Journal of Human Kinetics volume xxx/xxxx, x–x DOI: 10.5114/jhk/226267 x
Section IV – Psychological and Sociological Aspects of Sport and Exercise

Decision-Making in Basketball: The Interplay between Cognitive Processes and Motor Execution

by

Eran Sabag [1,*]

This study aimed to explore the relationship between dribbling behavior preceding passing and shooting patterns, and its implications for the interplay between decision-making efficiency and motor execution across four competitive basketball levels: the National Basketball Association (NBA), the EuroLeague, and European national teams, and the under-16 (U16) and under-18 (U18) European national teams. A total of 32 games (eight from each level) were analyzed to identify performance variables associated with success. Actions involving zero dribbles and sequences of three or more dribbles (3+) emerged as the most effective offensive patterns, reflecting the complementarity between rapid, intuitive decisions and deliberate, well-planned actions. Moreover, at the higher competitive levels, assists were more frequently produced following zero-dribble situations, underscoring the efficiency of quick, collective ball movement among elite players. Professional players were more likely to draw fouls during extended dribbling sequences, suggesting greater technical adaptability compared to lower competitive level players. Overall, these findings emphasize the integration of decision-making and motor execution as hallmarks of basketball expertise, highlighting the importance of developing both intuitive and deliberate decision processes in training.

Keywords*: expertise; dual-process model; performance analysis; ecological dynamics; offensive efficiency*

Introduction

Basketball is an open-skill sport (Schmidt and Wrisberg, 2008) performed in an unpredictable environment that requires players to constantly adapt their movements and decisions. It is a dynamic, fast-paced game characterized by continuous interactions between offensive and defensive players and frequent changes in ball possession. Within this complex setting, the ability to make efficient decisions, whether intuitive and immediate or deliberate and calculated, has long been central to the study of sport performance and expertise (Johnson, 2025; Raab, 2012).

Everyday decision-making may be explained through the dual-process model (Voudouri et al., 2023) which distinguishes between two systems of thinking: a logical and deliberative mode, and an intuitive and automatic mode. Kahneman (2011) referred to these as System 1, a fast, automatic, and effortless mode of thinking, and System 2, which represents slower, more deliberate, and conscious reasoning. The intuitive System 1 often relies on heuristics (cognitive shortcuts that enable automatic judgment and decision-making), which are particularly functional in environments demanding immediate action, such as competitive open-skill sports like basketball (Lidor et al., 2022; Raab, 2012).

A relevant framework in this context is the take-the-first (TTF) heuristic, one of the "fast and frugal" heuristics proposed by Gigerenzer (2004). The TTF suggests that the first option that comes to mind is often the most effective in fast-paced situations. This heuristic has been investigated in sports contexts, including simulated basketball decision-making tasks under time pressure (Hepler and Feltz, 2012), where participants familiar with basketball tended to select their

[1] *Department of Movement and Sport Sciences, Levinsky-Wingate Academic College, Netanya, Israel.*
* Correspondence: sabageran@gmail.com

CC BY

initial option, which was typically rated as the best among those considered.

In a handball study, Raab and Johnson (2007) asked participants to view freeze-frames of game situations and decide on the next course of action. Across all groups of experts, near-experts, and novices, participants typically generated two to three options for each scene. The authors concluded that higher expertise was not associated with producing more options or spending more time on decision-making, but with generating higher-quality initial options and accessing them more rapidly. In a recent study on basketball decision-making, Pinilla-Arbex et al. (2024) asked participants from different age groups (under-14, under-16, and under-18) to predict the appropriate action, a dribble, a pass, or a shot, based on static photographs of game situations. Both decision accuracy and response time improved progressively with age, indicating a developmental enhancement of perceptual-cognitive expertise in young basketball players. In addition, Zemková et al. (2025) found that visual perception was associated with game-specific performance in skilled basketball players, highlighting the importance of perceptual abilities underlying effective decision-making.

