

Examining gender differences in ball reversal and paint touch usage in NCAA division I basketball games

GEORGIOS KARAMOUSALIDIS¹, MARIA AGATHOKLEOUS², IOANNIS TSIMPOURIS³, IOANNIS MICHAELIDIS⁴, PANAGIOTIS FOTEINAKIS⁵

^{1,2,3,4}School of Physical Education & Sport Science Aristotle University of Thessaloniki, Laboratory of Evaluation of Human Biological Performance, Thessaloniki, GREECE

⁵School of Physical Education & Sport Science Department of Physical Education and Sport Science, Democritus University of Thrace, GREECE

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Abstract

In recent years, there has been a growing focus on analyzing the factors that improve offensive efficiency in basketball. This study compared men's and women's NCAA Division I basketball teams by examining ball reversals, paint touches, and the use of passing and dribbling per possession. A total of 7,496 offensive possessions from 46 regular-season games during the 2023–24 season were analyzed using Sports Count STA. Statistical analysis was performed using SPSS 29. Descriptive statistics were first computed, followed by independent samples t-tests, binary logistic regression, and chi-square (χ^2) crosstabulation analysis to examine differences across variables. The significance level was set at $p < .05$. The results showed that men's teams had a higher frequency of passes per possession, while women's teams relied more on dribbling. Winning teams demonstrated more frequent passing per possession and achieved greater offensive efficiency. Notably, possessions that included at least one paint touch resulted in the highest offensive efficiency (i.e., points per possession, ppp) in both men's and women's games. Additionally, multiple ball reversals combined with an inside-focused offense were associated with increased offensive effectiveness. In conclusion, increased passing, a focus on paint touches often combined with ball reversals, minimizing one-dimensional individual actions such as excessive dribbling, and effective fast-break execution are all associated with higher offensive efficiency, regardless of gender. These findings provide valuable insights and highlight potential directions for future research on offensive tactical patterns. Future research could focus on these tactical variables in relation to specific game moments, score fluctuations, or the competitiveness of the match.

Keywords: Passing, dribbling, ball reversal, paint touch, result, points per possession.

Introduction

As basketball began to spread as a sport, this development led to the organization of official competitions. Winning gradually became a central criterion in evaluating performance, prompting the continual addition of new strategies and tactics. In the last decade, research examining the technical and tactical demands of basketball competition has grown substantially, shedding light on clear distinctions between winning and losing teams (Cotta Ortega et al., 2025). Beyond victory and the improvement of physical fitness, the objectives of basketball have come to include the cultivation of team spirit and cooperation.

After shooting, passing is often considered the second most critical skill in basketball. Its effective execution not only optimizes the flow of the game but is also essential for creating better offensive opportunities, facilitating the proper execution of offensive actions, and enhancing scoring potential (Nunes et al., 2016). Teams that excel in passing and receiving skills tend to achieve better performance, increase the number of passes per possession, generate more assists, and reduce turnovers (Gomez et al., 2013). A higher number of passes helps facilitate shot execution with reduced defensive pressure (Gómez et al., 2008; Strumbelj et al., 2013; Bismpos et al., 2022). However, the use of dribbling as a skill can either create or limit offensive opportunities, depending on the player's effectiveness and decision-making (Shea et al., 2013; Sampaio et al., 2015; Vaquera et al., 2016).

Cervone et al. (2016), in their model, stated that ball reversals i.e., transferring the ball from one side of the court to the other, crossing the imaginary line between the two baskets, open up driving lanes, reduce defensive pressure, minimize errors, and even when they do not lead directly to a score, they enhance the quality of the offensive possession. In the study by Klusemann et al. (2013) on NCAA games, tactical actions were examined—including ball reversals—and it was found that winning teams performed 18 times more ball reversals than losing teams. In the study by Cotta Ortega et al. (2025) on women's games in the Spanish national championship, one of the most competitive leagues worldwide, the relationship between the frequency and quality of ball reversals among players and their impact on offensive effectiveness was examined. The findings

indicated that rapid ball movement enhances a team's tempo and collective coordination, leading to better offensive choices and higher shooting percentages. The results revealed that ball reversal had a significant impact on possession outcomes ($p < 0.001$). Specifically, it was associated with a higher number of shot attempts and points scored, an increase in offensive rebounds, and a reduction in turnovers.

