OFFENSIVE EFFICIENCY IN U18 WOMEN'S BASKETBALL: POINTS PER POSSESSION AT 2024 EUROPEAN CHAMPIONSHIP

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https://doi.org/10.35189/dpeskj.2026.65.1.3

Abstract. *This study aims to evaluate the offensive efficiency of six top-performing teams at the 2024 FIBA U18 Women's European Championship, using Points Per Possession (PPP) across various offensive play types. A descriptive quantitative design was applied, analysing 42 games (7 per team) and eleven standardized offensive actions: Spot-Up, Transition, Pick & Roll (Ball Handler and Roll), Isolation, Cut, Handoffs, Post-Up, Off Screen, Put Backs, and Miscellaneous Plays. Results show that the highest average PPP was recorded in Isolation plays by France (2.25), followed by Cut actions from Portugal (1.24) and Transition plays from Spain (1.18). Conversely, the lowest efficiency was observed in Miscellaneous Plays by Serbia (0.21) and Spot-Up actions by Hungary (0.70). Standard deviation values highlighted the most consistent play types: France's Spot-Up (SD = 0.13), Hungary's Put Backs (SD = 0.25), and Serbia's Ball Handler P&R (SD = 0.22). In contrast, Israel showed the most inconsistent values, particularly in Off Screen (SD = 1.21) and Put Backs (SD = 1.21), indicating reliance on situational context. The study findings provide insight into how offensive strategies are constructed and executed at the elite U18 level, offering a valuable foundation for further investigation into possession dynamics, defensive interactions, and long-term player development pathways. In conclusion, statistical consistency emerges as a critical component of offensive performance. Coaches at the developmental level should look beyond isolated high-efficiency actions and instead emphasize repeatable structures that are effective across diverse game contexts.*

Keywords*: women's basketball; U18; offense; points per possession; play types.*

Received: *21 November 2025* / **Accepted:** *27 March 2026* / **Published:** *7 April 2026*

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Introduction

In recent years, youth-level women's basketball has seen considerable development, reflecting a growing interest in the performance analysis of young teams and players. Within this context, offensive efficiency has become a key performance indicator, offering valuable insights into the strategies and tactics employed in high-level competitions (Vencúrik et al., 2022; Doroshenko et al., 2020).

Studies indicate that offensive efficiency has a significant impact on the evaluation of team strategies and overall competitiveness (Yuan, 2024; Moselhy, 2018). Furthermore, research focused on women's basketball has revealed structural differences in offensive styles between winning and losing teams, showing that winning teams demonstrate greater efficiency in

various offensive actions such as cuts and off-ball screens (Jørgensen, 2024; Selmanović, 2019; Jeličić, 2021).

Offensive efficiency in basketball is a critical metric that reflects a team's ability to score points relative to their possessions. It encompasses various factors, including player contributions, shooting styles, and team dynamics. Offensive efficiency reflects a team's ability to score relative to possessions and is influenced by multiple performance factors. Understanding these elements is essential for teams aiming to enhance their scoring capabilities and overall performance.

Different aspects of the game are studied by researchers from various countries, thereby providing a foundation for the preparation and tactical decisions made during competitions. These studies provide valuable insights into various aspects of offensive efficiency in women's basketball, which can be applied to analyze and improve performance in U18 competitions. Vázquez-Estévez et al. (2024) analyzes offensive patterns during critical moments in women's EuroBasket 2021, highlighting that fast breaks and plays executed within the first 17 seconds of possession are more successful. Additionally, plays involving fewer passes and executed by point guards or centers tend to be more effective. These findings can inform strategies to enhance offensive efficiency in youth competitions.

Charamis et al. (2023) discuss methods for estimating team possessions and categorizing offensive ratings into discrete variables, reflecting different performance levels. Such methodologies can be applied to analyze offensive efficiency in youth basketball tournaments, providing a framework for comparison across teams.

Other researchers (Koh et al., 2011) identified technical-tactical demands that differentiate successful from unsuccessful teams in elite youth Olympic female basketball. It highlights that winning teams tend to have more efficient shooting, secure more rebounds, commit fewer turnovers, and draw more fouls. They consider that these factors are essential for evaluating and improving offensive efficiency in youth basketball.