The centrality of decision-making as a defining attribute of expert athletes has been widely recognized over the past two decades (Araújo, 2016; Raab et al., 2019). In basketball decision-making research, a considerable body of work has focused on referees' judgments, highlighting the cognitive demands of officiating in fast-paced game environments (Schweizer et al., 2013). However, although referees and players share common characteristics, the decisions made by players are inherently more complex, as they require not only cognitive evaluation under time pressure but also immediate motor execution in dynamic and constantly changing game situations (Raab, 2012; Raab et al., 2019).

This ecological perspective highlights the need for offensive players to both outthink and out-execute defenders whose primary goal is to neutralize their advantage. A classic example of this cognitive-motor interplay is reflected in the long-debated "hot hand" phenomenon (Gilovich et al., 1985). Gilovich and colleagues (1985) suggested that a player's likelihood of scoring did not depend on previous successes but rather on the overall shooting percentage. However, subsequent research (Miller and Sanjurjo, 2014) argued that the failure to detect a "hot hand" statistically might stem from defensive adaptations, as defenses responded strategically by increasing pressure and thereby making subsequent shots more difficult. Many researchers (Ashford et al., 2021; Simonet et al., 2022; Voigt and Raab, 2024; Zhang et al., 2026) have noted the need for further work to develop new frameworks that would explain and predict the interplay between cognition and motion in skilled performance, with basketball representing an ideal context for such investigation.

The current study aimed to illustrate this interplay from both cognitive and technical perspectives by relating the number of dribbles preceding an action to temporal phases that represented a continuum from fully intuitive to more deliberate behavior. This was done by examining expert basketball players' cognitive-motor decision-making from an ecological dynamics perspective, using real-game situations to explore the outcomes of fast and simple versus slower and more complex decisions. Specifically, it investigated whether intuitive actions, operationalized as plays executed without prior dribbles, were associated with greater efficiency (e.g., successful shots, effective passes) compared to more deliberate actions involving dribbles, which provided players with additional time to think, react, and identify emerging opportunities. Importantly, although prior evidence supported the notion that experts made superior intuitive decisions (Johnson, 2025; Raab et al., 2019), this did not necessarily imply that players should rush their decisions during live games. Rather, the current study aimed to clarify when and how intuitive, rapid actions were advantageous, and under what conditions a more deliberate approach might be beneficial.

In basketball, a player may hold the ball for up to five seconds before initiating a dribble, and for additional five seconds after completing one or more dribbles when the ball is stationary. Notably, in the National Basketball Association (NBA), players may hold the ball longer when not closely guarded. Hence, with each additional dribble, players gain more potential time to use to their advantage. A possession involving zero dribbles may reflect a fast, automatic, and intuitive decision (e.g., an immediate catch-and-pass, touch

pass, or catch-and-shoot), whereas multiple dribbles (one or more) may indicate a more deliberate attempt to create space, assess options, or manipulate the defense.

By analyzing outcomes such as successful shots, turnovers, and passing effectiveness across varying dribble counts, this study sought to provide empirical evidence for the relationship among decision-making, execution attributes, and performance quality in an open-skill sport context. Such analysis may contribute to a broader understanding of how cognitive processing styles interact with motor behavior in dynamic sport environments and offer practical implications for coaching strategies aimed at optimizing offensive efficiency and enhancing players' decision-making processes from a cognitive-motor perspective.

Methods

Participants

This study used 32 publicly available basketball games to construct a dataset. The dataset represented four levels of expertise, with eight games from each level: NBA games (including both regular-season and playoff games), games from the EuroLeague and European national teams participating in the International Basketball Federation (FIBA) tournaments, Under-18 (U18) games from the Division A and Division B European Championships, and games from the Under-16 (U16) European Championship.

This study was conducted following the principles of the Declaration of Helsinki, and approved by the Institutional Ethics Committee of the Levinsky-Wingate Academic College, Netanya, Israel (protocol code: 11-301124; approval date: 30 November 2024).

Measures, Design, and Procedures

The study included two phases: phase 1 consisted of collecting the data into an Excel spreadsheet to document game details, including competing teams, their competitive level, game outcomes, and video links. Comparable sampling procedures and video-based data collection methods had been employed in previous basketball and team-sport performance analyses (Francis et al., 2019; Matulaitis and Bietkis, 2021).

