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Pick-and-Roll Strategies Against Switching Defense in the Endgame of EuroLeague Matches

Foteinakis, P.[1], Pavlidou, S.[1], Stavropoulos, N[2].

[1]Department of Physical Education and sport Science,Democritus University of Thrace
[2]School of Physical Education and Sport, Aristotle University of Thessaloniki,

Abstract

Pick-and-roll (PnR) offense against switching defense in basketball games presents an intriguing aspect for analysis. However, few studies have delved into the tactical efficacy of PnR strategies employed by the offense in the last quarter of the game. This study aimed to elucidate the offensive tactics yielding maximum advantage in PnR mismatch situations and evaluate how PnR action duration influences its effectiveness in the final quarter of closely contested EuroLeague matches. Utilizing Sport Scout observation software, 400 PnR actions from 40 EuroLeague games were observed. The observed variables included the offensive tactical action post-switch, action duration, the player concluding the action, and the outcome of the action. Chi-square (χ^2) analysis was employed, supplemented by the Chi-square Automatic Interaction Detector (CHAID) for data classification and predictive insights into PnR actions. The findings underscored the prevalence of switching to PnR as the primary strategy in the last quarter. Notably, shorter PnR actions, within four seconds post-switch, proved most efficacious. Offensive tactics predominantly capitalized on exploiting speed and size mismatches, with size mismatches demonstrating notable effectiveness. Ball handlers emerged as the primary choice for concluding PnR actions post-switch. These findings offer valuable perspectives on optimizing PnR strategies against switching defenses in basketball.

Keywords: *basketball, ball screen, tactical analysis, mismatch*

Corresponding address: Panagiotis Foteinakis
Department of Physical Education and Sports Sciences, Democritus University of Thrace
Campus, 69100, Komotini, Greece
E–mail: pfotinak@phyed.duth.gr

Ερευνητική

Στρατηγικές Pick-and-Roll Εναντίον Άμυνας με Αλλαγές στο Τελευταίο Δεκάλεπτο Αγώνων της Ευρωλίγκας

Φωτεινάκης, Π.[1], Παυλίδου, Σ.[1] , Σταυρόπουλος, Ν. [2]

[1]Τμήμα Επιστήμης Φυσικής Αγωγής και Αθλητισμού, Δημοκρίτειο Πανεπιστήμιο Θράκης
[2]Σχολή Επιστήμης Φυσικής Αγωγής και Αθλητισμού, Αριστοτέλειο Πανεπιστήμιο Θεσσαλονίκης

Περίληψη

Η επίθεση Pick-and-roll (PnR) εναντίον άμυνας με αλλαγές στο μπάσκετ παρουσιάζει μεγάλο ενδιαφέρον, ωστόσο λίγες μελέτες έχουν εξετάσει την αποτελεσματικότητα των στρατηγικών του PnR που χρησιμοποιούνται στο τελευταίο δεκάλεπτο του παιχνιδιού. Η παρούσα μελέτη είχε ως στόχο να αναδείξει τις επιθετικές τακτικές που παρέχουν μέγιστο πλεονέκτημα σε καταστάσεις ανισορροπίας της άμυνας και να αξιολογήσει πώς η διάρκεια της PnR επίθεσης επηρεάζει την αποτελεσματικότητά της στο τελευταίο δεκάλεπτο αγώνων της Ευρωλίγκας. Αναλύθηκαν 400 επιθέσεις PnR από 40 παιχνίδια Ευρωλίγκας, μέσω του προγράμματος SportScout. Οι μεταβλητές που παρατηρήθηκαν περιλάμβαναν την επιθετική τακτική, τη διάρκεια και τον παίκτη που ολοκλήρωσε την επίθεση και το αποτέλεσμα της. Χρησιμοποιήθηκε η δοκιμασία χ^2 και ο αλγόριθμος χ-τετράγωνο Αυτόματος Ανιχνευτής Αλληλεπίδρασης (CHAID) για την ανεξαρτησία και ταξινόμηση των μεταβλητών σε σχέση με την αποτελεσματικότητα του PnR. Η χρήση των αλλαγών στα PnR αποτέλεσε την κύρια στρατηγική της άμυνας στο τελευταίο δεκάλεπτο, ενώ οι επιθέσεις που είχαν διάρκεια μικρότερη από τέσσερα δευτερόλεπτα αποδείχθηκαν αποτελεσματικότερες. Κυριότερες επιλογές της επίθεσης αποτέλεσαν η εκμετάλλευση της ανισορροπίας ταχύτητας και μεγέθους, με την εκμετάλλευση της ανισορροπίας μεγέθους να έχει την μεγαλύτερη αποτελεσματικότητα. Οι χειριστές της μπάλας, ήταν η κύρια επιλογή της επίθεσης. Τα ευρήματα της έρευνας παρέχουν πολύτιμες κατευθύνσεις στη βελτίωση των στρατηγικών επίθεσης εναντίων άμυνας με αλλαγές.

