind in the score.
Deuce	Teams are tie in the score.
Offensive Play Types	
Pick and Roll Ball-Handler (PnRBH)	Possession ending event finished by the ball-handler in the pick-and-roll. Includes off dribble shots or direct shots before dribbling off the screen, pull-ups and floaters, by that player. Includes also possessions where the ball handler rejects the screen (dribbles away from the screen).
Pick and Roll Screener (PnRSC)	Possession ending event where the screener receives the ball. These are the slips, rolls, and pops from screeners in the pick-and-roll.
Transition (TR)	Transition possession ending event before the defense is being set within 5-8 seconds.
Spot Up (SUP)	Possession ending event finished with a catch and shot or catch and drive. They can be catching and shooting, attacking a close out by dribbling into a pull-up, dribbling into a floater, or driving to the rim.
Isolation (ISO)	Possession ending event where the player is in 1vs1 situation trying to size up and create space from his defender.
Hand-Offs (HO)	Possession ending event where the screener with or without dribbling hands over the ball to a player cutting towards him, acting as an immediate screener creating space for his teammate.
Cuts (CUT)	Possession ending event where the player without a screen cuts out or toward the ball to receive it. Includes backdoor cuts and flash cuts and spacing when a player is getting open near the basket.
Putbacks (PB)	Possession ending event where a tip in or quick shot happens after offensive rebound.
Post Ups (PUP)	Possession ending event with the player receiving the ball with his back to the basket in proximity or inside the paint area.
Off Ball Screen (OBS)	Possession ending event generated by a player running off a screen, whether it be a pin-down, flare screen, elevator screens, or any other of the plethora of screen variations before they receive the ball. This includes curls and fades.
Miscellaneous (M)	Possession ending event that does not fit in the above categories. Includes but not limited to possessions such as: Players being fouled in the backcourt, errant passes out of bounds, possessions where the player dribbles into a pull up 3-point shot in the halfcourt, inbounds passes that go directly out of bounds, technical fouls etc.
Inbound Play (IN)	Possession ending event that is generated from the sideline or the baseline and creates a spatial advantage for the player. For this study the inbound play types were recorded only when it was concluded within 4 seconds after the inbound pass.

Procedure

The games were analysed through systematic observation using video analysis software (Sport Scout STA Ver. 3.2). The software was used to play all games on a laptop, pausing and replaying the games when possession was observed, and the results during the monitoring of the games were registered on a Microsoft Excel spreadsheet (Microsoft Inc., Washington USA).

The analysis of the games was carried out by a high-level professional basketball coach and Sports Sciences graduate with more than 20 years of experience. To ensure that the data were correctly observed and registered, each game was observed twice. To examine how stable the registration from the observer was and to ensure the validity of the data, in five randomly selected games, the observation was repeated by the

observer after one month. The weighted Cohen's Kappa correlation coefficients were used to assess intra-observer reliability. The obtained results were 0.83 to 0.98, indicating high to perfect agreement (Altman, 1991).

Statistical analysis

The SPSS 29 package software for statistical analysis was used in this study. Contingency table analysis was used for the group comparisons between the categorical variables (play type and offense outcome) with a chi-square (χ^2) distribution. Post hoc and planned comparison procedures for interpreting chi-square contingency-table test results were used (Beasley and Schumacker, 1995, Garcia-Perez and Nunez-Anton, 2003). The post hoc methods supplement the analysis of standardized residuals by reporting the percentage contribution of each cell to the overall chi-square statistic (relative contribution) and the percentage of variance shared by the two factors (absolute contribution). One-way analysis of Variance (ANOVA) with Tamhane's T2 multiple comparison post hoc test for unequal variance (Shingala and Rajyaguru, 2015) was used to determine if there are significant differences in the play type of possession associated with Points Per Possession (PPP) and the duration of the offense. A value of $p < .05$ was considered statistically significant.

