# **Original Article**

# The use and efficacy of the offensive action of pick and roll in the Olympic Games of 2020

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## Abstract:

The following research was conducted with the purpose of investigating and ascertaining the efficacy of Pick and Roll, depending on how they are dealt with by each defense, and to which extent they affect the outcome of a game on the highest worldwide level. For the actualization of this purpose, 26 games from the Olympic Men's Basketball Tournament of 2020 were analyzed. The survey's sample consisted of the 12 teams that took part in the Tournament. Of these 26 games, 798 Pick and Roll, from which the data was acquired, were recorded and analyzed. For the record and the analysis of the games the notational analysis program InstatScout-Basketball was used. In order to ascertain the frequencies of the defined variables and the differences between them, crosstabulation analysis with x<sup>2</sup> (Chi-square) distribution was performed and the level of significance was set at p < 0.05. The results showed that the efficacy of Pick and Roll statistically affects the outcome of a game ( $x^2=9.7$ , p=0.002). The Center was the most efficient in the execution after the Pick and Roll ( $x^2$ =26.6, p=0.001). The most efficient ending of the Pick and Roll was "pass to roll" ( $x^2$ =40.8, p=0.001). The "over" was the most efficient reaction to the Pick and Roll (x<sup>2</sup>=18.6, p=0.002). Finally, from the present research was shown that the winning teams execute more successful Pick and Roll and fewer unsuccessful one, while the losing teams the opposite ( $x^2$ =9.7, p=0.002). The data and the information that came up from this survey can help the coaching staffs, so that they can be prepared appropriately and use the Pick and Roll with more efficiency. Key Words: Basketball, Defense, Offense, Performance Analysis, Tactics

#### Introduction

In the recent years, the researches related to the tactical behavior of the teams and especially to the understanding of offensive cooperations of the players regarding the process of a game have gained great significance (Crehaigne et al. 2013, Stamiris et. al. 2020). During a basketball game there are innumerable technical and tactical actions performed, whose ultimate goal is win, through the harmonious cooperation of the athletes and coaching staff. Coaches have to choose, based on their coaching philosophy, the type of offense that their athletes will execute, depending on each occasion, during the game.

The most popular offensive cooperation in modern Basketball is the Pick and Roll, as it is the tactical offensive element that is being more widely executed than any other (Polykratis et al., 2009, Vanquera et al., 2013, Marmarinos et al., 2016, Koutsouridis et al., 2018, Remmert et al., 2019, Stavropoulos et al., 2020, Symeonidou et al., 2021, Nunes et al., 2022). Nunes et al. (2021) analyzed 8,267 actions during the game in their research, involving 18 teams from the ACB league (2010-11). Of these actions 2,224 at a rate of 26.9% were Pick and Roll. It is executed to a very large extent, especially in the last decade (Ionescu, 2015), by teams all over the world, teams of every level, from the NBA, the Euroleague, which is the top European competition and whose offense is mainly based on Pick and Roll (Zukolo et al., 2019), the national teams in the Olympic games, even in the U18 and U16 championships of the local associations (Stavropoulos et al., 2020, Symeonidou et al., 2021).

This constant increase in the execution of Pick and Roll appears to be directly related to the increase observed in the overall efficiency of high-level teams (Marmarinos et al., 2016). It is the tactical offensive element that can make a defense more difficult than any other and is also an action that opposing coaches struggle to scout. A successful execution of Pick and Roll constitutes a problem for opposing team's coaches, who have to find ways to deal with it appropriately by adjusting their defense to the occasion. It is also notable that most of the team's offenses include a Pick and Roll at the end of them (Stavropoulos et al., 2020, Matulaitis et Bietkis, 2021).