Λέξεις κλειδιά: *μπάσκετ, σκριν στη μπάλα, ανάλυση τακτικής, ανισορροπία*

Διεύθυνση επικοινωνίας: Παναγιώτης Φωτεινάκης
Τμήμα Φυσικής Αγωγής και Αθλητισμού, Δημοκρίτειο Πανεπιστήμιο Θράκης
Πανεπιστημιούπολη, 69100, Κομοτηνή, Ελλάδα
E–mail: pfotinak@phyed.duth.gr

Introduction

Performance analysis is a rapidly expanding field in professional sports, with teams increasingly relying on analysts to identify areas for improvement of the athletes and the team's performance (Hughes & Franks, 2004). As technology continues to evolve, performance analysts are leveraging advancements to enhance their analytical capabilities (Peraica, 2022). There has been a notable trend in sports toward embracing technological and scientific innovations for instructional purposes (Liebermann et al., 2001). This shift towards a more scientific approach to sports has driven the work of many performance analysts, who seek unbiased, objective insights in an attempt to enhance performance analysis and illuminate the parameters that have an impact on the game outcome (Vaquera et al., 2016). Recognizing the significance of technology in coaching and performance enhancement, performance analysts are heavily reliant on video analysis and video-based technology (Hughes & Bartlett, 2002). The fusion of technology and performance analysis generates vast amounts of data on individual players and teams.

Performance indicators, defined as specific action variables or combinations thereof, are utilized by analysts and coaches to evaluate individual or team performance. Invasion sports, such as basketball, where players collaborate with the main objective of scoring or preventing the opponent from scoring points through individual, group, and team actions (Lames, 2006).

According to Marmarinos and his colleagues (2016), the better the collaboration of the players in basketball, the greater the chance of success in the game. One of the simplest forms of players collaborating in a basketball game is predominantly called the pick and roll (PnR) (Sánchez et al., 2009), which is probably the most common offensive 2-on-2 team tactic used by basketball players in games (Gómezet al., 2015; Marmarinos et al., 2016; Remmert & Chau, 2019). In the majority of offensive strategies employed in the game, the PnR action demands particular defensive scrutiny towards the conclusion of each possession (Huciñski & Tymañski, 2006).

The PnR has the potential to trigger a defensive switch, wherein the defender originally guarding the ball handler, typically an interior player, switches to cover the screener, while the defender initially on the screener, also an interior player, now defends the ball handler. This scenario, referred to as a mismatch, presents a viable defensive strategy that can compel the offense to adapt its approach, resulting in varied game scenarios (Lorenzo et al., 2017). The ball handler could attack his defender, given the fact that is usually faster (perimeter mismatch), the ball can get inside the roll man, who is posting up and usually has an undersized player defending him (inside mismatch) and, if the defensive strategy decides to take away the aforementioned mismatches by using other players who were not involved directly in the ball screen action, the ball handler could pass to these players, punishing in a way the help.

While prior research has examined the frequency and effectiveness of PnR in various tournaments (Gómez et al., 2015; Izzo et al., 2023; Marmarinos et al., 2016; Polykratis et al., 2010; Stavropoulos et al., 2020; Vaquera et al., 2016), the efficacy of PnR toward switching in defense as a counter to the ball screen, thus creating a mismatch, has not been explored enough. A few studies investigated the efficacy of the PnR in mismatch situations (Calvo et al., 2017; Koutsouridis et al., 2018; Polykratis et al., 2009; Symeonidou et al., 2021), especially in the last quarter of the game (Prieto-Lage et al., 2022), where the nonlinear scoring performance during the fourth quarter of the game becomes unpredictable due to close score differences, and the games below 10 points of difference showed a highly competitive context between confronting teams (De Saá et al., 2013).

Consequently, this study aims to address two primary objectives: First, identifying the offensive tactical behaviours that derive the greatest advantage of PnR in mismatch situations, and second, assessing the impact of PnR action duration on the effectiveness of the PnR in the last quarter of tightly contested EuroLeague games.