Even at the highest level of competition in the NBA, coaches consistently emphasize the importance of ball movement for a functional and more effective offense, as San Antonio Spurs head coach G. Popovich famously stated: "Either you move it, or you die" (D'Amour et al., 2015). Similar findings were observed in the study by Zhang et al. (2019), which highlighted the increasing use of ball reversals in the world's top league to create higher-quality scoring opportunities. From a defensive perspective, teams often switch on ball screens to disrupt offensive rhythm and reduce the need for complex defensive rotations (Foteinakis et al., 2024a). This strategy further underscores the significance of continuous ball movement and coordinated offensive actions to counter effectively such disruptions.

In the study by Mavridis et al. (2009), differences in interior play between European basketball and the NBA were analyzed. The conclusion was that playing inside the paint is a crucial element for high-level teams, as it can lead either to high-percentage close-range shots or to open perimeter shots. Similar conclusions were drawn by Courel et al. (2013) and Courel-Ibanez et al., (2016), who reported that offensive possessions involving a paint touch were more effective, resulting in 23.5% more points scored.

In the study by Bani et al. (2023), it was found that the way the ball enters the paint plays a significant role in the progression of the play, influencing both the flow and offensive efficiency of the team. Teams that choose to send the ball near the basket primarily target the middle-to-low post in 69.7% of the cases (Stamiris et al., 2020). The significance of the inside game was also demonstrated in the findings of Sampaio et al. (2010) and Koutsouridis et al. (2020). Miller et al. (2014) also confirmed the importance of interior play in modern basketball, emphasizing that attacking the basket is more efficient than shooting from mid-range or beyond the arc, even at the NBA level. Inside game effectiveness in basketball relies heavily on the combination of precise inside passing, dynamic receiver movements (especially cutting to the basket), and use of screens to destabilize defenses and create high-percentage scoring chances near the basket. Teams that effectively implement these tactics are more likely to score and win games (Cárdenas et al., 1999; Courel-Ibáñez et al., 2016).

In the research by Conte et al. (2018), it was shown that winning teams tended to perform a greater number of ball reversals and paint touches compared to losing teams. These variables were found to be critical in generating offensive opportunities and increasing the likelihood of scoring. Similarly, Jackson (2009) found that possessions involving paint touches were more likely to result in made shots or drawn fouls. Playing close to the basket is considered one of the most effective offensive strategies, especially when supported by excellent passing and quick, well-timed player movement. In the same study, the importance was also placed on not only getting the ball into the paint, but also on how it is moved before that (e.g., ball reversals, passing range), to apply substantial pressure on the defense.

Overall, ball reversals and paint touches appear to be critical factors in offensive success at the NCAA Division I men's level. Basketball is characterized by rapid phase transitions, demanding swift and efficient movement from defense to offense (Chen et al., 2016). Specifically, Cárdenas et al. (2015) found that fast breaks play a significant role in a team's success. Regarding offensive play style, the study by Christmann et al. (2018) confirmed the importance of fast breaks at the highest level of men's basketball (NBA), demonstrating high scoring efficiency per possession. Transition was also highly effective in Foteinakis, Pavlidou & Stavropoulos's (2024b) study during critical moments in EuroLeague games, producing 1.28 PPP.

However, there is still a lack of studies that compare ball reversals and paint touches—both individually and in combination—with fundamental skills such as passing and dribbling. The present study aimed to conduct a comparative analysis of gender and game result concerning ball reversals and paint touches, as well as the use of passing and dribbling per possession, in NCAA Division I collegiate basketball.

Definitions and Abbreviations

- **ppp**: Points per possession
- **1BR**: One ball reversal and no paint touch
- **2+BR**: Two or more ball reversals and no paint touch
- **1PT**: At least one paint touch and no ball reversal
- **1BR & 1PT**: One ball reversal and at least one paint touch
- **2BR & PT**: Two or more ball reversals and at least one paint touch
- **NO BR & NO PT**: No ball reversals and no paint touches

Materials and Methods

Sample

In the present study, a total of 7,496 offensive possessions were recorded. Specifically, 46 NCAA Division I regular season games from the 2023–24 season were analyzed, consisting of 23 men's and 23 women's collegiate basketball games. The selection of the championship was based on the highly competitive level of the participating teams, while the specific games were selected randomly.