García et al. (2013) explore how different player combinations impact team performance in women's basketball, and they find that certain line-ups, such as those with three guards, tend to be more effective offensively. Understanding these dynamics may help optimize lineups and improve offensive efficiency in youth-level competitions.

The following sections examine key dimensions of offensive efficiency, including scoring concentration, the Four Factors of basketball, lineup composition, and player-performance metrics.

Scoring Concentration and Offensive Efficiency

- The relationship between scoring concentration and offensive efficiency has been studied extensively. Research indicates that teams with a higher concentration of scoring, as measured by the Gini index, tend to exhibit greater offensive efficiency (Ruiz et al., 2014).
- This finding supports the notion that teams with multiple star players can effectively increase their scoring concentration, leading to improved offensive outcomes.

The Four Factors of Basketball

- Dean Oliver's four factors - effective field goal percentage, turnover rate, offensive rebounding percentage, and free throw rate - are crucial in determining a team's offensive efficiency (Poropudas & Halme, 2023).
- Recent studies have shown that the relationship between these factors and efficiency ratings is non-linear, meaning that the impact of one factor can vary significantly depending on the values of the others.

Lineup Analysis and Player Compatibility

- Effective scoring efficiency is also influenced by the compatibility of players' styles and roles within a lineup. Research has utilized clustering methods to analyze shooting styles and offensive roles, revealing that certain combinations of players can significantly enhance scoring efficiency (Yamada & Fujii, 2024).
- Machine learning models have been employed to predict scoring outcomes based on lineup configurations, emphasizing the importance of player interactions in offensive performance.

Player Performance Metrics

- Traditional performance indices often fail to accurately capture a player's contribution to offensive efficiency. New metrics, such as the Basketball Efficiency Index (BEi) and Basketball Productivity Index (BPi), have been developed to provide a more valid assessment of player performance (Senatore et al., 2022).
- These indices reduce the emphasis on points scored, allowing for a more nuanced understanding of each player's impact on team success.

Although offensive efficiency constitutes a critical determinant of success, previous research has demonstrated that defensive performance also contributes substantially to overall team effectiveness. The interplay between offensive and defensive strategies creates a complex dynamic that teams must navigate to achieve success on the court.

The 2024 FIBA U18 Women’s European Championship, held in Matosinhos, Portugal, brought together the top national teams from across Europe, providing an appropriate context for the comparative analysis of offensive efficiency. The competition featured high-level individual and team performances, emphasizing the role of offensive organization and execution in determining game outcomes.

Differences in playing styles and offensive efficiency can be observed among European teams, influenced by factors such as player roles, tactical approaches, and physical preparation. These variations highlight the importance of analyzing offensive efficiency in order to better understand performance dynamics at the youth level.

Therefore, this study aims to conduct a comparative analysis of the offensive efficiency of teams participating in the 2024 FIBA U18 Women’s European Championship, using metrics such as points per possession and other relevant statistical indicators. The goal is to identify successful patterns and provide recommendations for improving team performance in youth-level competitions.

Methodology

Research questions

1. Which offensive play types demonstrate the highest scoring efficiency and the greatest consistency of execution across teams in the championship?
2. What is the nature and strength of the relationships between scoring efficiencies of different offensive play types as measured by the Pearson correlation coefficient?

Research design

This study employed a quantitative, descriptive research design, aiming to evaluate the offensive performance profiles of six national teams – France, Spain, Serbia, Israel, Portugal, and Hungary - participating in the 2024 FIBA U18 Women's European Championship. The objective was to assess both scoring efficiency and execution consistency across standardized offensive play types.

Data collection and variables

The data were collected from official match statistics and play-by-play reports provided by Synergy Basketball, covering seven games per team, resulting in a total of 42 games analyzed. "Points per possession" (PPP) served as the primary indicator of offensive efficiency and were analyzes for each team and offensive play type. For each team, the following eleven offensive play types were coded and analyzed:

- Cut
- Handoffs
- Isolation
- Miscellaneous Plays
- Off Screen
- Offensive Rebounds (Put Backs)
- Pick & Roll Ball Handler
- Pick & Roll Roll Man
- Post-Up
- Spot Up
- Transition.