RESULTS

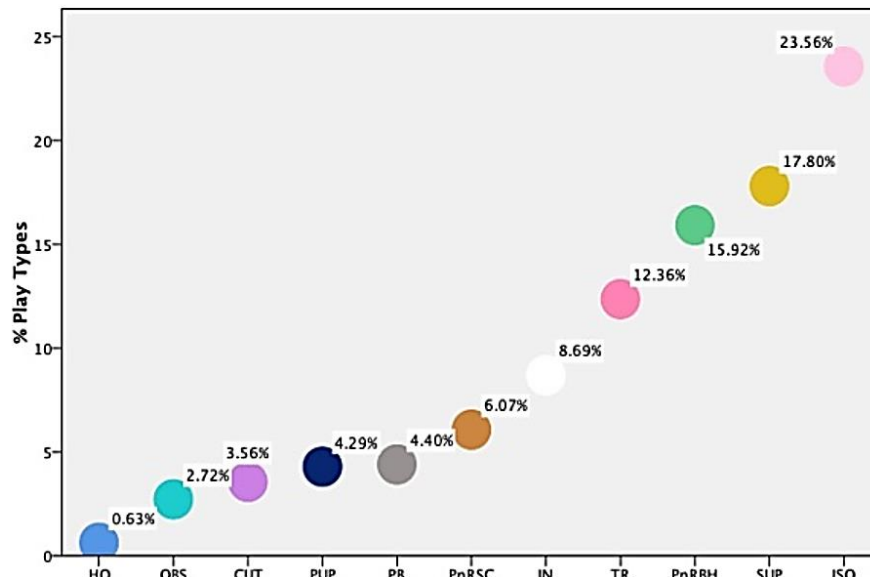
The mean difference in the score at the end of the matches was 3.18 ± 1.41 points (mean \pm SD), while the score line (points difference) at the onset of the possession was 3.21 ± 2.3 points, ranging from 0 to 13 points. The home team won 57.6% of the games. The preliminary comparison between the winning and the defeated teams regarding the game status (win, lose, or deuce), revealed that the teams that had the score lead at the onset of the first possessions during the crunch time (120 seconds before the end of the match), won the match in 70.2% of the games ($\chi^2 = 25.214$, $p < .001$).

The structure and frequency distribution of the possession play types as depicted in Figure 1 indicate that the predominant play type in the EuroLeague during the last 2 minutes of the 4th quarter and overtime was ISO (23.56%), followed by SUP (17.8%) and PnRBH (15.92%) possessions. TR (12.36%) and IN (8.69%) play type possessions were following. There were no statistically significant differences between the winning and defeated teams ($\chi^2 = 14.293$, $p = .161$).

The comparison between the winning and defeated teams in the coefficient of possession's play types showed that in 6 out of 11 possession-ending events, the winning team performed greater success (Figure 2). Winning teams succeed more in IN possessions (69% vs. 40%, $\chi^2 = 6.812$, $p < .05$), OBS (57% vs. 42%), PUP (55% vs. 42%), ISO (54% vs. 42%), TR (69% vs. 59%), and SUP possession play types (36% vs. 35%). The defeated teams performed better in CUT possessions (93% vs. 72%), PB (79% vs. 56%), PnRSC (65% vs. 48%), and HO (82% vs. 50%). PnRBH possession play type was equally successful between winning and defeated teams (51%).

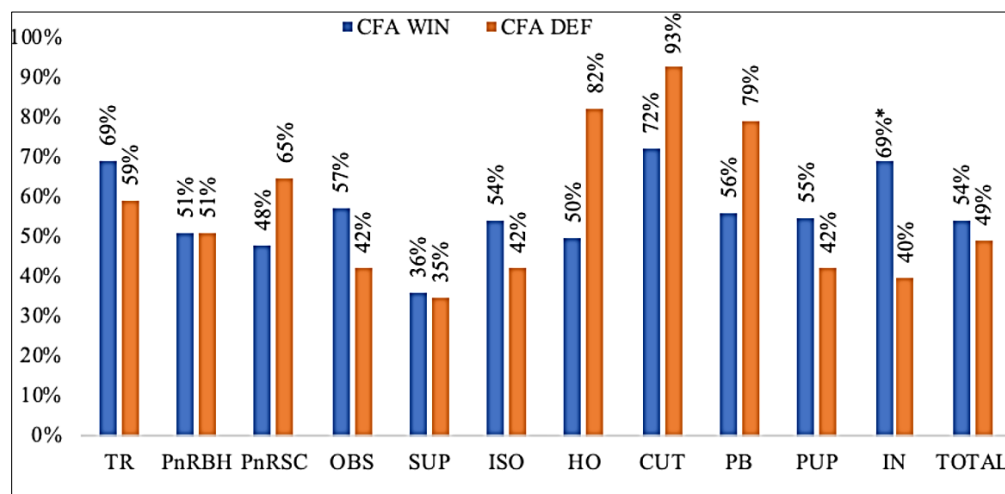
Regarding the efficacy (successful or unsuccessful) between the different possessions ending event play types (Table 2), CUT appeared to be the most effective play type, producing at 82.4% a successful outcome ($p < .001$), followed by PB with 69% of the possessions finishing with a successful outcome ($p < .001$). Furthermore, TR with 62.7% ($p < .001$), and PnRSC with 56.9% ($p < .001$) successful outcomes, were following in terms of effectiveness. HO play-type possessions were highly effective (HO, 66.7%), but with no statistical significance due to the limited number of possessions. On the other hand, possession play types

from SUP ($p < .001$), ISO ($p < .001$), PUP, and OBS more often ended up unsuccessful rather than successful.