Procedure and Variables

The analysis was conducted using two Windows 10 laptops, and the games were analyzed using the Sports Count STA software, which allows for the management and processing of game video footage. The videos were downloaded in mp4 format, and an analysis framework with variables was constructed after data digitization. Data entry into Excel spreadsheets was performed automatically.

The analyzed variables included: gender (men and women), game outcome (win or loss), ball reversal and paint touch combinations (1BR, 2+BR, 1PT, 1BR & 1PT, 2BR & PT, NO BR & NO PT), offensive play style (fast break, motion or set offense, and second chance), passes per possession, categorized as 0–2, 3–4, and 5 or more passes, dribbles per possession, categorized as 0–10, 11–20, and 21 or more dribbles per possession. Points per possession (ppp) were also calculated as an index of offensive efficiency for each team.

Statistical Analysis

Data processing and statistical analysis were conducted using SPSS v.29. Descriptive statistics were first computed, followed by independent samples t-tests, binary logistic regression, and chi-square (χ^2) crosstabulation analysis to examine differences across variables. The significance level was set at $p < .05$.

Results

An independent samples t-test was conducted to examine differences between men's and women's teams regarding the number of passes and dribbles used per possession. The results revealed statistically significant differences in the number of passes per possession. Specifically, men's teams had a higher mean number of passes ($M = 3.09$, $SD = 2.21$) than women's teams ($M = 2.99$, $SD = 1.87$), with $t = 2.144$, $p = .032$. Conversely, statistically significant differences were also found in the number of dribbles per possession, favoring the opposite group. Women's teams had a higher mean number of dribbles ($M = 9.38$, $SD = 5.96$) compared to men's teams ($M = 9.10$, $SD = 6.19$), with $t = -2.057$, $p = .040$. These findings suggest that women's teams rely more on individual ball advancement through dribbling, whereas men's teams favor passing as the primary means of initiating offensive actions.

An additional t-test was conducted to explore potential differences between winning and losing teams. The results showed statistically significant differences in the number of passes. Winning teams ($M = 3.12$, $SD = 2.13$) had a significantly higher average number of passes per offensive possession than losing teams ($M = 2.95$, $SD = 1.98$), with $t = 3.48$, $p < .001$. This suggests that increased use of passing is positively associated with winning outcomes. No statistically significant differences were found between winning and losing teams in terms of dribbling, with $t = 0.72$, $p = 0.47$.

The results of the binary logistic regression analysis indicated that the number of passes per possession is a statistically significant predictor of game outcome (win or loss). Specifically, the variable passes per possession, categorized into two levels (more than 3 passes vs. 3 or fewer passes per possession), was found to be significantly associated with the probability of winning ($\chi^2 = 7.068$, $p = .008$). The regression coefficient ($B = 0.123$) and the corresponding odds ratio ($OR = 1.131$) revealed that teams executing more than three passes per possession had a 13.1% greater likelihood of winning the game compared to teams that performed three or fewer passes per possession. This finding supports the notion that increased ball circulation and the involvement of more players in the offensive process can enhance offensive efficiency and, consequently, the probability of a successful game outcome. Conversely, when performing binary logistic regressions with game outcome as the dependent variable and dribbles per possession as the independent variable (more than 9 vs. 9 or fewer dribbles), the results indicated that the number of dribbles per possession was not a significant predictor of game outcome ($\chi^2 = .011$, $p = .997$). In total, 25.83% ($n = 1,936$) of offensive possessions included at least one paint touch (1PT) before the initiation of the offensive action; 20.89% ($n = 1,566$) corresponded to possessions that included neither a ball reversal nor a paint touch (NO BR & NO PT); while 16.93% ($n = 1,269$) involved one ball reversal and at least one paint touch (1BR & 1PT). In addition, 14.63% ($n = 1,097$) included two or more ball reversals and at least one paint touch (2+BR & PT), 13.18% ($n = 988$) involved one ball reversal only (1BR), and just 8.54% ($n = 640$) consisted of two or more ball reversals without any paint touch (2+BR).

