

Determinants of Three-Point Shooting Performance in the EuroBasket U21 Championship

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Abstract

This study aimed to conduct a detailed analysis of offensive strategies and tactics, as well as the temporal and spatial factors that affect the accuracy of the three-point shot in young U21 athletes who participated in the EuroBasket Championship in the summer of 2025. The research sample consisted of 822 three-point attempts from 16 games (round of 16, quarter-finals, semi-finals and final). The games were analysed using the SportScout STA v.3.2 program. The categorised variables studied were the result of the game and the shot, the level of pressure from the closest defender, the form of the shot, ball movement (Ball Reversals) and entry into the paint (Paint Touches), the area from which the shot was taken, the time period of shot execution, and the range of dribbles and passes that preceded it. The statistical package SPSS 29 was used for statistical analysis with a significance level of $p < 0.05$. The results showed that the overall three-point shooting accuracy was 28.1%. The winning teams had higher shooting accuracy and attempted more three-point shots during the 35 minutes of the game, excluding the final 5 minutes, while paint touches (41.3%) and one ball reversal with a paint touch (37.5%) were associated with higher shooting success. A medium level of defensive contest was associated with the highest shooting accuracy. The Binary Logistic Regression revealed that the variables could not predict victory (win) or defeat (loss). The results contribute to a greater investigation of the three-point shooting skill and could be useful for all coaches in determining their offensive strategy.

Keywords: basketball, three-point shot, contest, ball reversal, paint touch, Eurobasket U21

Introduction

Basketball is a multidimensional team sport characterised by a variety of offensive and defensive actions, constant movement of players and the ball, and generally requires quick decision-making skills. One of the most basic and demanding skills of the game is the three-point shot, which has become increasingly popular, especially in recent decades (Freitas, 2020; Malarranha et al., 2013; Piras, 2024). Over time, it has been observed that there has been a gradual increase in the use of long-range shots, which is considered to be a result of the optimisation of teams' performance (Foteinakis & Pavlidou, 2025; Vollmer et al., 2000). The development of new technologies has become essential in order to gain an in-depth understanding of when and how three-point shots are executed most effectively (Chen et al., 2008; Karamousalidis et al., 2025a).

At the highest competitive level of the NBA, it has been found that when points from three-point shots account for more than 36% of total points, the probability of winning increases to 59% (Gou et al., 2022). However, there are also studies that suggest that excessive use of three-point attempts can reduce the chances of success in the final result, perhaps suggesting more balanced options (Gjoen et al., 2023). In particular, this trend of increasing three-point attempts as an integral part of offensive tactics has expanded in recent years to the league of EuroLeague competition (Durmus et al., 2023; Foteinakis & Pavlidou, 2024a). Research has shown that accuracy in these attempts leads to better results, especially in high-level competitions (Csataljay et al., 2013).

In the study by Daly - Grafstein and Bornn (2019), a contested shot is defined by the distance of the closest defender at the moment the shot is released. When the closest defender

is less than 1.22 m (4 feet) away, there is high pressure on the shooter (high or tight contest), while shots with the defender more than 1.83 m (6 feet) are considered open or low contest. Shots with the defender at an intermediate distance are defined as medium or partial contest (Medium or intermediate contest). The research showed that the closer a defender is to the shooter, the lower the probability of accuracy, due to increased shot depth variability and shot adjustment, while open shots were more effective. Similarly, in Morgulev's study (2024) at the professional level of the NBA (2013-2023), where he classified shots in relation to the distance of the defender (0-2 ft, 2-4 ft, 4-6 ft and 6+ ft), it was found that the closer the defender is, the worse the three-point percentages are (25.1%, 29.1%, 34.5% and 38.5%).

Pelechrinis' research (2016) found that three-point shots from the corners had better accuracy rates (38.8%) compared to shots taken from the top of the key (34.7%). Similarly, Cotta-Ortega et al. (2025) found that corner three-point shots, particularly those taken from the left corner and right wing, showed the highest success rates in women's basketball. This is due to the shorter distance from the basket and better offensive spacing, as the offensive player at that point usually remains stationary for a few seconds, waiting for a possible penetration and kick-out pass from a teammate. Similar results were presented in the study by Pelechrinis and Goldsberry (2021), where high frequencies of three-point shots from the far corners were observed, as well as higher effectiveness compared to shots from the top and sides, where there was less accuracy. In any case, however, long-range three-point shots require greater release speed and are characterised as shots of reduced efficiency (Nakano et al., 2018).