Play Types: HO:Nand-Off, OBS:Off Ball Screen, CUT:CUT, PUP:Post UP, PB:Putback, PnRSC:PnR Screener, IN:Inbound, TR:Transition, PnRBH:PnR Ball-Handler, SUP:Spot Up, ISO:Isolation.

Figure 1. Frequency of possessions play types.



Play Types: TR:Transition, PnRBH:PnR Ball-Handler, PnRSC:PnR Screener, OBS:Off Ball Screen, SUP:Spot Up, ISO:Isolation, HO:Nand-Off, CUT:CUT, PB:Putback, PUP:Post UP, IN:Inbound. (* $p < .05$).

Figure 2. Efficiency of possessions ending event play types between the winning and defeated teams.

The comparisons in Points Per Possession (PPP) between winning (PPP = 1.09) and defeated (PPP = 1.04) teams revealed no statistically significant differences ($F = .361$, $p = .548$). As depicted in Table 2, significant differences were determined using the One-Way Analysis of Variance (ANOVA) by comparing all the end-of-event play types with the PPP ($F = 1.965$, $p < .05$). Tamhane's T2 multiple comparison post hoc test revealed

that CUT producing 1.58 PPP was statistically more efficient than PUP possessions (0.78 PPP, $p < .05$), ISO possessions (0.98 PPP, $p < .05$), and SUP possessions (0.93 PPP, $p < .05$).

Table 2. Description of the possession play types regarding their outcome and Points Per Possession (PPP).

Play Types	Outcome of the Offense		
	Successful	Unsuccessful	Points Per Possession (PPP)
TR	62.7**	37.3%**	1.28
PnRBH	51.3%	48.7%	1.03
PnRSC	56.9%**	43.1%**	1.02
ISO	47.6%**	52.4%**	0.98*
SUP	35.3%**	64.7%**	0.93*
PUP	48.8%	51.2%	0.78*
PB	69%**	31%**	1.33
HO	66.7%	33.3%	1.5
OBS	46.2%	53.8%	1.0
IN	51.8%	48.2%	1.06
CUT	82.4%**	17.6%**	1.58*
TOTAL	51.1%	48.9%	1.06

Play Types: TR:Transition, PnRBH:PnR Ball-Handler, PnRSC:PnR Screener, ISO:Isolation, SUP:Spot Up, PUP:Post UP, PB:Putback, HO:Nand-Off, OBS:Off Ball Screen, IN:Inbound, CUT:CUT. * $p < .05$, ** $p < .001$.

Table 3. Description of the possession play types regarding the duration of the possession.

Play Types	Duration of the possession (sec)					
	Total		Winning Teams		Defeated Teams	
	M	SD	M	SD	M	SD
TR	5.6**	2.3	5.7	2.3	5.6	2.3
PnRBH	14.0*	4.5	15.28*	4.3	12.8*	4.5
PnRSC	14.8*	4.9	17.22*	4.14	12.65*	4.7
ISO	14.7**	5.9	16.8*	5.3	12.8*	5.8
SUP	13.7**	6.7	17.04**	5.79	11.4*	6.48
PUP	15.7**	5.7	14.8	5.7	16.6	5.86
PB	1.43**	0.5	1.39	0.50	1.46	0.58
HO	10.3	5.2	17.0	5.8	9	4.6
OBS	9.1*	5.0	10.7	5.9	8.58	4.76
IN	2.3**	1.5	2.14	1.37	2.52	1.62
CUT	14.1**	5.8	15.78*	5.5	12.3*	5.88
TOTAL	11.49	6.9	13.31*	7.17	10.03*	6.35

Play Types: TR:Transition, PnRBH:PnR Ball-Handler, PnRSC:PnR Screener, ISO:Isolation, SUP:Spot Up, PUP:Post UP, PB:Putback, HO:Nand-Off, OBS:Off Ball Screen, IN:Inbound, CUT:CUT. * $p < .05$. ** $p < .001$.

Table 3 also compares the different play types regarding their duration. The results showed that there was a statistically significant difference between the different play types in the duration of the offense ($F = 315.411$, $p < .001$). Tamhane's T2 multiple comparison post hoc test revealed that PB, IN, and TR play type possessions had a statistically shorter-lasting duration compared with SUP, PUP, PnRSC, ISO, PnRBH, and CUT ($p < .001$) possessions, where the duration of the play types was longer-lasting. PB and IN possessions were also statistically significantly shorter-lasting compared to OBS possessions ($p < .001$). OBS possessions were statistically shorter-lasting compared with PnRBH, CUT, and SUP possessions ($p < .05$).

and also with PnRSC, ISO, and PUP possessions ($p < .001$). Regarding the comparison between winning and defeated teams, statistically significant differences in the duration of the play types were found in PnRBH and PnRSC possessions ($p < .05$), in SUP possessions ($p < .001$), and in possessions finishing with a CUT ($p < .05$). Totally, winning teams had statistically significant longer-lasting duration in their possessions ($F = 80.560, p < .001$).