For men's teams, the most efficient offensive possessions (19.5% of the total) required at least one paint touch (1PT), yielding 1.13 points per possession (ppp). These were followed by possessions (16.8% of the total) that included one ball reversal and at least one paint touch (1BR & 1PT), with an efficiency of 1.02 ppp. Next in effectiveness were possessions (21.2% of the total) involving two or more ball reversals and at least one paint touch (2+BR & PT), which resulted in 0.90 ppp. The least effective offensive possessions were those involving two or more ball reversals (2+BR), which comprised 13.6% of the total and produced only 0.73 ppp. Similarly low efficiency was observed in possessions (13.9% of the total) with only one ball reversal (1BR), yielding 0.78 ppp, and in possessions (15% of the total) with neither a ball reversal nor a paint touch (NO BR & NO PT), which resulted in 0.86 ppp. Women's teams exhibited a similar trend, with the most efficient possessions (32% of the total) involving at least one paint touch (1PT), which produced 1.05 ppp. These were followed by possessions (17.1% of the total) including one ball reversal and at least one paint touch (1BR & 1PT), with 0.98 ppp, and possessions (7.9% of the total) with two or more ball reversals and at least one paint touch (2+BR & PT), resulting in 0.95 ppp.

The least effective offensive choices for women occurred when there were no ball reversals or paint touches (NO BR & NO PT), comprising 26.9% of all possessions and yielding just 0.61 ppp. These were followed by possessions (12.3% of the total) with one ball reversal (1BR), yielding 0.73 ppp, and possessions (3.4% of the total) with two or more ball reversals (2+BR), resulting in 0.81 ppp. (Figure 1).

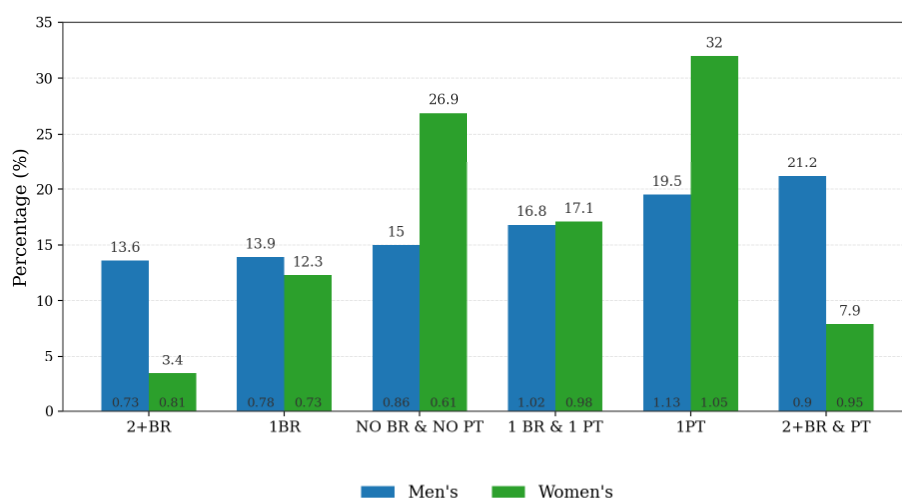


Figure 1. Percentage frequency analysis of offensive options (%) of the total. Differences in points per possession (ppp) between NCAA Division I men's and women's basketball under conditions related to ball reversal (BR) and paint touches (PT).

An independent samples t-test was conducted to examine potential differences between men and women in terms of the number of passes and dribbles executed per offensive possession. The results revealed statistically significant differences between male and female players in the average number of passes per possession. Specifically, men exhibited a higher mean number of passes ($M = 3.09$, $SD = 2.2$) compared to women ($M = 2.99$, $SD = 1.87$), $t = 2.144$, $p = .032$.

In contrast, significant differences were also found in the number of dribbles, but in the opposite direction. Women recorded a higher mean number of dribbles ($M = 9.38$, $SD = 5.96$) compared to men ($M = 9.10$, $SD = 6.19$), $t = -2.057$, $p = .040$. This suggests that women's teams rely more on individual ball advancement through dribbling, whereas men's teams tend to prefer passing when organizing their offensive actions.