Method

Sample

The sample consisted of 40 tightly contested games from the 2023-2024 regular season of the EuroLeague, and was observed on the publicly acceded EuroLeague TV (http://tv.euroleague.net/). The games were selected according to the criterion of inclusion of tightly contested (less than 10 points of difference at the end of the third quarter and the end of the game) of the same season (De Saá et al., 2013). The mean difference in the score at the end of the game was 4.62±2.54 points (mean ± SD), and at the end of the third quarter, it was 4.7± 2.84 points. A

total of 400 PnR actions from set offenses where the opponents used man-to-man defense and the defensive response was a switch were observed and analyzed. This study exclusively analyzed ball screens occurring during the last period of the games.

Instruments

The games were analyzed through systematic observation video-based technology software (Sport Scout STA Ver. 3.2). The software was used to play all games on a laptop, pausing and replaying the games when a PnR was observed, and the results were registered on a Microsoft Excel spreadsheet (Microsoft Inc., Washington USA).

Procedure

To ensure that the data were correctly observed and registered, each game was observed twice by a basketball coach and Sports Sciences graduate with more than 20 years of experience. To verify the accuracy of the data, the observer repeated the observations in four randomly chosen games after a one-month interval. Intra-observer reliability was assessed using weighted Cohen's Kappa correlation coefficients. The results obtained ranged from 0.85 to 1.0, indicating a high to perfect level of agreement (Altman, 1991). This study exclusively considered PnR actions occurring in the fourth quarter of the game, specifically those that provided the offense with a discernible tactical edge and significantly contributed to offensive outcomes. Additionally, only instances of genuine defensive switches (double or triple) were documented, excluding temporary switches prompted by situational factors unrelated to the team's defensive strategy. A defensive switch was recognized in instances where the defense employed a man-to-man strategy, and a PnR scenario unfolded. During this sequence, the screener engaged the defender of the dribbler, while the defender of the screener transitioned to guard the dribbler for at least two seconds (Calvo et al., 2017).

During the game observations, several variables were examined, including the game outcome (win or loss), the tactical action of the offensive team after the switch to the PnR, the duration of the offense after the switch (0-4 sec, 5-8 sec and more than 8 sec), the player that concluded the offense (ball handler, screener or another player, and the effectiveness of the offense (successful or unsuccessful).

The tactical actions of the offense after switching the PnR were defined for this study as follows: offense against the perimeter mismatch (speed mismatch), offense against the inside mismatch (size mismatch), offense from other players not directly engaged in the mismatch but gaining an advantage (punish the help), and offense proceeding as usual without exploiting the mismatch occurred by the switch (continue as normal). A PnR offense was deemed successful if the team scored two (2p) or three (3p) points, obtained a basket and foul for two (2pF) or three points (3pF), or if the offense received a foul resulting in no bonus free throws (FO) or bonus free throws (FT1, FT2, FT3). Conversely, a ball screen action was considered unsuccessful if the team missed a shot (-3p, -2p), committed a turnover (TO, including offensive fouls), or had a shot blocked (BL).

Statistical Analysis

The SPSS 29 Professional package software for statistical analysis was used in this study. Crosstabulation analysis was used with a Chi-square (χ^2) distribution. Post hoc testing using adjusted standardized Residual (critical value = 1.96, $p < .05$) was used to determine which cross-section is responsible for the independence of the variables. To assess the relative importance of the observed variables (the offensive tactical action and the duration of the PnR after the switch) regarding the efficacy of the PnR action, chi-square automatic interaction detector (CHAID) decision trees were created. CHAID decision trees, model non-linear phenomena and they are very powerful and popularly known for their ability to classify data and make meaningful predictions for the data under investigation (Marques & Ighalo, 2022). The level of significance was set at $p < .05$.

Results

The analysis of the PnR actions from the 40 tightly contested EuroLeague games revealed that in a total of 745 observed PnR actions, 400 (53.69%) actions followed by a switch were found, creating a mismatch situation. Comparing the data as a whole, the PnR was positive in 41.8% (n = 167) actions, while the PnR produced a negative result in 58.2% (n = 233) of the total mismatch actions (Figure 1).