DISCUSSION

The present study is, to the best of our knowledge, the first study to analyse the possessions play type at the end of a close EuroLeague game. A similar study analysed the possession play types in NBA close games (Christmann et al., 2018). The objective of this research was to analyse the effectiveness of the different possession play types in the last two minutes of the last quarters and overtime in games with a final score equal to or less than 5 points in EuroLeague games and identify differences between the winning and defeated teams.

The results indicated that there were no significant differences between the winning and defeated teams in the comparison of the frequency and the structure of the possession play types. Hence, we can conclude that the winning and defeated teams applied almost identical structures and frequencies of finishing actions to score. The most frequent play type was ISO possessions (23.5%). These results are similar to those acquired by other studies (Zukolo et al., 2019, Christmann et al., 2018, Karipidis et al., 2010). Regarding the Pick and Roll (PnR), PnRBH (15.9%) and PnRSC play types (6.07%) combined for 22% of the total possessions. The researchers specify that ball screens are the most frequently performed play type (Lamas et al., 2011, Gomez et al., 2015, Marmarinos et al., 2016, Remmert, 2003, Vaquera et al. 2013, Vaquera et al. 2016). Although PnR actions were not the most frequent play type in this study, the findings correspond to Nunes et al. (2016) argument that 25.3% of total possessions end with a PnR. On the other hand, Christmann et al. (2018) findings indicated that PnR play type represented 29.1% of the total possessions in the last two minutes of NBA close games, a percentage that is significantly higher in NBA games.

SUP (17.8%) possessions were also frequently performed at the end of the game. In modern basketball, the most common finishing offensive actions without screens are SUP (Zukolo et al., 2019, Selmanovic et al., 2015) and the results of this study confirm this argument. The share of TR offense play type followed with 12.36% of the total possessions. This result is similar to other studies (Christmann et al., 2018, Selmanovic et al., 2015, Fotinakis et al., 2002).

Regarding the efficacy of each play type, CUT appeared to be the most effective way to score (1.58 PPP, 82.4% of the possessions' successful outcome). The results of this study confirm the findings of previous studies (Zukolo et al., 2019, Matulaitis and Bietkis, 2021, Vaquera et al., 2016). CUT in basketball involves players making quick and tactical movements without the ball on the strong or weak side of the defence, creating scoring opportunities close to the basket or in open areas on the court that can lead to high-percentage scoring. Especially, backdoor cuts involve offensive players moving behind defenders toward the basket, catching the defence off guard, and creating easy scoring opportunities. Incorporating CUT into offensive tactical patterns requires communication, teamwork, and a good knowledge of the fundamentals. Coaches often emphasize the importance of off-ball movement to create dynamic and effective ways to score.

PB play type possessions, also known as offensive rebounds, followed by a quick shot, were, as expected, very efficient in this research, producing 1.33 PPP and a successful outcome at 69% of the possessions. Teams that excel at PB can significantly impact the game by converting missed shots into second-chance

points, and besides that, they significantly reduce the opponent's chance to create a quick and favourable transition (Zukolo et al., 2019). The importance of offensive rebounds is well documented in previous studies (Matulaitis and Bietkis, 2021, Dežman et al., 2002, Kubatko et al., 2007, Suárez-Cadenas & Courel- Ibáñez, 2017, Tsamourtzis et al., 2005), producing high-percentage scoring opportunities because offensive players are often in proximity to the basket.

TR play type was particularly effective, producing 1.28 PPP (67.2% successful possessions). The TR offense in basketball targets exploiting defensive vulnerabilities and creating scoring opportunities before the opposing defence sets up. The results of this study are in agreement with previous studies establishing TR play type as particularly effective in scoring (Christmann et al., 2018, Matulaitis and Bietkis, 2021). IN play type is not often examined in the literature and involves tactical movements designed to inbound the ball successfully and create scoring opportunities. IN possessions produced 1.06 PPP (51.8% successful possessions) in this study, which is lower than the 1.5 PPP from IN possessions during the last two minutes of NBA games (Christmann et al., 2018). Regarding the comparison between winning and defeated teams, IN possessions were the only statistically significant different play type (69% for winning vs. 42% for defeated, successful possessions). Effective IN plays, tailored to the strengths of the players and adjusted to the specific game situations, play a crucial role in a team's overall offensive strategy, especially during the last minutes of the game, and the results of this study support this argument.