Furthermore, in their research Christmann et al. (2018) found the Pick and Roll as the most frequent offensive action in the last critical minutes, i.e. "crunch time", in the NBA. At critical possessions coaches rely more on the Pick and Roll to control the game or even get a lead (Nunes et al., 2022). An important contribution to the effort of coaches to maximize the performance of their team is the method of video analysis and in general the field of Scouting which is an integral part of the training process at all levels of competitive sports. Coaches

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are helped a lot by technology and the information they acquire from Scouting (Markovic et al., 2020). In recent years the use of Scouting has increased to a great extent, providing coaches with accurate information about their teams, but also about their opponents (Calvo et al., 2017). Through notational analysis they can find the most important elements of the teams' performance, helping them in training and games (Santos et al., 2019). Performance analysis in sports has attracted interest since the beginning of their appearance (Markovic et al., 2020), and it is gradually gaining more and more importance resulting in being one of the main topics of study and research in sports sciences (Vanquera et al., 2016, Koutsouridis et al. al., 2020, Stamiris et al., 2020), with the interest from the academic community having skyrocketed in the last decade (Tian et al., 2019). The huge amount of information that Scouting can provide coaches has inevitably led to the need to create specialized Scouting software programs which detect and provide information (Markovic et al., 2020). One such Scouting software is InstatScout, which was used in this research to extract information and data and analyze all the games of the 2020 Olympic basketball tournament. InstatScout has also been used in other researches for various sports, such as the research by Santos et al. (2019), where they extracted data from 20 games for the 2018 Pan-European Futsal Cup and the research by Nemec et al. (2019), who used it to assess the competitive activity of athletes in two youth men's soccer leagues. Leontijevic et al. (2018) also used it to collect data to create profiles of athletes based on their offensive performance in soccer. Finally, Bustamante-Sánchez et al. (2022) used it in their research to collect statistical data for the 2019-2020 NBA season.

Sports data collection methods have evolved and this enables teams to process and encode all this data quickly and then help their athletes in making the right decision and execution. Generally high-quality data, which is found in a large amount, constantly helps coaches to achieve their goals.

The purpose of this research was to study and analyze all the games of the 2020 Olympic Games tournament to record how Pick and Roll were executed in relation to how they were dealt with as well as to determine any effects on the outcome of the game.

# Material & methods

## Sample

The research sample was the 26 games that took place at the 2020 Olympic Basketball Tournament, in Tokyo, Japan from July 25 to August 7, 2021. All group stage games, the quarterfinals games, the semi-final games, the gold medal game and the bronze medal game were analyzed. Of these games, 798 Pick and Roll plays were recorded and analyzed. The teams that participated in the Tournament are the following. 1. Islamic Republic of Iran, 2. Czech Republic, 3. Japan, 4. United States of America, 5. Argentina, 6. Nigeria, 7. Australia, 8. France, 9. Spain, 10. Germany, 11. Italy , 12. Slovenia.

# **Recording instruments**

The recording instrument used to analyze the 2020 Olympic games was the notational analysis program InstatScout Basketball (https://basketball.instatscout.com/). Two A1 level Coaches of the Greek Championship evaluated the analysis of 798 plays confirming the use of Pick and Roll.

# Procedure and Variables

In this specific study, seven (7) variables were investigated during the analysis of the games, the results of which were recorded in a Microsoft Excel spreadsheet. These variables were (Table 1):

PnR Defense	PnR Efficacy	Athlete's Position	Team-of- execution	Pair-of-execution	PnR Outcome	PnR
1.Over	1.Successful	1.Guard	1.Winner	1. Guard+Center	1. Drive	1. High
2.Under	2.Unsuccessful	2.Forward	2.Loser	2. Guard+Forward	2. Pull Up Shoot	2. Side
3 Switch		3.Center		3. Forward+Center	3. Pass to Roll	3. Flat
4.Hedge				4. Forward+Forward	4. Pass to Pop	4. Step-Up
5.Ice				5. Forward+Guard	5.Pass to Strong/Weak Side	
6.Double				6. Center+Forward	6. Slip Play	
				7. Center+Guard	7. Ghost Play	
				8. Guard+Guard		

 Table 1. The application variables of Pick and Roll

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## **Statistical Analysis**

For the statistical analysis of the data, the software SPSS Statistics 28 was used. In order to determine the frequencies in certain variables and the differences between these variables, Crosstabulation Analysis was performed with  $x^2$  (Chi-square) distribution and the level of significance was set at p<0.05. Regarding the separation of a successful and unsuccessful offense, the following signaling was carried out (Table 2).