Ibanez et al. (2009) emphasised in their study the need for time intervals (five minutes) in order to study accuracy in more detail every five minutes. The studies by Cotta-Ortega et al. (2025) and Csataljay et al. (2013) found that at the beginning of the game and in the last five minutes, better accuracy results were achieved, emphasising the importance of both physical condition and offensive strategy. Many studies (Foteinakis et al., 2024b; Matulaitis & Bietkis, 2021; Yamada & Fujii, 2024) report a series of categories of offensive actions, known as Play Types (Spot up, Off Screen, Pick and Roll or Pop, Hand Off, Isolation).

Karamousalidis et al. (2025a) and Koutsouridis et al. (2020) have shown that the timing of offensive possessions influences shooting effectiveness. In addition, several studies (Christmann et al., 2018; Evangelos et al., 2005; Foteinakis et al., 2024b; Karamousalidis et al., 2025b) have identified different types of offensive situations.

Many studies (Courel et al., 2013; D'Amour et al., 2015; Jackson, 2009; Karamousalidis et al., 2025c) have confirmed the need for fast ball reversals and paint touches with the primary purpose of moving defenders and creating scoring

opportunities. In addition, a significant number of fast passes creates scoring opportunities through assists or by creating uncomfortable situations for defenders, allowing players to take uncontested shots (Bismpos et al., 2022; Gomez et al., 2008; Gomez et al., 2015; Štrumbelj et al., 2013; Karamousalidis et al., 2025c).

Despite the growing body of research on three-point shooting, little is known about the combined influence of tactical, spatial, and temporal factors on shooting performance in elite international U21 basketball. Therefore, the present study sought to address this gap by providing a comprehensive analysis of three-point shooting performance during the EuroBasket U21 Championship and offering practical implications for coaches working with young elite basketball players.

Specifically, the aim of this study was to investigate the offensive strategies and tactics, as well as the spatial and temporal factors, affecting the effectiveness of three-point shooting among U21 athletes who participated in the EuroBasket U21 Championship during the summer of 2025. It was hypothesised that tactical, spatial, and temporal factors would significantly influence three-point shooting effectiveness in elite U21 basketball players.

Methods

Sample

The research focused on 16 high-level EuroBasket U21 Championship games (2025). A total of 822 three-point shot attempts were recorded from the games, which gradually covered the round of 16 (8 games), the quarter-final phase (4 games), the semi-final phase (two games) and the final (one game) during the summer of 2025.

Procedure and data collection

The videos of the specific games were downloaded in mp4 format, and an analysis framework with variables was created after the data was digitised. The analysis of the games was carried out using the program SportScout STA v.3.2 (SportScout Group, Thessaloniki, Greece), which allows for the management and processing of match videos. Two trained analysts independently coded the variables. Inter-rater reliability was assessed using Cohen's kappa coefficient ($\kappa=0.89$), indicating a high level of agreement (Altman, 1990).

Variables

The dependent variable was three-point shooting outcome (made/missed). The independent variables included play type, court zone, defensive contest, ball reversals and paint touches, number of dribbles, number of passes, offensive phase, clock phase, game time, and game outcome. The variable definitions and descriptions are provided in Table 1.

Table 1. Definition and description of the examined variables

Variable	Definition and Description
Game Outcome	a) Winning team b) Losing team
Shot Outcome	a) Made b) Missed
Contest Level	a) High (Tight): Defender is within 1.22 meters. b) Medium (Intermediate): Defender is 1.22–1.83 meters away; hands may be raised, but the contest is not strong enough to affect the shot c) Open Shot: A shot is classified as Open when the defender is far or disengaged, with no raised hand or contesting motion
Play Type	a) Spot up b) Off the Dribble c) Exit from screen d) Pick and Roll Handler e) Pick and Pop or Ghost Screen f) Hand Off or Dribble Hand Off (D.H.O.)
BR & PT	a) 2+BR & PT: Two or more ball reversals and at least one paint touch b) 1 BR & PT: One ball reversal and at least one paint touch c) 2+BR: Two or more ball reversals and no paint touch d) 1BR: One ball reversal and no paint touch e) NO BR OR PT: No ball reversals and no paint touches f) PT: At least one paint touch and no ball reversal
Zone	a) Top of the Key b) Right Win c) Left Wing d) Right Corner e) Left Corner f) Depp Area
Type of Offensive Execution	a) Early Offense: Within the first 6 s of possession b) Set Offense: After transition phase c) Second Chance: After an offensive rebound
Clock Phase	a) 1-6 seconds b) 7-18 seconds c) 19-24 seconds
Quarter	a) 1st quarter b) 2nd quarter c) 3rd quarter d) 4th quarter
Range Dribbles	a) 1-10 dribbles b) 11-20 dribbles c) 21+ dribbles
Range Passes	a) 0-2 passes b) 3-4 passes c) 5+ passes
Game Time	a) 1-35 Minutes: Shots taken from the start of the game up to the 35th minute b) 36-40 Minutes: Shots taken during the final 5 minutes of the game

