Original Article

Effect of Pick and Roll exploitation speed on mismatch situations

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Abstract
Ball screens are the most frequently used offensive tactic in basketball. A performance analysis wasperformed to examine this offensive strategy in combination with different defensive actions. The purpose of this study was to examine the exploitation speed of Pick and Roll (PnR) in mismatches created by defensive switch. The study sample consisted of 26 matches from the EuroLeague championship throughout 2017–2018 (16 matches) and 2018–2019 (10 matches). A total of 472 Pick and Roll actions were analyzed in which the defense responded with switching, and the Pick and Roll exploitation speed (in the first 4′′or after 5′′) was examined. The results showed that most Pick and Roll plays (63.8%) occurred during 9′′– 16′′ of the 24′′ ball possession (p <0.05). The duration of Pick and Roll actions lasted primarily from 1′′ to 4′′ (64.8%). Furthermore, most Pick and Roll phases occurred without the use of a pass or with at least one pass (73.8%), and it was exploited in the first 4′′ (81%) when the Pick and Roll result was positive (p<.001). The outcome of the match and the effectiveness of the Pick and Roll were not affected by the exploitation time of the mismatches. Finally, the home team had a higher percentage of effective Pick and Rolls performed during the first 4′′. The above findings are important findings for coachesto apply best practices for exploiting this offensive energy. Effective use of PnR requires a lot of practice by athletes and further investigation by researchers to find the best possible options for its exploitation.
Keywords: basketball, duration of action, possession time, defensive switch

Introduction
        Basketball is a team sport that requires continuous involvement of all players, both in defense and in offense. Decision-making and collaboration between players lead in finding solutions and maximizing performance. Moreover, athletes' decision-making plays an important role in coaching behavior(Karamousalidis, Galazoulas, Manousaridou, Bebetsos, Grammatikopoulou, &Alexaki, 2010). The different responses resulting from the interaction between two opposing teams, in offensive and defensive situations, explain the non-deterministic nature of the sport of basketball (Bourbousson, Sève& McGarryl,2010).
        Fast breaksare ones of the main components of victoryand the organized game in which all five players participate is another offensive choice (Tsamourtzis,Karypidis&Athanasiou, 2005;Ortega,Cardenas, Sainz de Baranda&Palao, 2006).The aim of most offensive plays is to create spacing in order todisorganize the defense. Recent findings showed the high percentage of half court offenses execution and more specifically the greater use of ball screens than other offensive strategies (Remmert, &Chau,2019). According to Lamas, De Rose, Santana, Rostaiser, Negretti and Ugrinowitch (2011), in high-level teams, ball screens were the most frequently used offensive actions to create space. More specifically, Pick and Roll (PnR) is an offensive tactic that is used both by youth (Ortega et al., 2006)and high-class professional players (van Maarseveen, Savelsbergh, &Oudejans, 2018).
        PnR execution involve the ball handler and a second teammate who sets up the screen and is called the "screener". Many studies have shown that the pair of players who took part, usually, in PnRsituations are the Point Guard (PG) and the Center (C) and the area in which it is performed most often is the central area of the basketball court (Marmarinos,Apostolidis, Kostopoulos&Apostolidis, 2016;Polykratis,Tsamourtzis, Mavridis and Zaggelidis, 2010). Decision-making skills of the ball handler is of great importance and substantially influences the evolution of the offensive action (Stavropoulos, N. & Stavropoulos, D., 2020).
        Effectiveness of PnR has been studied based on the choices of the two players involved. Marmarinos et al., (2016) showed that the execution of PnR in the final seconds of the attack, had the highest success rates when the shot was made by the screener who rolled to the basket, followed by the shot from another teammate after one or two passes. However, defensive strategies against PnR were not studied.

Similar results were found in the study of Gómez,Battaglia, Lorenzo A, Lorenzo J, Jiménez and Sampaio(2015), according to which the movement of the screener towards the basket, as well as the drive and execution of shots by the ball handler were the most effective choices. In contrary to the findings of Marmarinos et al., (2016) it was found that passing to an open teammate reduced the effectiveness of PnR.