Data analysis procedure

The dataset was organized in Microsoft Excel, where Points Per Possession (PPP), standard deviation (SD), and Pearson correlation coefficients were calculated using built-in functions. PPP was defined as the mean number of points scored per possession and was calculated using the AVERAGE function across the seven games played by each team for each offensive play type. Standard deviation (SD) was computed to quantify the variability of PPP values across games, providing an indicator of performance consistency. Pearson correlation coefficients were calculated to examine the relationships between scoring efficiencies of different offensive play types. Assumptions for Pearson correlation (linearity and normality) were visually

inspected and considered acceptable for analysis. Statistical significance was set at $p < 0.05$. Correlation coefficients were interpreted as weak ($r < 0.3$), moderate (0.3–0.5), and strong ($r > 0.5$). Results were presented in tables summarizing PPP (efficiency; Table 1) and SD (consistency; Table 2) for each team and offensive action, while correlation analysis was presented separately in Figure 1.

Results

The analysis included six national teams - France, Spain, Serbia, Israel, Portugal, and Hungary - that competed at the 2024 FIBA U18 Women's European Championship. The objective was to evaluate offensive efficiency and execution consistency across eleven standardized offensive play types, using Points Per Possession (PPP) as presented in Table 1, Standard Deviation (SD) in Table 2.

Table 1. *Points per possesion top six teams at U18 Women's European Championship*

Team	Cut	Handoffs	Isolation	Miscellaneous Plays	Off Screen	Offensive Rebounds	P&R Ball Handler	P&R Roll Man	Post-Up	Spot Up	Transition
France	1.14	0.57	2.25	0.67	0.49	1.11	0.85	0.76	0.59	0.78	1.09
Spain	1.08	0.67	0.25	0.24	1.16	0.96	0.87	1.15	0.86	0.86	1.18
Serbia	1.11	1.00	1.20	0.21	0.56	0.79	0.80	0.89	0.57	0.69	0.90
Israel	1.12	0.65	0.73	0.24	0.83	0.83	0.67	0.98	0.00	0.93	0.84
Portugal	1.24	1.00	0.60	0.28	1.00	1.10	0.66	0.45	0.98	0.72	0.89
Hungary	1.00	0.94	0.39	0.28	0.66	1.16	0.49	1.12	0.50	0.70	0.66

Table 1 presents the average Points Per Possession (PPP) across eleven offensive play types for the six best-performing teams at the 2024 FIBA U18 Women's European Championship. The findings reveal substantial differences in offensive approaches and scoring efficiency across teams.

France recorded the highest PPP in Isolation plays (2.25). High values were also observed in Offensive Rebounds (1.11) and Transition (1.09).

Spain recorded high PPP values in Transition (1.18) and P&R Roll Man actions (1.15). Spain also achieved a PPP of 1.16 in Off Screen actions.

Serbia recorded PPP values of 1.00 or higher in Handoffs and P&R Roll Man actions. Isolation (1.20) and Cut (1.11) also showed relatively high values.

Israel recorded higher PPP values in Spot Up (0.93) and Off Screen (0.83), while Post-Up actions showed a value of 0.00. Other play types presented moderate PPP values.

Portugal recorded the highest PPP in Cut actions (1.24). High values were also observed in Post-Up (0.98) and Offensive Rebounds (1.10).

Hungary recorded the highest PPP in Offensive Rebounds (1.16) and a value of 1.12 in P&R Roll Man actions. Lower PPP values were observed in Spot Up (0.70) and Transition (0.66).

Overall, the most efficient play types across teams were:

- Isolation (France – 2.25);
- Cut (Portugal – 1.24);
- Transition (Spain – 1.18);
- P&R Roll Man (Spain – 1.15; Hungary – 1.12).

The least efficient play types tended to be Miscellaneous Plays (Serbia – 0.21) and Post-Up (Israel – 0.00).

These results summarize the scoring efficiency across offensive play types and teams.