The results of this study showed that PnRBH possessions produced 1.03 PPP (51.3% possessions with a successful outcome), while PnRSC 1.01 PPP (56.9% possessions with a successful outcome). Elite men's basketball teams more often use PnRBH as the end-of-possession play type but with lower efficacy compared with PnRSC play type possessions (Zukolo et al., 2019). Christmann et al. (2018) explained that the efficacy of the Pick and Roll in the last two minutes of NBA games reached 1.1 PPP, and in 52.8% of the possessions the teams scored, results that are very close to our findings. On the other hand, Zukolo et al. (2019) observed in their study that Pick and Roll effectiveness was 36% and Pick and PoP 35%, while Nunes et al. (2016) revealed that the efficiency of Pick and Roll reached 36.3% in direct score. Marmarinos et al. (2016) stated in their study that PnRBH produced 0.81 PPP, while PnRSC produced 1.25 PPP when the Roll man cut inside the basket and 0.95 PPP when they popped out. These findings are lower than the results of this study, showing that the pick-and-roll offensive play type is more effective at the end of the game. This can be explained for several reasons. In clutch moments, teams rely on the Pick and Roll for its versatility and ability to exploit defensive weaknesses, putting a lot of pressure on the defence and requiring quick decision-making. Late in the games, when every possession matters, the Pick and Roll can manage the shot clock effectively, and even if the initial play breaks down, the ball handler can still create a shot, preventing losing balls and possessions and going to the foul line more frequently than other play type possessions (Matulaitis and Bietkis, 2021). Additionally, at the end of the game, the ball goes to the most skilled players, the stars of the team, who can create dynamic offensive opportunities and exploit defensive vulnerabilities, making this play type a go-to option when teams need reliable scoring opportunities.

Concerning the result of the game, it was found that the teams that were defeated had higher efficacy in PnRSC possessions (65%) compared with the winning teams (48%), while PnRBH possessions were equally successful (51%). This finding coincides with the study of Nunes et al. (2022) and Prieto-Lage et al. (2022), showing that the teams that were defeated or were behind in the score at the time of possession were more effective compared to the winning teams. This might be explained by the fact that the defeated teams played more aggressively due to the score, aiming to generate defensive mismatches (Prieto-Lage et al., 2022). Çene (2018), also stated in his study that the teams compete more aggressively when the score is close.

OBS was found to produce 1.0 PPP with 46.2% successful possessions. These results are in agreement with other studies (Matulaitis and Bietkis, 2021, Zukolo et al., 2019). A study by Stavropoulos et al. (2021), aiming to evaluate the efficiency of off-ball screens on the weak side that positively affect the finishing move and the outcome, concluded that the outcome of every OBS action in the basketball context depends on several factors, such as the type of defence, the characteristics of the players involved, the scoreboard, the finishing moves and the screen types on the strong and weak side. Regarding the result of the game, winning teams were more effective than the defeated (57% vs. 42% successful possessions, respectively). These findings are very similar to the results of Zukolo et al. (2019), where winning teams had 51% successful actions while defeated teams had 39%.

ISO actions turned out to be a less effective play type (0.98 PPP, 47.6% of possessions with a successful outcome). Although players who can play efficiently in ISO situations usually have a distinct role in the team's plays (Uhlmann et al., 2014) it seems that it is not effective at the end of the EuroLeague games. Christmann et al. (2018) found similar results in the last 2 minutes of close NBA games (0.9 PPP, 42.4% of the possessions offense scored). ISO actions are characterized by a decreased number of cooperative actions, making it difficult for the offensive player to score. The low effectiveness of the ISO play type possessions was observed in other studies (Zukolo et al., 2019, Matulaitis et al., 2021). Concerning the comparison between the winning and defeated teams, the winning teams were more efficient than the defeated (54 vs. 42% successful possessions).

Possessions that ended with a SUP action were also less effective compared to other play types. SUP actions produced 0.93 PPP and were successful only at 35.3%. The findings of this study are very close to those of Zukolo et al. (2019), who found that the efficiency of SUP actions was 37% in the 2013 European Championship of Slovenia. Matulaitis and Bietkis (2021) stated also that the ends of the ball possession from SUP more often ended up inefficiently rather than efficiently. PUP end-of-game possessions were also characterized by low efficacy (48.8% successful possessions, 0.78 PPP).

The average efficacy of the different play types in this study was 51.1%, slightly above the findings recorded by Lehto et al. (2010) in the Olympic Games of Beijing (49%), and significantly higher than the efficiency of finishing actions studied by Zukolo et al. (2019), which was 42.6%. Regarding the PPP, the average of the different play types in this study was 1.06 PPP, slightly below Christmann et al. (2018) findings for NBA games (1.2 PPP).