In addition, the possession duration is a factor that affects the effectiveness of PnR. Studies showed that success rates were higher when PnR was executed in the last eight seconds of the attack (Vaquera,García-Tormo, Gómez Ruano&Morante, 2016; Gómez et al., 2015), most likely due to defense disorganization (Bourbousson et al., 2010). On the other hand, performing the pick to initiate offenses produced the highest probability leading to a new space creation dynamic (Lamas, Santana, Heiner, Ugrinowitch,&Fellingham, 2015)

Defensive actions against PnR depend on the area in which it is executed, as well as on the players that are involved. Koutsouridis,Karamousalidis and Galazoulas (2018) found that Switch and Deny and Trap in defense led to a failed High Pick and Roll, while Trail and Sag (drop coverage) defense was not effective against this offensive action. On the other hand, Gómez et al., (2015) observed that both Switch and Deny failed to deal effectively with Pick and Roll, since in both cases a mismatch arises.

Reading the defense and early reaction plays an important role in success of an offensive action. When PnR is executed in less than 4 sec the offense is favored, because it directly exploits the mismatches, whereas when the offensive action exceeds 5 sec, defense adapts and is more effective (Calvo, García &Navandar, 2017). However, switch in defense, particularly at the end of the attack, has brought about both positive (Koutsouridis et al., 2018) and negative results (Polykratis,Tsamourtzis, Karypidis, Mavridis&Christodoulos, 2009). The role of capable analysis, who aim to provide coaches and athletes with specific guidelines for better decision-making in any situation, is considered necessary (Koutsouridis, Lioutas, Galazoulas, Karamousalidis, & Stavropoulos, 2020).

The purpose of the present study was to examine the exploitation speed of PnR in mismatches created by defensive switch.

Material and Methods
Participants
The study sample consisted of 26 matches from Euroleague championship in 2017-2018 (16 matches) and 2018-2019 (10 matches). A total of 472 Pick and Roll actions were found and analyzed in which the defensive response was switch. The games were randomly selected with at least two matches from each team (Vaquera et al., 2016).

The following teams took part in the games analyzed: in the year 2017-2018, Anadolu Efes, Real Madrid, Brose Bamberg, Olympiakos, Panathinaikos, CSKA Moswow, Maccabi Tel Aviv, Armani Olimbia Milan, Zalgiris, Valencia Basket, Fenerbache, Unicaja Malaga, Barcelona, Khimki, Crvena Zvezda, Baskonia and the year 2018-2019, Anadolu Efes, Real Madrid, Olympiakos, Panathinaikos, CSKA Moswow, Maccabi Tel Aviv, Zalgiris, Fenerbache, Barcelona, Baskonia, Herbalife Gran Canaria ,BuducnostVoli.

Recording instruments– Statistical analysis
The instruments used for the completion of the research were a portable PC with Windows 10 software installed, Sport Scout STA Ver. 3.2 and SPSS 25 package software for statistical analysis.To determine possible differences Crosstabulation Analysis was used with chi-square distribution and the level of significance was set at $p < 0.05$.

Procedure and variables
During the monitoring of the games, the following variables were recorded in a spreadsheet: The court (home and guest), result of the game (win-loss),duration of action (1-4 sec and 5 sec or more), possession duration (0-8 sec, 9-16 sec, 17-24 sec), pair of players who participated inPnR action, who took advantage of the mismatch (the ball handler or the player who set up the screen or one of the other three players), the result of the PnR action (positive or negative), the number of passes after the PnR action, and the type of defensive switch.

A PnR action was successful when a team: scored a two (2p) or a three pointer (3p), received a foul (including 1 or 2 or 3 free throws) (2ft), scored a two pointer and received a foul (2p-F) and scored a three pointer and received a foul (3p-F). A PnR action was defined as unsuccessful when a team: missed a two (-2p) or a three pointer (-3p), made a turnover (To), had a shot blocked (Bl), the steal of the ball (St), the offensive foul (Off.F) and the end of the 24 sec.