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Successful Offense	Unsuccessful Offense
• Two-point shot made (+2)	Missed Two-point shot (-2)
• Three-point shot made (+3)	Missed Three-point (-3)
• Foul	• Turnover
<ul> <li>Foul → Two Free Throws (2FT)</li> </ul>	• Steal
• Foul → Three Free Throw (3FT)	• Block
• Two-point shot made and Foul (2+1FT)	Offensive Foul
• Three-point shot made and Foul	Shot Clock Violation (24 seconds)
(3+1FT)	

Table 2. Signaling of successful and unsuccessful offense

## Results

The type of Pick and Roll that was used the most in the Olympic games was the "High Pick and Roll" at 54.3% (n=433), while regarding defense, the most common way of tackling was the "Over" defense at 45.2% (n = 361). The athlete who executed the most times after a Pick and Roll was Guard at 57.9% (n=462). The athletes who cooperated the most in the execution of the Pick and Roll were Guard-Center at 63.9% (n=510). In the majority of cases the Pick and Roll ended with "Pull up Shoot", specifically at 43.4% (n=346), and "Drive" at 26.7% (n=213). Overall, the types of the Pick and Roll, the defensive ways, the athletes, their cooperation and the final offensive endings are presented in Table 3.

PnR	n	%	PnR	n	%	Athlete's	Ν	%	PnR	n	%	PnR Outcome	n	%
Option			Defense			Position			Pair					
High	433	54.3	Over	361	45.2	Guard	462	57.9	G+C	510	63.9	Drive	213	26.7
Side	195	24.4	Under	66	8.3	Forward	157	19.7	G+F	125	15.7	Pull Up Shoot	346	43.4
Flat	59	7.4	Switch	273	34.2	Center	179	22.4	F+C	98	12.3	Pass to Roll	129	16.2
Step Up	111	13.9	Hedge	75	9.4	<u>Total</u>	798	100	<i>F</i> + <i>F</i>	19	2.4	Pass to Pop	61	7.6
<u>Total</u>	798	100	Ice	15	1.9				F+G	17	2.1	Pass to Strong/Weak Side	10	1.3
			Double	8	1.0	·			C+F	6	0.8	Slip Play	24	3
			<u>Total</u>	798	100				C+G	5	0.6	Ghost Play	15	1.9
									G+G	18	2.3	<u>Total</u>	798	100
									<u>Total</u>	798	100			

Table 3. Frequency and percentage analysis of the variables

The offensive efficiency of Pick and Roll was analyzed for each of the variables with a significance level of p<0.05 using Crosstabulation Analysis. It was found that the defensive ways to deal with the Pick and Roll ( $x^2$ =5.5, p=0.356, Cramer= 0.083), the type of the Pick and Roll ( $x^2$ =3.8, p=0.276, Cramer=0.070), but also the position of the athletes who participated in it ( $x^2$ =7.5, p=0.372, Cramer=0.097) did not statistically significantly affect the efficacy of Pick and Roll. On the contrary, it was found that the efficacy of the Pick and Roll was statistically significantly affected by the position of the athletes executing after their application ( $x^2$ =26.6, p=0.001, Cramer=0.183), but also by their offensive endings ( $x^2$ =40.8, p=0.001, Cramer=0.226). Specifically, Center executed more efficiently after the application of Pick and Roll compared to Guards (fig.1)





Regarding the endings, the "Pass to Roll" constituted only 16.2% of the total offenses, but even so, the successful attempts (n=88) were more than twice as many as the unsuccessful ones (n=41). On the contrary, we notice that while the "Pull Up Shoot" cooperation constituted 43.4% of the total offenses, the successful attempts (n=142) were much fewer than the unsuccessful ones (n=204), as shown in figure 2.





Examining the efficacy of Pick and Roll, 503 plays (50.5%) with a positive result and 395 plays (49.5%) with a negative result were found. When the application of the Pick and Roll (19.2%, n=153) resulted in a pass to the screener who cut to the basket or applied the slip movement then the ending was positive at 70.6% (n=108). Pick and Roll applications had marginally positive efficacy (36.2%, n=289) when their offensive ending was the possible drive, the pass to the athlete executing after a pop out or after a ghost move at a percentage of 51.9% (n=150). On the contrary, the application of Pick and Roll (44.6%, n=356) had a negative effect when the options involved a shot after dribbling by the ball-handler or an extra pass on the strong and weak side at a percentage of 59.3% ( n=211). The comparison of the above categories-options showed statistically significant differences in terms of the offensive ending with x<sup>2</sup>=38.5, p=0.000. Regarding the application of the Pick and Roll that led to a negative outcome (with choosing to shoot after dribbling and an extra pass on the strong or weak side) differences were found in the overall outcome of the game, i.e. win - loss, with the winners and losers executing more Pick and Roll with a negative outcome x<sup>2</sup>=5.48, p=0.019 (fig. 3).