Regarding the duration of the play types, the results of the study showed that the quicker play types (TR, IN, and PB, mean duration <6 seconds) produced 1.22 PPP combined with 61.1% of the possessions ending with a successful outcome, while longer-lasting possession play types (ISO, PUP, mean duration >14.5 seconds) produced 0.88 PPP as an average, with 48.2% of the possessions ending successfully. Pick-and-roll possessions had a mean duration of 14.4 seconds, while CUT, which requires more players to cooperate, had a duration of 14 seconds. Prieto-Lage et al. (2022) observed in their study that Pick and Roll was more effective when executed between 9–16 seconds of possession. Therefore, it seems that the duration of the possession affects the efficacy of the end-of-possession play type, with the most efficient possessions being the ones that last no more than 6 seconds. Winning teams, as expected, kept the ball more in their hands, finishing an average of 3 seconds later than the defeated teams in possession. Similar results were found in another study (Matulaitis and Bietkis, 2021), where the authors concluded that the most efficient ball possessions are those that last no more than 10 seconds.

CONCLUSIONS

Winning teams employed longer-lasting possessions in the last two minutes of the game and overtime because they were protecting the end-of-game lead, trying to freeze and delay the game and use as much of the game clock as possible, particularly if they held a narrow lead. Coaches may choose to run longer plays that exploit matchups, create open shots, or involve key players who excel in clutch situations. On the other hand, trailing teams may opt for a quick scoring attempt to preserve time for potential defensive stops or fouls. In situations where a team is trailing and needs multiple scores to catch up, the duration of end-of-game possessions becomes critical. Teams may aim for quick scores to maximize the number of possessions in the remaining time. The duration of end-of-game possessions in basketball is influenced by a combination of strategic decisions, time management, shot clock considerations, clock stoppages, and the specific game situation. Teams target to balance the need for efficient scoring opportunities with the constraints imposed by the remaining time on the game clock. The ability to execute under pressure and make effective use of limited time is crucial in these late-game scenarios.

The findings suggest that coordinated actions and teamwork among players produce a more effective outcome at the end of the game. Teams that can underscore the importance of teamwork, communication, and understanding the strengths and tendencies of the game, related to the score line and the remaining time, often find success in their actions. The play types that involved less cooperative actions, such as ISO and PUP possessions, were less effective compared with play types that involved the cooperation and movement of two, three, or even four players, such as PnRBH and PnRSC, OBS, and especially CUT. According to Christmann et al. (2018), the ISO play type exhibits fewer dynamics, is more static, and employs a lower action frequency, thus being more foreseeable, providing the defence with better possibilities to adapt. Additionally, Uhlmann and Barnes (2014), noted that solo scoring negatively influenced the team's performance. Thus, coaches should advise their players to attempt a TR offense whenever possible, use more cooperative play types that involve more actions, and reduce the individual or less cooperative play types that proved less effective. Further research is required regarding the play types that are more or less effective at the end of the game, scrutinizing more details regarding the offense and the defence, the profile of the players that finish the last possessions, and the criticality of the possession.

AUTHOR CONTRIBUTIONS

Conceptualization, P.F. and S.P.; methodology, P.F. and N.S.; software, N.S. and P.F.; validation, P.F. and N.S., investigation, P.F.; resources, P.F. and S.P.; data curation, P.F. and S.P.; writing—original draft preparation, P.F. and S.P.; supervision, N.S.; All authors have read and agreed to the published version of the manuscript.

SUPPORTING AGENCIES

No funding agencies were reported by the authors.

DISCLOSURE STATEMENT

No potential conflict of interest were reported by the authors.