Results
When the defense chose to respond with "switch" in a PnR action, the offense could either attack with the ball handler (drive, shot or boomerang pass and quick execution) or with the screener (roll into the basket, short roll, pop out) or with a pass in an open teammate in strong or weak side.

In order to determine the duration of the PnR action (1-4 sec, 5 sec or more) in relation with the possession time (0-8 sec, 9-16 sec, 17-24 sec), crosstabulation analysis was used with chi-square distribution.

Statistically significant differences were observed between the duration of PnR action and the possession time (x^2 = 8.52, p < .05). Most pick and roll situations (63.8%) occurred in the middle of the possession time (9''-16'' sec) and the duration of the action lasted 1''-4'' (fig 1).
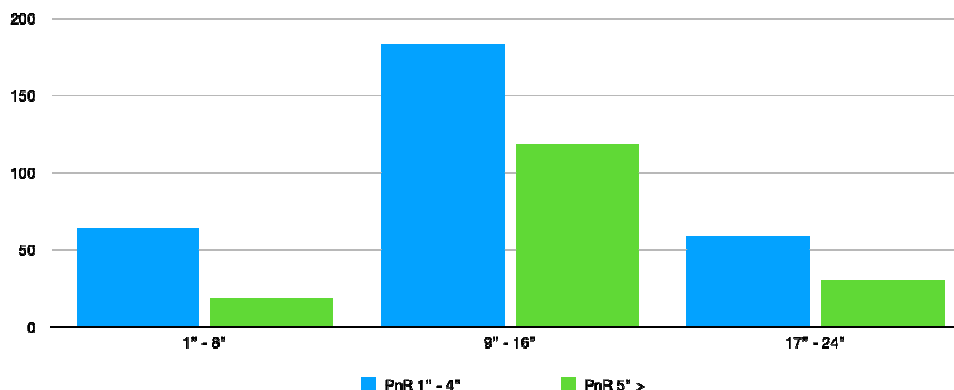

Figure 1. Execution of pick and roll in relation to the possession time (1-8 sec, 9-16 sec and 17-24 sec). Exploitation of pick and roll in the first 4 sec and in 5 or more sec.

In order to determine the duration of action (1''-4'', 5'' or more) in PnR situation in relation to the number of passes used after defensive switch, crosstabulation analysis was performed with chi-square distribution. Most PnRattacks (73.8%) were carried out without a pass, or at most with the use of only pass and theaction was completed in the first 4'' (x^2=66.2, p<.001) (Fig. 2).
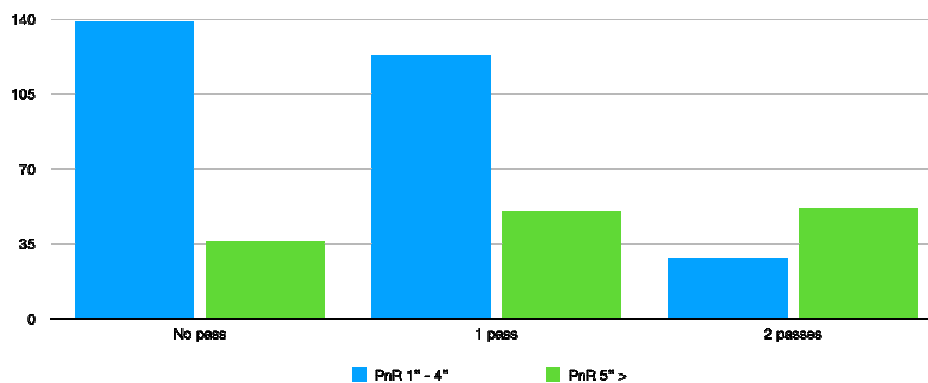

Figure 2. Passes used in PnR situations in the first 4 secs and over 5 sec: no passes, one pass, two passes and more passes.