Table 2. *Standard deviation top six teams at U18 Women's European Championship*

Team	Cut	Handoffs	Isolation	Miscellaneous Plays	Off Screen	Offensive Rebounds	P&R Ball Handler	P&R Roll Man	Post-Up	Spot Up	Transition
France	0.25	0.90	0.25	0.39	0.51	0.46	0.39	0.42	0.55	0.13	0.22
Spain	0.28	0.99	0.43	0.19	0.71	0.38	0.33	0.66	0.34	0.19	0.29
Serbia	0.48	0.84	0.69	0.18	0.66	0.62	0.22	0.68	0.66	0.18	0.31
Israel	0.66	0.53	0.49	0.34	1.21	1.21	0.21	0.66	0.00	0.36	0.30
Portugal	0.57	0.89	0.68	0.26	0.58	0.84	0.37	0.56	0.30	0.26	0.20
Hungary	0.39	1.16	0.73	0.20	0.71	0.25	0.38	0.52	0.39	0.15	0.43

Table 2 presents the Standard Deviation (SD) of Points Per Possession (PPP) for each offensive play type across teams.

• France recorded low SD values in Isolation (0.25), Spot Up (0.13), and Transition (0.22).

• Spain recorded low SD values in Miscellaneous Plays (0.19) and Spot Up (0.19), while higher SD values were observed in Off Screen (0.71) and P&R Roll Man (0.66).

• Serbia recorded low SD values in P&R Ball Handler (0.22) and Spot Up (0.18), while higher SD values were observed in Post-Up (0.66) and P&R Roll Man (0.68).

• Israel recorded the highest SD values in Off Screen (1.21) and Put Backs (1.21), while Post-Up recorded values of 0.00 (SD = 0.00; PPP = 0.00).

• Portugal recorded moderate SD values across most play types, with lower values in Transition (0.20), Spot Up (0.26), and Post-Up (0.30).

• Hungary recorded the highest SD value in Handoffs (1.16), while lower SD values were observed in Put Backs (0.25) and Spot Up (0.15).

To explore the relationships among offensive performance indicators, a correlation analysis was conducted using the Points Per Possession (PPP) values associated with the standardized offensive play types. This analysis aimed to identify potential patterns of association between different offensive actions and to provide an initial understanding of how their scoring efficiency may co-vary across elite youth basketball teams.

The results are presented in Figure 1.