REFERENCES

- Altman D. (1991). Practical Statistics for Medical Research. Chapman & Hall, London, UK.
<https://doi.org/10.1201/9780429258589>
- Bar-Eli, M., & Tractinsky, N. (2000). Criticality of game situations and decision making in basketball: an application of performance crisis perspective. Psychol Sport Exerc., 1(1), 27-39.
[https://doi.org/10.1016/S1469-0292\(00\)00005-4](https://doi.org/10.1016/S1469-0292(00)00005-4)
- Bashuk, M. (2012). Using cumulative win probabilities to predict NCAA basketball performance. In Proceedings of the MIT Sloan Sports Analytics Conference (pp. 1-10).
- Beasley, T. M., & Schumacker, R. E. (1995). Multiple regression approach to analyzing contingency tables: Post hoc and planned comparison procedures. The Journal of Experimental Education, 64(1), 79-93. <https://doi.org/10.1080/00220973.1995.9943797>
- Božović, B. (2021). The Use of "Synergy Sports Technology" for the Collection of Basketball Game Statistics. In Sinteza 2021-International Scientific Conference on Information Technology and Data Related Research (pp. 272-276). Singidunum University. <https://doi.org/10.15308/Sinteza-2021-272-276>
- Çene, E. (2018). What is the difference between a winning and a losing team: insights from Euroleague basketball. Int. J. Perform. Anal. Sport, 18(1), 55-68.
<https://doi.org/10.1080/24748668.2018.1446234>
- Chen, R., Zhang, M., & Xu, X. (2023). Modeling the influence of basketball players' offense roles on team performance. Front. Psychol., 14. <https://doi.org/10.3389/fpsyg.2023.1256796>
- Christmann, J., Akamphuber, M., Müllenbach, A. L., & Güllich, A. (2018). Crunch time in the NBA-The effectiveness of different play types in the endgame of close matches in professional basketball. Int J Sports Sci Coach., 13(6), 1090-1099. <https://doi.org/10.1177/1747954118772485>
- Csataljay, G., James, N., Hughes, M. D., & Dancs, H. (2012). Performance differences between winning and losing basketball teams during close, balanced and unbalanced quarters. J. Hum. Sport Exerc. Vol. 7, No. 2, pp. 356-364. <https://doi.org/10.4100/jhse.2012.72.02>
- Dežman, B., Erčulj, F., & Vučković, G. (2002). Differences between winning and losing basketball teams in playing efficiency. Acta Kinesiol. Univ. Tartu, 7, 71.
- Ethical Principles of Psychologists and Code of Conduct. (2002). Ethical principles of psychologists and code of conduct. The American Psychologist, 57(12), 1060-1073. <https://doi.org/10.1037/0003-066X.57.12.1060>
- Fotinakis, P., Karipidis, A., & Taxildaris, K. (2002). Factors characterising the transition game in European basketball. J. Hum. Mov. Stud., 42(4), 305-316.
- Fotinakis, P., Karipidis, A., Papadimitriou, K., & Taxildaris, K. (2000). A statistical evaluation of selected variables for predicting end of championship ranking in the European basketball championship of France 1999. NBP., 5(2), 129-138.
- Garcia-Perez, M. A., & Nunez-Anton, V. (2003). Cellwise residual analysis in two-way contingency tables. Educ Psychol Meas., 63(5), 825-839. <https://doi.org/10.1177/0013164403251280>
- Garefis, A., Xiromeritis, C., Tsitskaris, G., & Mexas, K. (2006). The one on one situation as an important factor in modern basketball. Inquiries in Sport & Physical Education, 4(3), 462-466.
- Gómez, M. Á., Battaglia, O., Lorenzo, A., Lorenzo, J., Jiménez, S., & Sampaio, J. (2015). Effectiveness during ball screens in elite basketball games. J. Sports Sci., 33(17), 1844-1852. <https://doi.org/10.1080/02640414.2015.1014829>
- Karipidis, A., Fotinakis, P., Taxildaris, K., & Fatouros, J. (2001). Factors characterizing a successful performance in basketball. J. Hum. Mov. Stud., 41(5), 385-397.