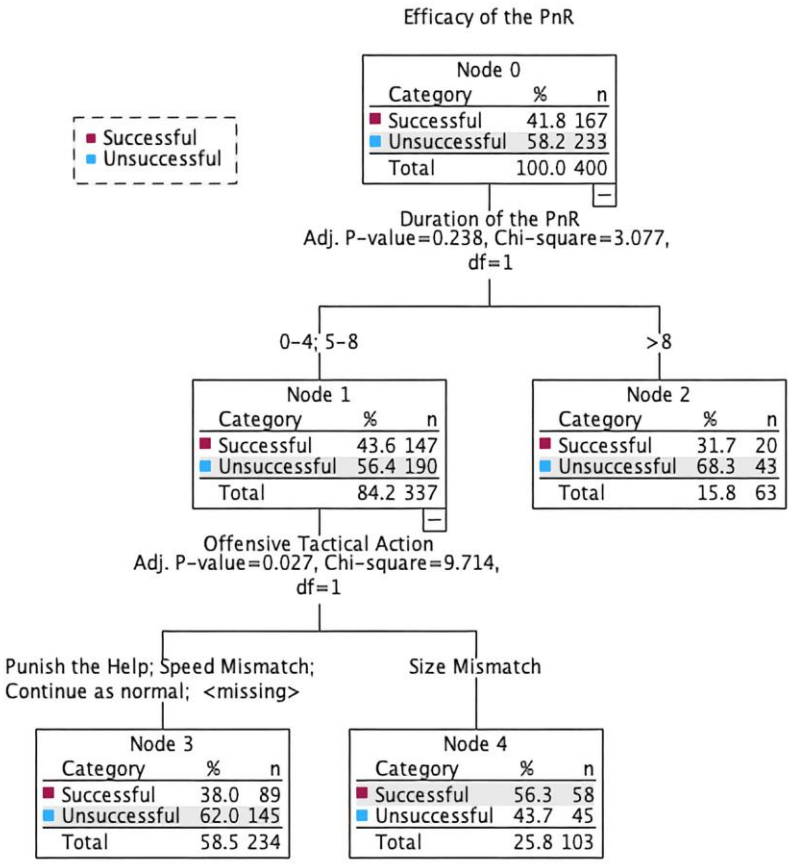

Figure 1. Growing method: CHAID decision tree describes the frequency efficacy (%) of PnR actions according to the duration of the action and the offensive tactical action.

Regarding the efficacy of the PnR across the tactical actions after the switch and the duration of the action, size mismatch actions within 8 seconds after the switch (56.3% successful actions) were found to be statistically significantly more effective [$\chi^2(1) = 9.714$, $p < .05$] compared with speed mismatch, punish the help or continue as normal actions (Figure 1).

To evaluate the efficacy of the PnR across the duration of the PnR action, the Chi-Square Test of Independence was executed. The observed frequencies revealed (Table 1), that 46.5% of the PnR actions lasted 0-4 seconds, while 37.75% between 5-8 seconds. No statistically significant differences between the duration and the efficacy of the PnR action were found [$\chi^2(2) = 3.077$, $p = .238$]. The Cramer's V coefficient was .158.

Table 1. PnR efficacy regarding the duration of the action.

	Efficacy of the PnR						
Duration of the PnR	**Successful**		**Unsuccessful**		**Total**		χ^2
	n	%	*n*	%	*n*	%	3.077, $p = .238$
<4 sec.	83	44.6	103	55.4	186	46.5	
5-8 sec.	64	42.4	87	57.6	151	37.75	
>8 sec	20	31.7	43	68.3	63	15.75	
Total	167	41.8	233	58.2	400	100	

Note: n: number of actions, %: percentage of actions, *$p < .05$, **$p < .001$. Bottom row (total) percentages are row-wise: Total distribution of the efficacy of PnR. Right column (total) percentages are column-wise: total

distribution of the PnR actions. Percentages within cells are column-wise: efficacy of PnR actions within the duration of the action.

To assess the PnR efficacy across the different tactical actions after the switch, the Chi-Square Test of Independence was performed. Statistically significant differences weren't observed [$\chi^2(3) = 6.550$, $p = .088$, Cramer's V = .131], between the successful and unsuccessful PnR actions regarding the type of tactical action that was used. The most efficient tactical action after switching the PnR was to exploit the size mismatch (n = 67, 52.3% successful actions), while the most frequent was to exploit the speed mismatch in the perimeter (n = 148, 37%). All the above results are depicted in Figure 2.