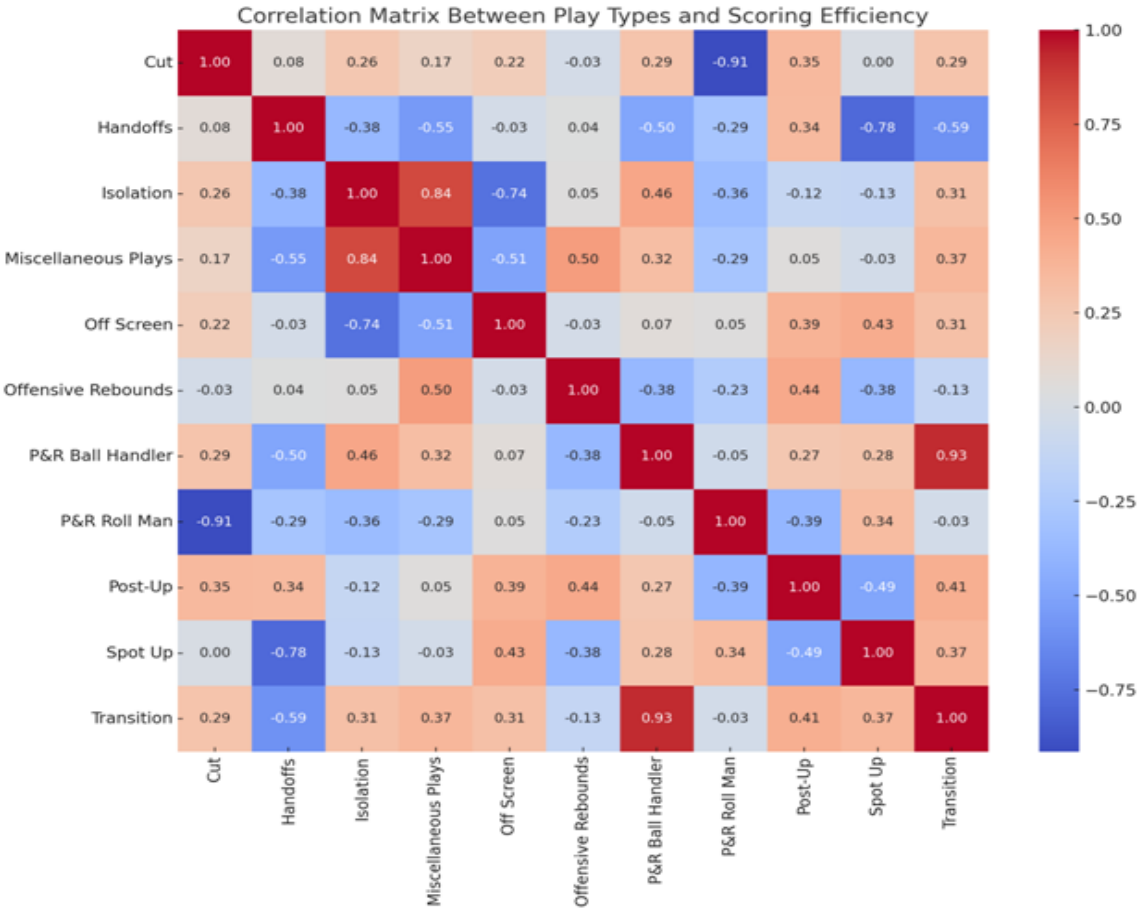

Figure 1. Correlation Matrix between play types and scoring efficiency

Figure 1 presents the correlation matrix derived from Points Per Possession (PPP) values across eleven standardized offensive play types utilized by six national teams participating in the 2024 FIBA U18 Women's European Championship. The relationships were quantified using Pearson's correlation coefficient (r).

Several patterns were identified:

• A strong positive correlation was observed between P&R Ball Handler and Transition efficiency (r = 0.93).

• Spot-Up and Transition play types showed a moderate positive correlation (r = 0.37).

• A moderate positive correlation was identified between Post-Up and Offensive Rebounds (r = 0.44). Cut and Post-Up also showed a positive correlation (r = 0.35).

• P&R Roll Man actions showed a weak negative correlation with Transition (r = –0.03) and a moderate positive correlation with Off Screen (r = 0.32).

• A strong negative correlation was observed between P&R Roll Man and Cut (r = –0.91).

• Isolation and Off Screen actions showed a strong negative correlation (r = –0.74).

• A strong negative correlation was observed between Spot-Up and Handoffs (r = –0.78).

• A strong positive correlation was identified between Isolation and Miscellaneous Plays (r = 0.84).

Discussions and Conclusion

This study examined the offensive effectiveness and execution consistency of six national teams participating in the 2024 FIBA U18 Women's European Championship, using Points Per Possession (PPP) and standard deviation (SD) across eleven offensive play types.

In response to the first question, the analysis revealed that Isolation produced the highest overall PPP, particularly for France, which recorded a value of 2.25, paired with a very low standard deviation of 0.25. This suggests a well-integrated and repeatable tactical action within the team's offensive structure. Similar findings about the high scoring efficiency of isolation plays, especially in women's basketball, have been reported by Wagner et al. (2014) Gómez et al. (2009), and Gómez et al. (2013), who highlight that isolation plays rely heavily on individual skill but can be effectively integrated into team offenses.

By comparison, Spain reported a similarly high average in P&R Roll Man (PPP = 1.15), though its standard deviation of 0.66 indicated greater variability in execution. This observation aligns with the research of Symeonidou et al. (2018) and Sampaio & Janeira (2003), who emphasize the centrality of pick-and-roll actions in creating offensive opportunities, while noting variability due to defensive countermeasures and team cohesion.

Cut actions also stood out, with Portugal recording the highest efficiency (1.24), while France combined strong performance (1.14) with relatively consistent execution across games. The critical role of cutting in women's basketball offensive success is supported by research from Courel-Ibáñez et al. (2017), who demonstrated that off-ball movements like cuts create space and facilitate high-percentage shots.