In phase 2, similarly to the data collection procedures used in previous basketball studies (Lidor et al., 2022; Matulaitis and Bietkis, 2021), each player's action during live-ball situations was coded, including all passes (e.g., unchallenged perimeter passes and handoffs), as well as any dribbles, even when used solely to bring the ball into the frontcourt. End-of-shot-clock (24 s) and end-of-quarter situations, in which the player receiving the ball clearly lacked alternative decision options, were excluded from the coding. Such post-event coding procedures were consistent with established performance analysis templates developed for basketball (Francis et al., 2019; Lidor et al., 2022) and other team-sport contexts (Bar-Eli et al., 2007; Hughes, 2015). The coding was conducted according to two categorical variables organized in separate columns: (1) the number of dribbles performed before the action (zero, one, two, and so on); and (2) a numerical code indicating the event outcome. Table 1 presents the coded event outcomes, while Figure 1 illustrates areas in the basketball field: the area near the basket (A), marked in the data spreadsheet as "close-range", and the area outside area A but within the three-point arc (B), classified in the data spreadsheet as "mid-range".

The coding scheme was intentionally designed to reflect conceptual proximity between events and their numerical values. For example, if a successful pass was coded as 1, then an unsuccessful pass or dribble resulting in a turnover was coded as 11. A missed two-point shot was coded as 2, while its successful counterpart was represented by its multiple –4 for close-range and 8 for mid-range shots. Similarly, a missed three-point attempt was coded as 3, and its successful performance as its multiple 6. Drawn fouls were coded analogously: 22 for a foul drawn on a two-point shot attempt, 33 for a foul drawn on a three-point shot attempt, and 0 for a non-shooting foul drawn. The code 7, representing an assist, was chosen arbitrarily for convenience rather than by conceptual logic.

A dribble was defined as any intentional bounce of the ball on the floor. Accordingly, the initial contact with the ball during a steal or deflection was not coded as a dribble; instead, only the intentional dribble that followed the steal was recorded. Unsuccessful offensive plays were not coded when the ball was deflected but remained in the offensive team's possession (e.g., a deflected pass that went out of bounds). Similarly, blocked shots were not coded if the offensive team retained

Articles published in the Journal of Human Kinetics are licensed under an open access Creative Commons CC BY 4.0 license.

possession, either by recovering the ball in live play or by regaining it after it went out of bounds. For the purposes of the present study, and due to rule differences between the NBA and European competitions regarding what constitutes a legal defensive block, any shooting motion that resulted in a change of possession was coded as a turnover. Any ball that made contact with the rim or the backboard was coded as a shot attempt in all cases. Similarly, offensive plays that ended in a jump-ball situation were coded according to the same principle: if possession remained with the offensive team, the event was not recorded as a turnover; however, if the final possession was awarded to the defense, the event was coded as a turnover.

Similarly to Francis et al. (2019), to assess the reliability of the data collection, approximately three weeks after coding the final game, one game was randomly selected from each competitive level (four games in total). Each game was reanalyzed, yielding a dataset of 2,144 events, of which 120 events were not documented accurately in the follow-up coding. A chi-square goodness-of-fit test indicated a statistically significant deviation from a uniform distribution of error types ($\chi^2(6) = 70.4$, $p < 0.001$, Cramér's $V = 0.68$) suggesting a large effect size. Specifically, most errors were associated with events characterized by three or more dribbles followed by a regular pass, which accounted for approximately 40% of all inconsistencies. These discrepancies primarily reflected category-level ambiguities, such as distinguishing between seven versus eight dribbles before a pass, rather than errors that could meaningfully affect the study's outcomes. Overall, the reliability between the original and follow-up coding was 94.4%, representing an almost perfect level of consistency.