The result of the game (win or loss) and the efficacy of Pick and roll (positive or negative) were not affected by the duration of the action in mismatch situations (x^2=.16, p=.691 and x^2=2.04 p=.153, respectively).The player who executed the final action (the ball handler, the screener or another player) as well as the pair of players who took part in PnR situations (in which positions the ball handler & screener competes) in relation to the duration of action, had no statistically significant differences (x^2=.74, p=.690 and x^2=2.6 p=.852,respectively).

In a total of 472 pick and roll executions, where the defensive response was switch (double or triple) and mismatch situations occurred, the offensive attackslasted 1''-4''in greater percentage of 64.8% (n=306) than those that occurred at a later time,which constituted the 35.2% (n=166).

Most of the PnR attacks (n=348) were executed using one pass, or no pass at all, while in the remaining 26.3% of attacks (n=124), two or more passes were used. When the duration of action lasted 1''-4'', offensive situations with no pass or one pass dominated, while when offensive players chose to execute two or more passes the duration of action lasted 5''-9'' (x^2=63.527, p<.001). Using one or no pass after pick and roll (n=348) had both positive results in 36.9% of the offensive situations (n=174), and negative results equal to 36.9% (n=174) with duration of action dominant at 1''-4'' but with higher demonstration in positive results 81% (x^2=6.178, p=.013).

In fact, when the result of the attack was positive (n=174), which was the case in both home (n=85) and away games (n=89), the manifestation of the offensive action took place in 1''- 4'' (x^2=5.607, p=.018) in home games 88.2% (n=75) while in away games with a somewhat smaller percentage of 74.2% (n=66). When two or more passes were made (n=124) to exploit the mismatch situations in Pick and roll, a third player was found to

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have taken the most offensive options (n=72) but with the duration of action equally distributed at 50 %. On the other hand, if the ball handler or the screener (n=52) executed the final action the prevailing duration was at 5''-9'' with 84.6% (n=44) with x^2=15.803, p<.001 (Fig.3).

Discussion

The purpose of the present study was to investigate the exploitation speed of PnR in mismatch situations created by defensive switch. The duration of possession time, in whichPnR took place, the duration of the selected offensive action after PnR execution and the player who finished the action were examined.

Although basketball is constantly evolving at speed with quick attacks and early pick and roll, this survey found that most PnR occurred in the middle of the possession time (i.e. 9''-16''). In addition, a previous study by Vaquera et al. (2016) showed that the effectiveness of this offensive cooperation was greater in the last eight seconds of ball possession, which undeniably requires further investigation of this issue.