Figure 3. Growing method : CHAID tree describing frequency result of efficacy (%) according to the type of action and result.

Crosstabulation Analysis was carried out to determine the effect of the variables on the final outcome of the game with a significance level at p<0.05. It was found, therefore, that the position of the athletes who executed after the Pick and Roll application ( $x^2$ =4.8, p=0.090, Cramer=0.078), the cooperation of athletes ( $x^2$ =8.1, p=0.320, Cramer=0.101), the endings after Pick and Roll ( $x^2$ =9.3, p=0.155, Cramer= 0.108), as well as

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the different types of Pick and Roll ( $x^2=0.6$ , p=0.877, Cramer=0.029) did not statistically significantly affect the final outcome of the games. On the contrary, it was found that the defensive ways ( $x^2=18.6$ , p=0.002, Cramer=0.153), as well as the efficacy of the Pick and Roll ( $x^2=9.7$ , p=0.002, Cramer=0.110) had a statistically significant effect on the final outcome of the games, that is, they determined the win or loss of the team.

From the results, it was found that the winners used the "over" defense more often at 24.1% (n=192) and the "switch" defense at 18.2% (n=145) compared to the other defensive ways (fig.4).



Figure 4. The effect of defensive ways on the final outcome of the game

In general, winning teams executed more successful Pick and Rolls as opposed to losing teams that executed more unsuccessful Pick and Rolls (fig.5).



Figure 5. The effect of Pick and Roll on the final outcome of the game

When the defense chose to deal with the Pick and Roll with an "over" the most common ending was the "Pull Up Shoot" at 18.8% (n=150), the same thing happened with the "switch" defense with the most common ending being the "Pull Up" Shoot" at 17.7% (n=141), as in the "Under" option also "Pull Up Shoot" at 4% (n=32). On the contrary, in the "Hedge" defense, the most common ending was the execution of "Pass to Roll" at 3.5% (n=28), as shown in table 4.

Table 4. Results of frequency	y of endings	according to defense
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Variables	Driv	Drive I		Pull-Up Shoot		Pass-to-Roll		Pass-to-Pop		Pass-to- Strong/Weak Side		Slip PLay		Ghost Play		Total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	
Over	103	12.9	150	18.8	61	7.6	23	2.9	6	0.8	11	1.4	7	0.9	361	45.2	
Under	14	1.8	32	4	7	0.9	10	1.3	0	0	1	0.1	7	0.9	66	8.3	
Switch	78	9.8	141	17.7	27	3.4	15	1.9	4	0.5	4	0.5	4	0.5	273	34.2	
Hedge	15	1.9	14	1.8	28	3.5	9	1.1	0	0	7	0.9	2	0.3	75	9.4	
Ice	3	0.4	7	0.9	3	0.4	2	0.3	0	0	0	0	0	0	15	1.9	
Double	0	0	2	0.3	3	0.4	2	0.3	0	0	1	0.1	0	0	8	1	
Total	213	26.7	346	43.4	129	16.2	61	7.6	10	1.3	24	3	15	1.9	798	100	

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#### Discussion

From the analysis of the games of the 2020 Olympic Basketball tournament and from the process of the recorded data, useful conclusions were drawn about the technical and tactical action of Pick and Roll at the top level of world Basketball.

The type of Pick and Roll that was executed the most was the High Pick and Roll (54.3%), followed by the Side and Step Up Pick and Roll. This is probably due to the more options the ball handler seems to have after executing a High Pick and Roll eg. the passing angles and the favorable spacing that is created for the offense. Similar results were shown by the researches by Polykratis et al. (2010), in their study of Mundobasket 2006, by Gomez et al. (2015), by Stavropoulos et al. (2020), in their study of the 2016-2017 Basketball Champions League, and Angelou et al. (2021).