Statistical analysis

Data processing and statistical analysis were conducted using SPSS v.29 (IBM Corp., Armonk, NY, USA). Descriptive statistics were calculated for all variables. Pearson's Chi-square (χ^2) tests were used to examine associations between categorical variables. Binary Logistic Regression analysis was performed to identify the variables associated with successful three-point shooting. Statistical significance was established at $p < 0.05$.

Results

In total, 822 three-point shots were recorded, with successful attempts accounting for 28.1% ($n=231$) and unsuccessful attempts accounting for 71.9% ($n=591$). Most shots were set plays (75.3%, $n=619$). The majority of attempts were classified as highly contested (40.9%, $n=336$) and without any paint touches (70.1%, $n=576$). Most shots 60.7% ($n=499$) were Spot up, 65.3% ($n=537$) of shots were taken after 1 to 10 drib-

bles and 38.9% (n=320) of shots were taken after 3 to 4 passes. Overall, 83% (n=682) of shots were taken during the first 35

minutes. Detailed descriptive characteristics of all variables are presented in Table 2.

Table 2. Descriptive statistics

Variable	Category	N	%	Variable	Category	N	%
Shot Outcome	Made	231	28.1	Quarter	1st Quarter	213	25.9
	Missed	591	71.9		2nd Quarter	199	24.2
Game Outcome	Winning	420	51.1		3rd Quarter	196	23.8
	Losing	402	48.9		4th Quarter	214	26.1
Contest Level	High	336	40.9	Zone	Top of the Key	155	18.9
	Medium	244	29.7		Right Wing	184	22.4
	Open	242	29.4		Left Wing	180	21.9
Play Type	Spot up	499	60.7	Offensive Execution	Right Corner	93	11.3
	Off dribble	150	18.2		Left Corner	112	13.6
	Exit from screen	29	3.5		Deep Area	98	11.9
	PnR handler	68	8.3		Early Offense	15	18.3
	PnP or Ghost	51	6.2		Set Offense	619	75.3
	H.O. or D.H.O.	25	3.0		Second Chance	53	6.4
BR & PT	2+BR & PT	96	11.7	Range Dribbles	1 - 10 Dribbles	53	65.3
	1 BR & PT	10	12.7		11 - 20 Dribbles	276	33.6
	2+BR	178	21.7		21+ Dribbles	9	1.1
	1BR	205	24.9	Range Passes	0-2 Passes	282	34.3
	NO BR OR PT	193	23.5		3-4 Passes	320	38.9
	PT	46	5.5		5+ Passes	220	26.8
Clock Phase	1 – 6 seconds	251	30.5	Game Time	1' - 35'	682	83
	7 – 18 seconds	528	64.2		36' 40	14	17
	19 -24 seconds	43	5.3				

Chi-square (χ^2) crosstabulation analyses (Table 3) showed that two variables presented statistically significant correlations with the outcome of the shot (Made-Missed).