When defensive switch occurred, the offense preferred to execute the PnR action in the first 4''. This was also the case when the PnR situation was executed with or without one pass. The speed of evolution observed in these cases is likely to have to do with the fastest general reading of the game and perhaps with automatization. The above findings are in line with the results of the study of Gomez et al., (2015) who have similarly found that the movement of the screener towards the basket as well as the drive and execution of shots by the ball handler were the most effective options.
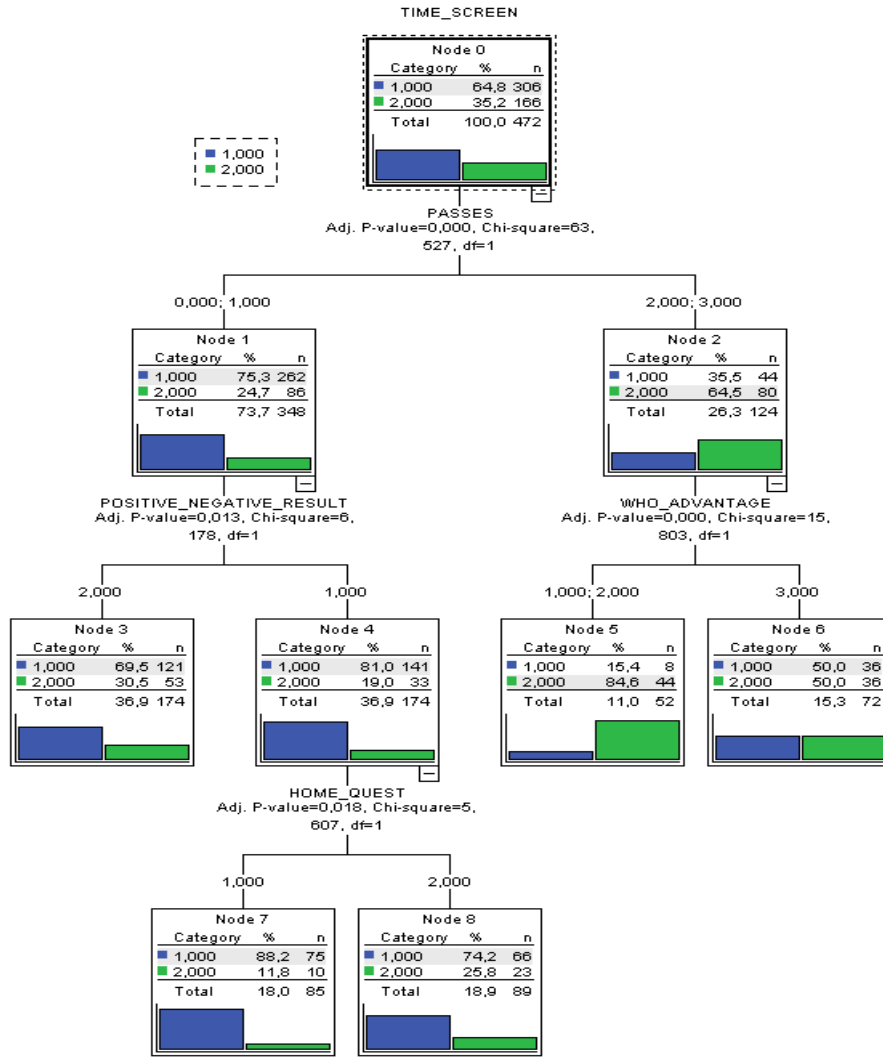

Figure 3. Growing method: CHAID tree is describing the frequency time of screen according to the number of passing, the result (positive or negative), the player who had the advantage and whether the game was home or guest.

In contrast, when two or more passes were observed, executions were expected to become somewhat slower and therefore ineffective, since defense has time to adjust (Calvo et al., 2017). Conflicting findings were reached by Marmarinos et al., (2016) and Gómez et al., (2015), who reported positive and negative, respectively, efficacy of PnR after the use of two or more passes.

In this study, the exploitation of PnR in the first 4'' did not affect its effectiveness or the outcome of the game. On the contrary, Koutsouridis et al., (2018) found that the winning teams executed a greater number of successful High PnR compared to the defeated teams. Similarly, Marmarinos et al., (2016) found that the effectiveness of the PnR was positively related to the final standings in the Euroleague championship 2012 – 2013.

Finally, being home or guest is a factor that may affect offensive choices and team performance (Pollard and Gómez, 2013). In the present study was found that the home team, compared to the guest, had a higher percentage of effective PnR performed during the first 4''. This finding is probably due to the 'home advantage', which sometimes seems to affect both the defensive (Gómez, Lorenzo, Ibáñez, Ortega, Leite and Sampaio, 2010), and the offensive tactics of the teams (Krommidas, et al., 2019).

Conclusion

In conclusion, the results of this study showed that PnR is one of the most frequent offensive action and is usually performed in the middle of the 24'' possession time. In particular, when the defensive response created a mismatch situation, the PnR is exploited in the first 4''. The quick decision-making and execution of the offensive action does not seem to have affected the outcome of the game, however, it seems to have been slightly influenced by the 'home advantage'.

The above findings are important elements for coaches, who are looking for offensive solutions against the constantly adaptable defense of opposing teams. Effective use of PnR requires a lot of practice by athletes and further investigation by researchers in order to find the best possible options for its exploitation, combined with the different ways of defensive response.

Conflict of Interests: The authors have no conflict of interest to declare.

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