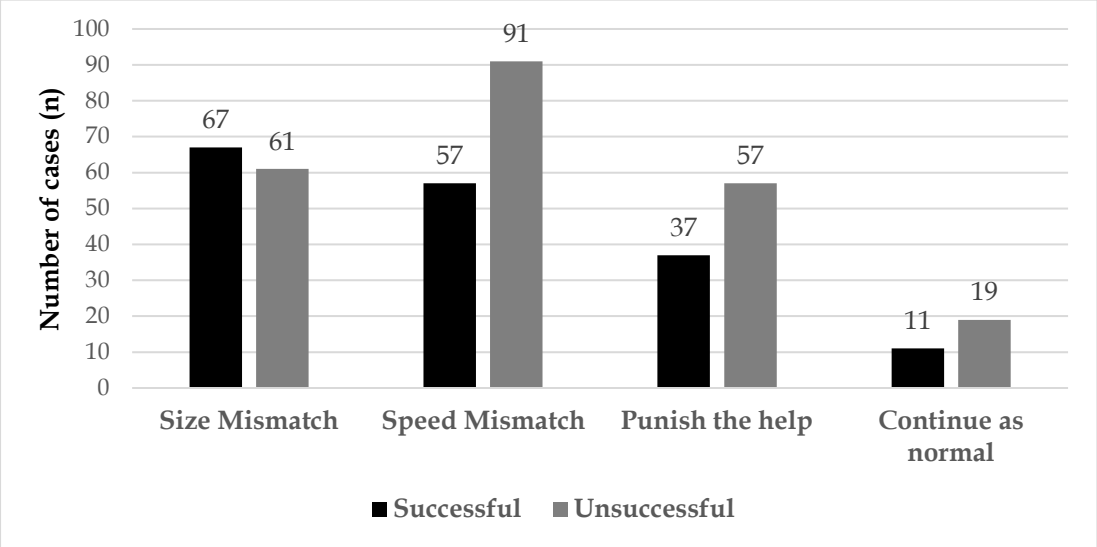

Figure 2. PnR efficacy regarding the tactical action after the switch.

To evaluate the effectiveness of the PnR across the player that concluded the offense, a Chi-Square Test of Independence was performed. As depicted in Table 2, ball handlers concluded 44.5% of the total PnR actions, with 63.5% of the actions being unsuccessful. Other players finished 33.5% of the actions, with a 32.8% success rate. The most efficient players were the screeners (65.9% successful actions). The Chi-Square Test yielded significant results [$\chi^2(2) = 26.928$, $p < .001$, Cramer's V= .260]. These results imply a statistically significant, albeit moderately sized, association between the player that concluded the action and the efficacy of the PnR.

Table 2. PnR efficacy regarding the player that concluded the action.

	Efficacy of the PnR						
	Successful		**Unsuccessful**		**Total**		χ^2
Player that concluded the PnR action	*n*	%	*n*	%	*n*	%	26.928, $p < .001$
Ball handler	65	36.5	113	63.5	178	44.5	
Screener	58	65.9**	30	34.1	88	22	
Other Player	44	32.8**	90	67.2	134	33.5	
Total	167	41.75	233	58.25	400	100	

Note: n: number of actions, %: percentage of actions, *$p < .05$, **$p < .001$. Bottom row (total) percentages are row-wise: Total distribution of the efficacy of PnR. Right column (total) percentages are column-wise: total distribution of the PnR actions. Percentages within cells are column-wise: efficacy of PnR actions within the players that concluded the action.

Discussion

The purpose of this study was to investigate the PnR offensive tactical behaviors that yield the most advantage in mismatch scenarios and to evaluate how the duration of PnR actions affects its effectiveness in the final quarter of closely contested EuroLeague matches. Regarding the frequency of the switch to the PnR action, it was found that it was the most commonly used tactic in the last quarter, finding that is in line with previous studies (Polykratis et al., 2009; Prieto-Lage et al., 2022, Foteinakis et al., 2024). An advantage of this strategy is its preservation of the PnR as a "2 vs. 2" matchup, thereby reducing the necessity for help defense from the weak side, and reducing defensive rotations. Also, according to Polykratis et al. (2009) it is the fastest way to defend the PnR. Regarding efficiency, the PnR action against switching defense was not effective (58.2% unsuccessful actions), coinciding with previous studies' findings (Foteinakis et al., 2024; Prieto-Lage et al., 2022).