Table 3. Chi-square results examining the associations between shot outcome (made–missed) and categorical performance variables

Variables	Categories	X ²	df	p	Cramer's	Significant
Game Outcome	Win - Loss	10.59	1	0.001	0.11	Yes
Contest (Level)	High/Medium/Open	5.41	2	0.07	0.08	No (marginal)
Play Type	6 Types	3.15	5	0.68	0.06	No
BR & PT	6 Categories	12.85	5	0.03	0.13	Yes
Quarter	1st – 4th	3.57	3	0.31	0.07	No
Zone	6 Zones	4.96	5	0.42	0.08	No
Type of Offensive Execution	Early/Set/2nd Chance	1	2	0.55	0.04	No
Clock Phase	Early/Mid/Late	0.83	2	0.66	0.03	No
Range Dribbles	1-10/11-20/21	1.95	2	0.38	0.05	No
Range Passes	0-2/3-4/5	2.11	2	0.35	0.05	No
Game Time	1'-35'/36'-40'	0.77	1	0.78	0.01	No

More specifically, ball reversals and paint touches (BR & PT) showed significant differences in relation to the outcome

of the shot ($\chi^2=12.85$, $p=0.025$, Cramer's $V=0.13$), confirming the importance of these specific strategies in the quality of ex-

ecution. The 1BR & PT and PT categories had the best accuracy rates (37.5% and 41.3%), while the NO BR OR PT category had the lowest accuracy rate (21.8%), as shown in Figure 1. The outcome of the match was also related to shooting accuracy ($\chi^2=10.59$, $p=0.001$, Cramer's $V=0.11$), indicating different

accuracy rates between the winning and losing teams. No other variable showed a statistically significant relationship, while the level of defensive pressure on the shot (Contest) showed a marginal trend.

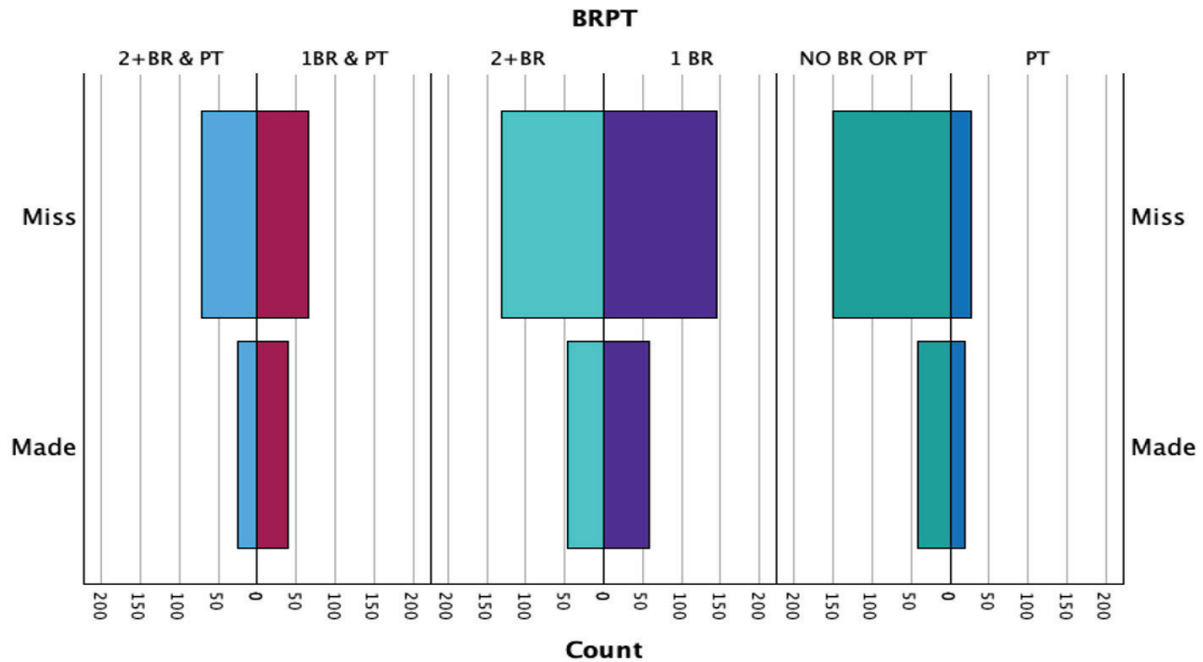


Figure 1. Three-point shooting accuracy across BR and PT categories

The Crosstabulation Analyses with χ^2 (Chi-square) presented in Table 4 showed us that the outcome of the match had a statistically significant association with the following variables: Play Type ($\chi^2=11.45$, $p=0.04$), BR and PT ($\chi^2=11.35$, $p=0.05$),

Zone ($\chi^2=14.44$, $p=0.01$), Range Passes ($\chi^2=6.42$, $p=0.04$) and Game Time ($\chi^2=4.58$, $p=0.03$). The effects were small (Cramer's $V=0.08$ to 0.13), suggesting that the winning and losing teams differed from each other in the above variables.