Statistical Analysis

The statistical procedures applied in this study followed established principles of observational data analysis in basketball and other ball sports (Hughes, 2015; Matulaitis and Bietkis, 2021; Paulauskas et al., 2018). Accordingly, to explore differences between types of actions and across competitive levels, quantitative analyses focused on the relationships and distributions among variables. Chi-square (χ^2) tests of independence and goodness-of-fit were used to determine whether the distribution of event outcomes (e.g., successful pass, assist, turnover, made or missed shot) differed significantly across four dribble categories (0, 1, 2, and 3+ dribbles) and among the four competitive levels (NBA, European leagues, U18, and U16). These analyses were performed both within each league and across leagues to identify potential differences associated with expertise and age. Additionally, separate χ^2 analyses were conducted to further examine performance-specific contrasts, such as made versus missed shots (for both two- and three-point shot attempts) and successful versus unsuccessful passes, providing a more detailed view of efficiency patterns.

For analyses involving mean comparisons, such as the number of dribbles preceding fouls, one-way analyses of variance (ANOVAs) were conducted to test for significant differences among competitive levels. When significant effects were identified, Tukey's Honest Significant Difference (HSD) post-hoc tests were performed to determine specific group differences.

Effect sizes were calculated and reported for all relevant analyses to provide estimates of the magnitude of the observed effects: Cramér's V for chi-square tests, partial eta-squared (η^2) for ANOVAs.

A significance level of $p < 0.05$ was adopted for all tests. Data coding was carried out in Microsoft Excel, and all statistical analyses were performed using IBM SPSS Statistics software (version 29.0).

Results

Preliminary analyses were conducted to examine whether the number of dribbles preceding each offensive action should be treated as separate categories. A χ^2 test of independence comparing event outcomes across dribble counts (0, 1, 2, 3, 4, 5, and 6+) and competitive levels revealed no significant differences among the higher dribble counts ($\chi^2(12) = 8.47$, $p = 0.75$, Cramér's $V = 0.06$), indicating a negligible effect size. In other words, plays preceded by three, four, or more, sometimes up to 15 dribbles, showed similar outcome distributions across all age groups. Therefore, for subsequent analyses, these cases were combined into a single category labeled 3+ (3 or more dribbles), alongside the distinct categories of 0, 1, and 2 dribbles.

A total of 17,361 (N) ball-related events

were documented, including plays with and without preceding dribbles. Table 2 presents the average number of ball-related events per game for each team across the different competitive levels.

A statistical comparison across the four competitive levels revealed a marginally significant difference, with F (3, 28) = 2.71, p = 0.053, partial η^2 = 0.22, representing a moderate effect size. Specifically, a higher number of average events per game was observed in the U16 games compared to the European and U18 levels, though the NBA showed the highest overall average, likely due to longer game duration.

Distribution of Successful Passes by the Number of Preceding Dribbles

The distribution of successful passes, assists, and turnovers is shown by the number of preceding dribbles in Table 3. A consistent trend was observed across all four leagues: the proportion of successful passes (excluding assists) following either 0 or 3+ dribbles was significantly higher than those following 1 or 2 dribbles. This pattern was evident in all levels of competition: NBA: $\chi^2(3) = 658.96$, $p < 0.001$; Europe: $\chi^2(3) = 783.57$, $p < 0.001$; U18: $\chi^2(3) = 676.25$, $p < 0.001$; and U16: $\chi^2(3) = 621.94$, $p < 0.001$. Across these analyses, Cramér's V values ranged between 0.22 and 0.27, indicating medium effect sizes. No significant difference was found between the 0 and 3+ dribble conditions.

The distribution of successful passes that directly resulted in points for the team (see "assists" in Table 3) varied significantly across the number of preceding dribbles in all leagues, as indicated by goodness-of-fit χ^2 tests: NBA: $\chi^2(3) = 47.78$, $p < 0.001$; Europe: $\chi^2(3) = 72.19$, $p < 0.001$; U18: $\chi^2(3) = 67.86$, $p < 0.001$; and U16: $\chi^2(3) = 54.31$, $p < 0.001$. Cramér's V values for these contrasts ranged from 0.18 to 0.25, indicating small-to-medium effect sizes.