Comparison of Gender (Men – Women) and Game Outcome (Win – Loss) across Variables Using Crosstabulation and Chi-Square Analysis

To examine the relationship between gender (men – women) and various variables, including ball reversal and paint touch categories (2+BR, 1BR, NO BR & NO PT, 1BR & 1PT, 1PT, 2+BR & PT), offensive style (fast break, motion or set offense, second chance), range of passes (0–2, 3–4, 5+), and range of dribbles (0–10, 11–20, 21+), a crosstabulation analysis with Chi-square distribution (χ^2) was conducted. The results revealed statistically significant gender-based differences across all variables (Table 1).

For both genders, the most frequent offensive action was the use of at least one paint touch (1PT), accounting for 26.8% of possessions. This was followed by possessions with no ball reversals or paint touches (NO BR & NO PT) at 20.9%, and those with one ball reversal and at least one paint touch (1BR & 1PT) at 16.9%. In all three of these most common categories, women demonstrated a higher frequency of execution compared to men.

Following these were possessions with two or more ball reversals and at least one paint touch (2+BR & PT) at 14.6%, one ball reversal (1BR) at 13.2%, and two or more ball reversals (2+BR) at 8.5%. Regarding the comparison between gender and offensive style, fast breaks accounted for 12% of all possessions, set offenses for 76.9%, and second-chance opportunities for 11.1%. Men executed more fast breaks (7.2%) compared to women (4.8%).

In the comparison of gender and pass range, possessions with up to two passes represented 45.5% of all cases, those with 3 to 4 passes accounted for 32.9%, and those with five or more passes for 21.6%. In the 5+ pass category, men initiated more possessions (12.2%) than women (9.4%), while the reverse was true for the other two categories.

Finally, in the analysis of gender and dribble range, possessions with up to 10 dribbles dominated, comprising 61.9% of all possessions. These were followed by possessions with 11 to 20 dribbles at 33.5%, and those with 21 or more dribbles at 4.6%.

Table 1. Crosstabulation analysis of all study variables (gender)

Gender	X ² (df)	P
BR & PT	725.91(5)	.001 *
Style of offense	38.77(2)	.001 *
Range of passing	42.12(2)	.001 *
Range of dribbling	8.79(2)	.01 *

In the comparison between the variable of game outcome (win-loss) and the aforementioned variables, statistically significant differences were observed in relation to offensive style and pass range (Table 2). Both winning and losing teams most frequently opted for at least one paint touch (IPT) as their primary offensive choice, representing 12.9% of possessions. However, losing teams exhibited a higher frequency of possessions without any ball reversal or paint touch (NO BR & NO PT) at 11.1%, compared to 9.8% among winning teams. Similarly, they executed more possessions (6.8%) involving only one ball reversal (1BR), whereas winning teams recorded 6.2% in the same category. Despite these findings, no statistically significant differences were found regarding this specific variable.

When comparing game outcome in relation to offensive style, winning teams executed more fast-break possessions (6.7%) compared to losing teams (5.3%). In terms of pass range, a notable difference emerged: winning teams used a higher proportion of possessions (11.9%) involving five or more passes compared to losing teams (9.9%). Conversely, losing teams executed more possessions involving fewer passes.

Table 2. Crosstabulation analysis of all study variables (result)

Result	X ² (df)	P
BR & PT	7.85(5)	.165
Style of offense	18.19(2)	.001 *
Range of passing	18.02(2)	.001 *
Range of dribbling	2.74(2)	.253

Discussion

Despite the limitation regarding the number of games, the present study aimed to analyze offensive possession characteristics in NCAA Division I men's and women's basketball, focusing on passing and dribbling behaviors, their relationship to game outcomes, and their integration within offensive strategies. The results underscore the tactical differences between genders and between winning and losing teams, providing important findings that extend previous research in elite-level men's and women's basketball, with broader implications for coaching practices and performance optimization. They indicate that men's teams rely more on passing skills to execute offensive actions, while women's teams tend to rely more on dribbling to develop their attacks. These differences may reflect variations in playing style, physical attributes, or coaching strategies. These findings are consistent with previous studies (Gómez et al., 2008; Cervone et al., 2016) that emphasize the importance of passing as a means to create open shots and reduce defensive pressure.