Table 4. Chi-square results examining the associations between game outcome (winning teams - losing teams) and categorical performance variables

Variables	Categories	X ²	df	p	Cramer's	Significant
Contest (Level)	High/Medium/Open	2.08	2	0.35	0.05	No
Play Type	6 Types	11.45	5	0.04	0.12	Yes
BR & PT	6 Categories	11.35	5	0.05	0.12	Yes
Quarter	1st – 4th	2.19	3	0.53	0.05	No
Zone	6 Zones	14.44	5	0.01	0.13	Yes
Type of Offensive Execution	Early/Set/2nd Chance	1.91	2	0.38	0.05	No
Clock Phase	Early/Mid/Late	4.63	2	0.10	0.08	No
Range Dribbles	1-10/11-20/21	1.79	2	0.41	0.05	No
Range Passes	0-2/3-4/5	6.42	2	0.04	0.09	Yes
Game Time	1'-35'/36'-40'	4.58	1	0.03	0.08	Yes

The winning teams had the highest number of three-point shots from the right corner. They also had high shooting percentages from this position, while the losing teams had more three-point shots from the top of the key (Figure 2). Spot-up was the most prevalent shot for the winning teams,

while they moved the ball more with over five passes in their attacks. Multiple ball reversals and paint touches (2+ BR & PT) were also a characteristic feature of the winning teams' offensive structure.

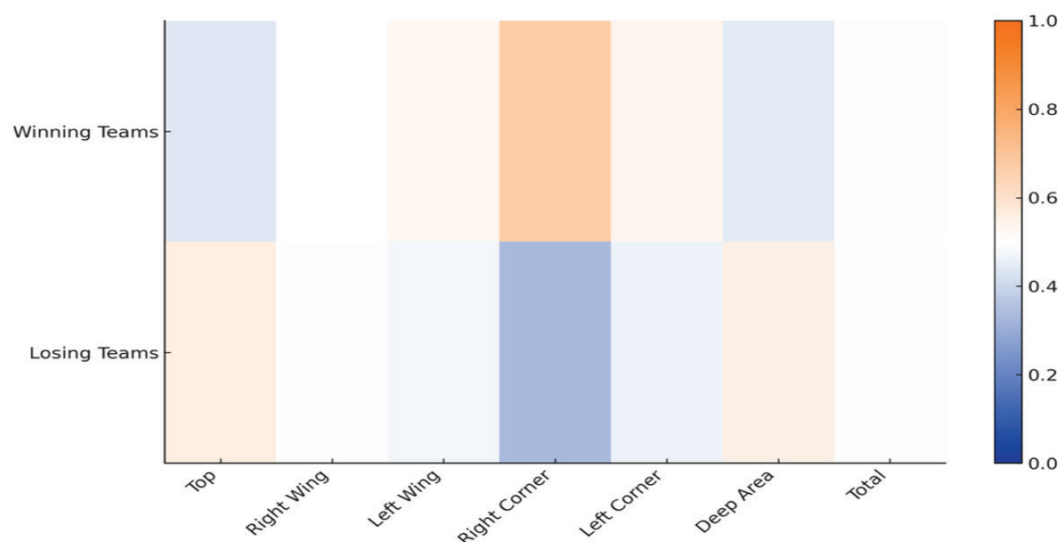


Figure 2. Spatial and tactical characteristics of three-point shots according to match outcome

Binary Logistic Regression Analysis was applied to determine how well the categorised variables could predict the outcome of the shot (Made – Missed). The overall model was not statistically significant as determined by the Omnibus Tests of Model Coefficients, $\chi^2(23)=32.16$, $p=0.09$, although some variables (Contest and BR & PT) showed significant associations. The Cox & Snell $R^2=0.04$ and Nagelkerke $R^2=0.05$ indices indicate that the model explains a small percentage of the variance in the outcome of the shot. The -2 Log Likelihood decreased from 976.398 to 944.240 in the final stage, indicating some limited improvement in the fit. The Contest (Medium) variable significantly predicted a higher probability of shooting accuracy ($B=0.43$, $p=0.03$, $\text{Exp}(B)=1.53$). Shot attempts with medium defensive contest were more likely to

result in a successful shot than attempts that were more contested or less contested (uncontested shots). The second variable, BR and PT, also had a significant effect on the model (Wald=13.05, $df=5$, $p=0.02$).