The "Over' defense (45.2%) was the most common defensive way chosen to deal with the Pick and Roll, followed by the "Switch" and "Hedge" defenses. Similar results were found in the research by Koutsouridis et al. (2018), in their study of the 2016 Olympic Games, while in the research by Polykratis et al. (2010) the "Switch" defense was preferred to a greater extent than "Over". Choosing the "Over" defense to such a large extent is probably due to the players' effort to prevent or make it difficult for the ball handlers to take shots after a Pick and Roll, especially if they are good shooters. This fact can also justify the low percentage in choosing the "Under" defense (8.3%), as it seems that teams do not often want to risk by their opponent's taking a shot which is relatively free and under good conditions. In addition, the preference for the "Switch" defense may be related to the ability of some tall players to tackle ball handlers effectively after the switch and short players in their turn tackle screeners, but also to the possible ability of the entire defense to deal with a mismatch successfully.

In the present study the athlete who executed the most after a Pick and Roll was the Guard (57.9%) followed by Center and Forward. The researches by Polykratis et al. (2010) and Koutsouridis et al. (2018) showed similar results, with the difference that in the research by Koutsouridis et al. (2018) in previous Olympic Games, Center performed fewer times than Forward. The primary goal of a Pick and Roll is to create space for execution by the ball handlers and if this doesn't work then pass to the screener for execution by him, depending, of course, on the manpower available on each team.

From the analysis of the games, it was also found that the athletes who cooperated the most in the execution of the Pick and Roll were Guard-Center (63.9%), followed by Guard-Forward and Forward-Center pairs, a result that strengthens the conviction that it is a "short-tall" cooperation that takes advantage of the possible mismatches. There were very few Guard-Guard, Forward-Guard, and Center-Guard cooperations in which there will probably be a further increase in frequency in the future. Similar results were found in the researches by Polykratis et al. (2010), by Koutsouridis et al. (2018) and Angelou et al. (2021).

The present survey showed that in the majority of cases the Pick and Roll ended with "Pull up Shoot", "Drive" and "Pass to Roll". Similar findings were shown by the research by Angelou et al. (2021), in which, however, the most frequent ending was "Drive", as in the 2016 Olympic games (Koutsouridis et al., 2018). Actually, in the 2020 Olympic games, mid-range or long-range shots prevailed in relation to drives which were more common in the previous Olympics in 2016. This fact may be due to factors such as the development of athleticism and speed, but also the continuous improvement of athletes' shooting skills.

Observing the application of Pick and Roll in Olympic tournaments over time, it is found that the defensive ways teams choose to deal with Pick and Roll and the frequency of their application are similar in the 2016 and 2020 Olympic games. However, this research showed that the defensive ways did not statistically significantly affect the efficacy of Pick and Roll in the 2020 Olympic Games, a result that agrees with the research by Polykratis et al. (2010), while the research by Koutsouridis et al. (2018) showed the opposite for the 2016 Olympics. In addition, in the 2020 Olympics defensive ways had a statistically significant effect on the final outcome of the games, while in the 2016 Olympics the opposite was found.

Regarding the athletes who execute after the Pick and Roll, in both events the Guard executed the most times, with the difference that in the 2020 Olympic Games, Center executed more times than Forward, while in the 2016 Olympic Games it was the opposite. In the 2020 Olympics the Pick and Roll offense was statistically significantly affected by the position of the athlete who executed, just like in the 2016 Olympics, with Center being much more effective than Guard, despite the fact that the latter, as it was above-mentioned, executed in the biggest percentage of offenses. This is probably due to the difficulty of dealing with the Screener when the ball is passed to him, but also the higher shooting percentage that can be created due to the close range of the shot from the basket. The above-mentioned hypothesis is supported by the finding in the present research that the ending "Pass to Roll" is the most effective, but also the finding that "Pull Up Shoot" is ineffective the most times. In contrast, the position of the athletes who executed did not statistically significantly affect the final outcome of the 2020 games, while in the 2016 Olympics Koutsouridis et al. (2018) found the opposite.

Furthermore, when it comes to the pairs that cooperated for the Pick and Roll, the results are similar in both tournaments, with the Guard-Center executing much more frequently in both cases. In both events, it was found that the pair of athletes who cooperated did not statistically significantly affect the offensive efficacy of the Pick and Roll, but neither did the outcome of the game.