Winning teams also demonstrated significantly higher numbers of passes per possession, confirming that increased ball circulation is positively associated with offensive effectiveness. Logistic regression further reinforced this finding, revealing that teams executing more than three passes per possession had a 13.1% higher probability of winning the game (even though the model itself showed limited predictive accuracy). This result aligns with the perspectives of Jackson (2009) and D'Amour et al. (2015), who underscore the necessity of quick and continuous ball movement to achieve effective offense. In contrast, dribbling was not found to be a statistically significant predictor of game outcome, suggesting that individual offensive actions, when not integrated into a collective framework, may not lead to improved efficiency. This finding aligns with the results of Foteinakis and Pavlidou (2024), who demonstrated that end-of-game possessions in the EuroLeague were executed more efficiently through teamwork-oriented strategies, highlighting the importance of recruiting players capable of effective collaboration and cohesive team play. This finding holds particular value in the context of coaching tactics, highlighting the need to develop offensive strategies that prioritize passing over excessive and unnecessary dribbling.

Regarding offensive play distribution, the most effective possessions in both genders were those that included at least one paint touch (IPT), confirming the findings of Courel et al. (2013) on the importance of interior play. Moreover, for women, paint touches represented the most frequent offensive option, while for men, it was the second most frequent. When possessions combined ball reversals with paint touches (1BR & IPT or 2+BR & PT), they also showed high offensive efficiency, suggesting that quality preparation before entering the paint contributes to breaking down the defense and generating better scoring opportunities.

The chi-square (x²) analysis between gender and tactical indicators revealed statistically significant differences across all variables. Although women had the highest frequency of options that included paint touches, they also frequently chose options (26.9%) without paint touches, which may have negatively affected their offensive effectiveness. Conversely, men presented more complete offensive forms, with more passes and faster ball movement. Men's teams employed more passes per possession, while women's teams relied more heavily on dribbling to move the ball. This distinction may reflect differing emphases in offensive strategies,

with male teams potentially prioritizing ball circulation and player movement, while female teams may focus more on individual ball control and penetration. In terms of offensive style, as confirmed in Christmann et al. (2018), men were more likely to engage in transition situations, which could be linked to physical attributes such as athleticism and speed, or to deliberate tactical choices.

The importance of this offensive approach was also evident in the comparison between winning and losing teams, where winners exhibited a higher frequency of fast breaks, supporting previous findings (Christmann et al., 2018) that fast-paced attacks are associated with greater offensive efficiency. Furthermore, passing volume was significantly higher among winning teams, reinforcing the belief that teamwork leads to better outcomes.

The study's findings have timely value because they illuminate how passing-oriented for men's teams and dribble-oriented for women's teams possessions shape shot quality. As modern offenses rely heavily on spacing and the three-point shooting (Foteinakis & Pavlidou, 2025; Mandić et al., 2019), efficient long-range shooting demands quick ball movement to create catch-and-shoot windows before defenses recover. Acknowledging that successful men's programs already promote ball reversal and passing helps coaches benchmark best practices for perimeter offensive systems. Conversely, the evidence that women's teams rely more on controlled dribble penetration suggests an alternate pathway to collapse defenses and kick out for threes, reminding analysts not to force a one-size-fits-all model. Emphasizing purposeful ball movement, promoting paint touches, and reducing reliance on isolated dribbling can enhance offensive outcomes. Practice planning should reflect these concepts, incorporating scenarios that simulate defensive pressure while encouraging effective passing and post-entry actions. Additionally, the predictive power of passing volume, but not dribbling frequency, reinforces the need to evaluate technical execution in its tactical context.

Conclusions

In conclusion, increased use of passing, emphasis on interior play, often in combination with ball reversals, avoidance of one-dimensional individual actions (such as excessive dribbling), and execution of fast breaks are associated with higher offensive effectiveness, regardless of gender. The systematic use of ball reversals and paint touches, especially when accompanied by a high number of passes and collective collaboration, appears to lead to high-quality and efficient offensive decisions. Gender and game outcome influenced tactical preferences, and coaching emphasis on these critical tactical aspects is essential. This research is highly significant not only for basketball analysts but also for coaches, as it provides valuable guidance for offensive strategy. Future research could focus on these tactical variables in relation to specific game moments, score fluctuations, or the competitiveness of the match. It would also be valuable to explore these variables in youth developmental stages, as well as in relation to a set of defensive indicators, and to explore the qualitative aspects of passing (e.g., type, direction, timing), defensive formations, and screen usage, offering a more holistic view of possession effectiveness.

Conflicts of interest. The authors declare no conflict of interest.

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