Transition offense emerged as one of the most effective offensive strategies across teams, particularly for Spain, which recorded the highest PPP value (1.18). The observed relationship between Transition and Spot-Up actions suggests that fast offensive sequences may create open perimeter shooting opportunities. These situations are typically associated with effective ball movement and defensive imbalances during fast breaks (Jeličić, 2021; Selmanović et al., 2019). Previous research further indicates that transition-based scoring opportunities, particularly perimeter shots, tend to be more efficient than those generated in set offensive structures (Triantafyllos, 2019; Garcia et al., 2013).

Conversely, Handoffs and Off Screen actions were among the most variable play types across teams, indicating inconsistent execution. Such variability is consistent with findings by Pérez-Ferreirós et al. (2019) and Dellal et al. (2012), who associate fluctuations in performance with the reliance on individual decision-making and situational factors rather than structured team play.

Across the dataset, Spot-Up shooting proved both efficient and stable. France (PPP = 0.78; SD = 0.13) and Spain (PPP = 0.86; SD = 0.19) demonstrated reliable scoring from perimeter setups. This is corroborated by studies from Cabarkapa et al. (2022), who argue that consistent perimeter shooting is a cornerstone of effective offensive schemes in female basketball.

Post-Up actions, however, showed greater variability. While Portugal had a strong performance (PPP = 0.98), Hungary's PPP dropped to 0.50, highlighting inconsistency in post execution at the youth level. This observation is supported by Anđelić et al. (2021), who found that post-up effectiveness varies widely depending on player physical development and defensive pressure in youth competitions.

Addressing the second research question, the correlation analysis revealed meaningful relationships between offensive play types. Positive associations between Offensive Rebounds, Post-Up, and Cut actions suggest that teams effective in interior scoring are also more likely to capitalize on second-chance opportunities. These findings are consistent with previous research linking offensive rebounding to scoring efficiency in the paint (Vencúrik et al., 2022; Senatore et al., 2022; Marmarinos et al., 2016).

Additionally, P&R Roll Man displayed positive correlations with Off Screen and Transition play, reflecting fluid team movement and tempo-oriented strategies (Jørgensen, 2024; Yamada & Fujii, 2024; Bruins Sports Analytics, 2024).

In contrast, Isolation actions showed weaker associations with other offensive play types, reflecting their individualized nature and limited integration within structured offensive systems. Although isolation can produce high-value scoring situations, its contribution to overall team efficiency may be less consistent compared to more structured offensive actions (Ruiz et al., 2014; Yuan, 2024).

The findings suggest the existence of two distinct offensive profiles among elite U18 women's teams. One emphasizes speed, spacing, and perimeter efficiency – typically through pick-and-roll ball handler actions and spot-up shooting. The second focuses on interior scoring through post-up actions, cuts, and offensive rebounding, reflecting a more structured and physical style of play.

The findings of the current study provide insight into how offensive strategies are constructed and executed at the elite U18 level, offering a valuable foundation for further investigation into possession dynamics, defensive interactions, and long-term player development pathways.

In conclusion, statistical consistency emerges as a critical component of offensive performance. From an applied perspective, coaches should prioritize thr development of offensive structures and demonstrate both high efficiency and consistency across diverse competitive contexts. While this research focused solely on offensive metrics, future work could incorporate defensive contributions, player-specific profiles, and contextual performance indicators to construct a more comprehensive model of team efficiency. Expanding this analytical framework may help bridge the gap between youth development and elite performance demands.

This study is subject to several limitations. First, the sample was limited to six teams from a single competition, which may restrict the generalizability of the findings. Second, the analysis relied on aggregated performance indicators and did not account for contextual variables such as game pace, opponent quality, or match status. Third, the use of secondary data sources (Synergy Basketball) may introduce classification and coding biases. Additionally, the exclusive focus on offensive metrics does not allow for a comprehensive evaluation of overall team performance. Future research should include larger samples, multiple competitions, and integrate defensive and contextual variables to provide a more complete understanding of game dynamics.

Authors' Contributions: All authors have equally contributed to this study.

Acknowledgement: The authors would like to acknowledge the use of advanced language support tools during the English translation and revision of this manuscript.

Funding: This research did not receive any external funding.

Data Availability Statement: Data can be made available upon request to the contact author.

Conflicts of Interest: The authors declare no conflicts of interest.

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