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In both tournaments Pick and Roll endings statistically significantly affected Pick and Roll efficacy, but did not statistically affect the final outcome of the games. Also, in both tournaments both the winning and losing teams executed Pick and Roll with about the same frequency, with the efficacy of Pick and Roll having a statistically significant effect on the final outcome of the game, as the winners had more successful Pick and Roll than the losers and fewer unsuccessful ones and vice versa, confirming the significance of Pick and Roll to achieve a better result in a game.

Furthermore, the type of Pick and Roll did not statistically significantly affect their offensive efficacy. The same conclusion was reached by Polykratis et al. (2010) while in the research by Angelou et al. (2021) and Ionescu (2015) it was found that the efficacy of Pick and Roll depends significantly on the position from which it was executed.

#### Conclusion

The findings of the present research on the efficacy of the Pick and Roll in the 2020 Olympic Games, as well as their comparison with the findings of a similar research on the 2016 Olympics, can significantly help the coaching staff of the teams in their preparation regarding the technical and tactical action of Pick and Roll. For example, since the ending "pass to roll" was found to be the most effective, the coaches can place emphasis on this ending according, of course, to the available athletes of their team. Coaches can create such conditions so that the Center can be given a pass more easily and, depending on the occasion, make the best choice. Finally, since they know that Pick and Roll significantly affects the outcome of games, they should pay close attention to it and prepare accordingly.

Pick and Roll, as a tactical element, may not be used at a young age, but the preparation of athletes for it must start early with proper training of the basic skills of the sport, so that they can later perform the Pick and Roll as well as possible. The Pick and Roll is a form of offense that should be given a lot of attention in order for a team to improve its performance.

There is a need for further investigation of the Pick and Roll at the high level, both in terms of offensive and defensive tactics. It is important to constantly compare tactical elements between Olympics tournaments, as those belong to the highest level where the best players from all over the world compete and thus we observe significant changes that are likely to occur in the competitive part of the sport. Constant monitoring of trends at this level is essential so that coaches can be as prepared as possible and adjust their offense and defense where and when needed.

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## Supplement-Interpretation of Variables

Over: The defender of the ball-handler moves dynamically over the screen to follow and intercept him.

Under: The ball-handler's defender goes under the screen to tackle him.

- Switch: In this defensive way the defenders choose to tackle the Pick and Roll by switching their marking athletes.
- Hedge: After the screen, the defender of the screener goes quickly and explosively towards ball-handler (with one or more slides) in order to tackle him and not let him act "undisturbed", trying, that is, to stop him and force him to dribble until his teammate comes back to tackle him. Then, he quickly turns towards his own defender to tackle him.
- Ice: The ball-handler's defender rejects the screen, following the ball-handler and not allowing him to use the screen.

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Double: The defenders "trap" the ball-handler and pressure him, either to force him make a mistake or to prevent

the particular player from getting an opportunity to attack.

Drive: The drive to the basket.

Pull Up shoot: The shot executed by the ball-handler, who while dribbling stops and executes a jump shoot.

Pass to Roll: The ball-handler's pass to the screener's cut to the basket after a Pick and Roll.

Pass to Pop: The ball-handler's pass to the screener, who goes out to the perimeter, after a Pick and Roll.

Pass to Strong/Weak Side: The ball-handler's pass to a player on either the strong or weak side.

Slip Play: The screener goes to screen the ball-handler and after arriving he suddenly and quickly cuts towards the basket asking for the ball in order for him to execute.

Ghost Play: The screener goes to screen the ball-handler and after getting close enough, quickly changes direction and goes to the opposite side's perimeter, usually to receive the ball and shoot.

- High Pick and Roll: It is an on-ball screen and is executed at the top of the three-point line (at the top of the key), either below it (between it and the free throw line), or above it.
- Side Pick and Roll: It is an on-ball screen that takes place on the "wings", usually at 45 degrees. It can be executed either below the lines of three point, or above. This type of Pick and Roll drives the ball-handler towards the inner side of the court, specifically to the middle of it.
- Flat Pick and Roll: It is an on-ball screen that can be executed anywhere on the court. In this the screener applies the screen with his back to the basket.
- Step Up Pick and Roll: It is an on-ball screen that takes place on the "wings". It can be executed at 45 degrees, either below the three-point line or above. The screener's back is to the sideline or to the baseline of the court. This screen leads the ball-handler towards the outer side of the court, i.e. towards the sideline or the baseline.