Although no single BR and PT category was individually significant, overall significance showed that ball reversals with paint touches, are associated with higher execution quality. Apart from these two variables, which were associated with the probability of a shot being successful, the other variables had no predictive power on the outcome of the shot. As shown in Figure 3, the maximum accuracy of shots was recorded in the middle defensive contest, while ball reversals with paint touches showed higher performance compared to the other categories.

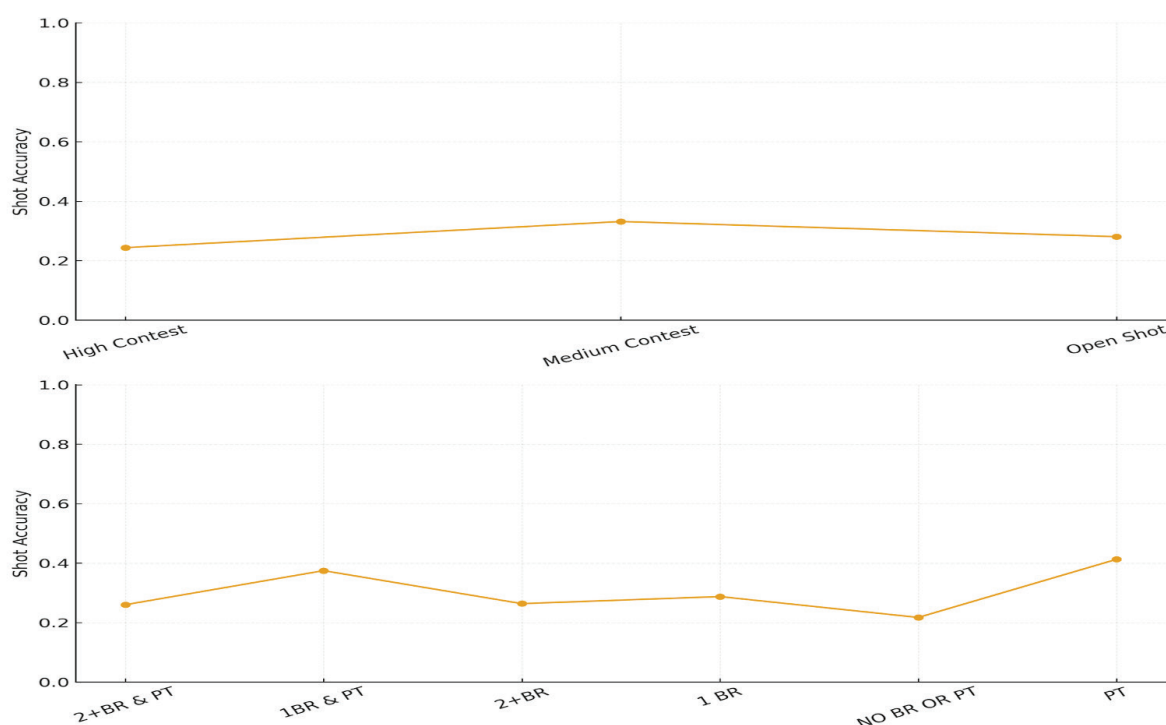


Figure 3. Three-point shooting accuracy by defensive contest and BR & PT categories.

A second Binary Logistic Regression was also performed to determine whether the categorized variables could predict the Game Outcome (Winning teams - Losing Teams). This model did not provide predictive power beyond random classification, as $B = -0.04$ and $p = 0.53$, and did not exceed the random classification rate (51.1%). Essentially, the above variables did not significantly predict game outcome.

Discussion

The purpose of this study was to examine in detail the offensive and tactical strategies, as well as the spatial and temporal factors, that may affect the effectiveness of three-point shots among young athletes competing at a high competitive level during the final phase of the 2025 U21 EuroBasket Championship. The findings showed that only specific variables, particularly ball reversals and paint touches, game outcome, and defensive contest, were significantly associated with three-point shooting success.

Initially, a low accuracy rate (28.1%) was observed, which is probably related to the young age and the critical nature of the games, combined with the high level of competition. Shooting accuracy was crucial for the winners, which is consistent with previous studies indicating that shooting accuracy has a significant impact on match outcome (Danilevicius & Kreivyte, 2019; Foteinakis & Pavlidou, 2025).