Overall, when an offensive team encounters a situation of a defensive switch in a PnR action, the shorter the duration, the more beneficial to them. PnR offense in the first four seconds post-switch was the most effective, a result that is in line with the findings of previous studies (Calvo et al., 2017; Symeonidou et al., 2021). From 46.5% of the PnR actions that lasted under four seconds, the offense benefited in 44.6%. When the action lasted five to eight seconds, the success rate for the offense dropped to 42.4%, and in actions that lasted more than eight seconds to 31.7%, making the duration a key determinant in the success. This is happening because in this brief timeframe, the defense is not fully adjusted to the new positioning, and defensive rotations are typically slower, leading to defensive breakdowns and communication misunderstandings, allowing the offense to exploit potential mismatches more efficiently. According to Stavropoulos and Stavropoulos (2020), PnR action is very fast, and for this reason, synchronization of the moves of offensive players is very important, so that defensive players are not given enough time to react. Polykratis et al. (2010) also argue, that when a switch is made, important defensive imbalances occur.

Regarding the tactical actions of the offense after the switch, it was found that the exploitation of the speed mismatch was the most frequent (37%) followed by the size mismatch (32%). Concerning the effectiveness, size mismatch was the most effective, especially if the offense lasted less than eight seconds (56.3% successful actions). Passing the ball to other players not directly involved in the PnR, and punishing in a way the helping, was the least frequent action (23.7%), with 35.7% successful actions. On the contrary, Calvo et al. (2017) stated in their study that the inside players tried to benefit the most from the mismatch, but failed more often than they succeeded, especially when the action lasted more than five seconds. One of the reasons that the offense is trying to exploit the size mismatch is to take advantage of the greater height and weight of the inside player compared to their defenders (Calvo et al., 2017). Clearing the middle of the paint and exposing the guard who defends the big is a common practice in trying to explore the inside mismatch.

Concerning the player who concluded the PnR action after the switch, the ball handlers were the primary option finishing 44.5% of the mismatch actions with 36.5% successful actions. The results coincide with those obtained by Angelou et al. (2021), Koutsouridis et al. (2018), and Marmarinos et al. (2016). On the contrary, Calvo et al. (2017) found that perimeter players after switching in the PnR concluded fewer possessions than the screeners, but benefitted the most. Generally, coaches emphasize the importance of player assertiveness and driving to the basket whenever opportunities arise. This strategy often results in the ball handler attempting a shot following a PnR play (Marmarinos et al., 2016), a fact that explains the high percentage of concluded actions by the ball handlers. On the other hand, what distinguishes a good ball handler from a standout player is the latter's ability to create optimal conditions for scoring or driving towards the basket, while also setting up advantageous offensive situations for teammates (Hill, 1999). Effective ball handlers excel in creating space through strategic maneuvers and utilize a range of techniques to execute the PnR offense efficiently (Stavropoulos et al., 2020).

Regarding the players who were not involved directly in the PnR, the results showed that they finished 33.5% of the actions with 32.8% effectiveness. On the other hand, screener actions were the less frequent (22%) but with the highest efficacy (65.9%). The above findings are in line with the findings from Koutsouridis et al. (2018) and Marmarinos et al. (2016). The results elucidate that a pass to other players, usually in the perimeter results in a shot more frequently than a pass to the screener, and the reason is that defensive players typically prioritize coverage on the player nearest to the basket.

In conclusion, the results of this study revealed that the defensive switch was the primary defensive strategy in the last quarter, aligning with previous research. Notably, shorter PnR durations within the first four seconds

post-switch were most effective, as defense adjustments were slower, leading to defensive breakdowns and offensive mismatches being exploited more efficiently. Exploiting the speed and size mismatches was the most common offensive tactic, with size mismatches proving to be particularly effective, especially within shorter PnR durations. Ball handlers were the primary option for concluding PnR actions after the switch, highlighting their importance in creating favorable offensive situations. Additionally, while players not directly involved in the PnR finished a significant portion of actions, the screener actions were less frequent but more effective.

Significance for Sport or/and Physical Education or/and Quality of Life

This study yields valuable data applicable to coaches across basketball. Apart from game-related performance analysis, the drawn conclusions offer insights into training methodologies to formulate targeted plans. Consequently, coaches are encouraged to integrate offensive variations more effectively to exploit PnR offensive actions against switching defenses and educate players on reading and anticipating defensive reactions to enhance offensive efficacy. The increasing prevalence of the PnR in contemporary basketball underscores its significance, with this research underscoring its direct impact on the game's dynamics. Future research is required, factoring variables such as score difference, players in the weak and strong side offense and defense, number of passes after the switch to the PnR, and a more analytical approach to the type of shot that concluded the offense.

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