- Karipidis, A., Mavridis, G., Tsamourtzis, E., & Rokka, S. (2010). The effectiveness of control offense, following an outside game in European Championships. *Inquiries in Sport & Physical Education*, 8(1), 99-106.
- Koutsouridis, C., Karamousalidis, G., & Galazoulas, C. (2018). The efficacy of "High Pick and Roll" in relation to the defence's reaction and its effect on the result of the game. *Int. J. Perform. Anal. Sport*, 18(4), 554-567. <https://doi.org/10.1080/24748668.2018.1501983>
- Kubatko, J., Oliver, D., Pelton, K., & Rosenbaum, D. T. (2007). A starting point for analyzing basketball statistics. *J. Quant. Anal. Sports*, 3(3). <https://doi.org/10.2202/1559-0410.1070>
- Lamas, L., Junior, D. D. R., Santana, F., Rostaiser, E., Negretti, L., & Ugrinowitsch, C. (2011). Space creation dynamics in basketball offence: validation and evaluation of elite teams. *Int. J. Perform. Anal. Sport*, 11(1), 71-84. <https://doi.org/10.1080/24748668.2011.11868530>
- Lamas, L., Santana, F., Heiner, M., Ugrinowitsch, C., & Fellingham, G. (2015). Modeling the offensive-defensive interaction and resulting outcomes in basketball. *PloS One*, 10(12), e0144435. <https://doi.org/10.1371/journal.pone.0144435>
- Lehto, H., Häyrynen, M., Fay, T., Tammivaara, A., & Dettmann, H. (2010). Technical and tactical game analysis of elite basketball in three different levels. *KIHU's publication series*, 19, 33.
- Marmarinos, C., Apostolidis, N., Kostopoulos, N., & Apostolidis, A. (2016). Efficacy of the "pick and roll" offense in top level European basketball teams. *J. Hum. Kinet.*, 51, 121. <https://doi.org/10.1515/hukin-2015-0176>
- Matulaitis, K., & Bietkis, T. (2021). Prediction of offensive possession ends in elite basketball teams. *Int. J. Environ. Res. Public Health*, 18(3), 1083. <https://doi.org/10.3390/ijerph18031083>
- McBasketball C. (2017). Nylon Calculus: How to understand synergy play type categories, 9. Retrieved from [Accessed February 27, 2024]: <https://fansided.com/2017/09/08/nylon-calculus-understanding-synergy-play-type-data/>
- Nunes, H., Iglesias, X., Daza, G., Iruña, A., Caparrós, T., & Anguera, M. T. (2016). Influencia del pick and roll en el juego de ataque en baloncesto de alto nivel. *CPD*, 16(1), 129-142.
- Nunes, H., Iglesias, X., Del Giacco, L., & Anguera, M. T. (2022). The Pick-and-Roll in Basketball From Deep Interviews of Elite Coaches: A Mixed Method Approach From Polar Coordinate Analysis. *Front. Psychol.*, 13, 801100. <https://doi.org/10.3389/fpsyg.2022.801100>
- Peraica, D. Investigating space protection dynamics in NBA and Euroleague (Doctoral dissertation, Lietuvos sporto universitetas, Lithuania, 2022).
- Polykratis, M., Tsamourtzis, E., Mavridis, G., & Zaggelidis, G. (2010). Relation of effectiveness in Pick n' Roll application between the National Greek Team of and its opponents during the Men's World Basketball Championship of 2006. *J. Phys. Educ. Sport.*, 29 (4), 57-67.
- Prieto-Lage, I., Vázquez-Estévez, C., Paramés-González, A., Argibay-González, J. C., Reguera-López-de-la-Osa, X., & Gutiérrez-Santiago, A. (2022). Ball Screens in the Men's 2019 Basketball World Cup. *Int. J. Environ. Res. Public Health*, 20(1), 59. <https://doi.org/10.3390/ijerph20010059>
- Remmert, H. (2003). Analysis of group-tactical offensive behavior in elite basketball on the basis of a process orientated model. *Eur J Sport Sci.*, 3(3), 1-12. <https://doi.org/10.1080/17461390300073311>
- Sampaio, J., & Janeira, M. (2003). Statistical analyses of basketball team performance: understanding teams' wins and losses according to a different index of ball possessions. *Int. J. Perform. Anal. Sport*, 3(1), 40-49. <https://doi.org/10.1080/24748668.2003.11868273>
- Selmanović, A., Škegro, D., & Milanović, D. (2015). Basic characteristics of offensive modalities in the Euroleague and the NBA. *Acta Kinesiol.*, 9(2), 83-87.
- Shingala, M. C., & Rajyaguru, A. (2015). Comparison of post hoc tests for unequal variance. *IJNTSE*, 2(5), 22-33.

- Skinner, B. (2012). The problem of shot selection in basketball. PloS one, 7(1), e30776. <https://doi.org/10.1371/journal.pone.0030776>
- Stavropoulos, N., Kolias, P., Papadopoulou, A., & Stavropoulou, G. (2021). Game related predictors discriminating between winning and losing teams in preliminary, second and final round of basketball world cup 2019. Int. J. Perform. Anal. Sport, 21(3), 383-395. <https://doi.org/10.1080/24748668.2021.1901437>
- Stavropoulos, N., Papadopoulou, A., & Kolias, P. (2021). Evaluating the Efficiency of Off-Ball Screens in Elite Basketball Teams via Second-Order Markov Modelling. Mathematics, 9(16), 1991. <https://doi.org/10.3390/math9161991>
- Suárez-Cadenas, E., & Courel-Ibáñez, J. (2017). Shooting strategies and effectiveness after offensive rebound and its impact on game result in Euroleague basketball teams. CPD, 17(3), 217-222.
- Tsamourtzis, E., Karypidis, A. and Athanasiou, N. (2005). Analysis of fast breaks in Basketball. Int. J. Perform. Anal. Sport, 5(2), 17-22. <https://doi.org/10.1080/24748668.2005.11868324>
- Uhlmann, E. L., & Barnes, C. M. (2014). Selfish play increases during high-stakes NBA games and is rewarded with more lucrative contracts. PloS One, 9(4), e95745. <https://doi.org/10.1371/journal.pone.0095745>
- Vaquera, A., Cubillo, R., García-Tormo, J. V., & Morante, J. C. (2013). Validation of a tactical analysis methodology for the study of pick and roll in basketball. RPD, 22(1), 277-281.
- Vaquera, A., García-Tormo, J. V., Gómez Ruano, M. A., & Morante, J. C. (2016). An exploration of ball screen effectiveness on elite basketball teams. Int. J. Perform. Anal. Sport, 16(2), 475-485. <https://doi.org/10.1080/24748668.2016.11868902>
- Zukolo, Z., Dizdar, D., Selmanović, A., & Vidranski, T. (2019). The role of finishing actions in the final result of the basketball match. J. Sports Sci, 12, 90-95.