According to the results, the modern offensive tactics of many teams, which involve increased paint touches, with the ultimate goal of forcing defenders to close in and creating open shots or disorganising the defence, as well as ball reversals with similar goals, seem to create quality and effective shots. On the contrary, attacks that do not involve ball reversals or paint touches are less effective, and these findings are consistent with several studies over time (Courel et al., 2013; D'Amour et al., 2015; Karamousalidis et al., 2025c). The quality of ball movement also determines the quality of the shot.

The effect of defensive pressure was marginally statistically significant. More specifically, shots with high defensive contest showed reduced effectiveness. Interestingly, shots with medium defensive contest showed slightly higher accuracy compared to open shots which contradicts the findings of Daly- Grafstein and Bornn (2019) and Morgulev (2024). This may be due to the limited number of games, defensive tactics, or perhaps better shot adjustments. Complete freedom of shots does not always lead to optimal results. All other variables showed no significant relationship with shooting accuracy. Nevertheless, most three-point attempts were spot-up shots without dribbling, executed during organised offenses and mainly from the wings or the top of the key (Morgulev, 2024).

The winning teams took more shots from the corners, especially from the right corner, where they had the highest accuracy rates, unlike the losing teams, who took more shots from the top or long-range shots. This finding is consistent with Cotta-Ortega et al. (2025). In addition, the winning teams executed more attacks with an increased number of passes (5+), which tends to disrupt the defence and increase the diversity of the attack. Attacks involving a higher number of passes were associated with more ball reversals and paint touches, creating better shooting opportunities through de-

fensive rotations and improved spacing. Overall, the winning teams demonstrated nearly twice as many offensive sequences as the losing teams with two ball reversals and at least one paint touch (2+BR & PT), and the findings are partly consistent with the results of Karamousalidis et al. (2025a). Spot-up shots proved to be the most effective, with winning teams having a significantly higher number of such shots compared with losing teams, who, in turn, attempted more shots following handoff or dribble handoff situations. The winning teams also attempted significantly more three-point shots during the 35 minutes of the game, excluding the final 5 minutes, whereas the losing teams attempted more three-point shots in the final 5 minutes, probably due to the score differential or a specific offensive tactic. The losing teams also took more shots under high defensive contest, while the winners took more open shots or shots under medium defensive contest, although these differences were not statistically significant.

In the application of Binary Logistic Regression, the Omnibus Test showed that, overall, the categorised variables could not predict whether the shot would be successful or unsuccessful. However, two variables (Contest – BR & PT) showed a statistically significant correlation with the outcome of the shot. When the shot was taken with medium contest from the defender, the probability of it being successful increased by 53.1% compared to the other two categories (high contest or open shot). This finding suggests that moderate defensive contest may provide favourable conditions for successful shooting. Also, ball reversals and paint touches were associated with a high probability of successful shooting. These findings are also consistent with the growing emphasis on ball movement and offensive spacing reported by Foteinakis et al. (2024b).

Binary Logistic Regression for predicting the outcome of the game showed that the categorised variables could not predict win or loss. In general, the results contribute to a greater analysis and understanding of the three-point shot skill and could be useful for all coaches in determining their offensive strategy in training and in the game. This study was limited to 16 games from a single EuroBasket U21 Championship, which may restrict the generalizability of the findings. In addition, the observational design does not allow causal conclusions to be drawn. Future studies should include larger samples from different competitions and age groups.

Conclusions

The overall accuracy of three-point shots proved to be low (28.1%), which may be due either to the young age of the athletes or to the intense competitive pressure. The winners had higher three-point shooting accuracy and attempted more three-point shots during the 35 minutes of the game, excluding the final 5 minutes. In addition, bringing the ball into the paint (paint touch) and moving it from one side to the other (ball reversals) were associated with higher shooting success. Medium defensive pressure (contest of the shot) was the ideal condition for an accurate shot. Despite the importance of these offensive tactics and categorised variables, it is evident that shooting is the most difficult and complex skill, and it is difficult to predict, as is the outcome of the game. Future studies should include larger samples, multiple seasons,

and additional contextual variables such as score differential, player fatigue, and defensive schemes.

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Conflicts of interest

The authors declare no conflict of interest.

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