A consistent pattern was observed whereby assists occurred predominantly after 3+ dribbles (39%–46% of all assists) and, to a lesser extent, after 0 dribbles (approximately 30% in the NBA and Europe, but only 20%–25% in the U18 and U16 games). In contrast, the proportion of assists following 1–2 dribbles remained low across all leagues (11%–20%). A direct comparison of assists made without preceding dribbles between the professional leagues (NBA and Europe) and the youth leagues (U18 and U16) revealed a statistically significant difference ($\chi^2(1) = 5.34$, p = 0.021).

Distribution of Turnovers by the Number of Preceding Dribbles

In each of the examined leagues, significant variance was observed in the distribution of turnovers according to the number of preceding dribbles, as indicated by goodness-of-fit χ^2 tests: NBA: $\chi^2(3) = 182.5$, $p < 0.001$; Europe: $\chi^2(3) = 140.6$, $p < 0.001$; U18: $\chi^2(3) = 146.7$, $p < 0.001$; and U16: $\chi^2(3) = 99.4$, $p < 0.001$. Cramér's V ranged between 0.20 and 0.26, indicating medium effect sizes. Across all leagues, and without any significant differences between them, a consistent pattern emerged: most turnovers occurred after 3+ dribbles (39%–53%), whereas relatively low rates were recorded after 0 dribbles (17%–23%), with turnovers following 1–2 dribbles occurring at similar or comparable frequencies (13%–22%).

Distribution of Made and Missed Shots by the Number of Preceding Dribbles

In the analysis of shot outcomes by the number of preceding dribbles (Tables 4 and 5), consistent patterns emerged across all four leagues. Goodness-of-fit χ^2 tests revealed significant variance in each category: three-point missed shots ($\chi^2(3) = 512.6$, $p < 0.001$), three-point made shots ($\chi^2(3) = 334.7$, $p < 0.001$, Cramér's V = 0.23–0.29), indicating medium-to-large effect sizes. In both cases, the majority of three-point attempts were taken after zero dribbles, accounting for approximately 70%–80%.

For two-point missed shots, the values of $\chi^2(3) = 289.4$, $p < 0.001$, Cramér's $V = 0.21$, indicated a medium effect size, and the missed shots were not coded separately as "close-range" and "mid-range", as it was done for the made shots, but rather grouped together as a single category.

Regarding made shots, distinct tendencies were observed: for mid-range made shots ($\chi^2(3) = 103.5$, $p < 0.001$, Cramér's $V = 0.19$), attempts were dominated by shots taken after three or more dribbles (41%–58%), while 0–2 dribbles appeared much less frequently. In contrast, for close-range made shots ($\chi^2(3) = 276.2$, $p < 0.001$, Cramér's V = 0.25), a dual pattern was evident, approximately 40% of the shots were taken without any dribbles, alongside a lower but still substantial proportion

Articles published in the Journal of Human Kinetics are licensed under an open access Creative Commons CC BY 4.0 license.

(approximately 25%–35%) made after three or more dribbles. Shot attempts following one or two dribbles contributed relatively little to the total distribution.

Dribble Count Prior to Drawn Fouls

Out of 17,361 recorded game events (plays with the ball), a total of 825 foul events were identified and included in the analysis, comprising 403 non-shooting fouls, 403 two-point shooting fouls, and 19 three-point shooting fouls. The distribution of fouls across all considered levels was relatively balanced, with 203 from the NBA, 207 from Europe, 186 from the U18 group, and 229 from the U16 group (Table 6).

A one-way ANOVA was conducted to examine differences in the number of dribbles preceding foul events across the four competitive levels. The analysis, which included all foul types, revealed a significant main effect of the level ($F(3, 740) = 23.99$, $p < 0.001$, partial $\eta^2 = 0.09$), indicating differences across levels of play in the average number of dribbles before a foul.

Post-hoc comparisons using the Tukey's HSD test showed that NBA players performed significantly more dribbles prior to drawing fouls than players in the EuroLeague/European ($p < 0.001$), U18 ($p < 0.001$), and U16 ($p = 0.027$) teams. EuroLeague/European players did not differ significantly from U18 players, but they performed more dribbles on average compared to U16 players ($p < 0.001$).

Further analysis by the foul type revealed a similar trend for both non-shooting fouls and two-point shooting fouls, whereby higher competitive levels were associated with longer dribbling sequences. In contrast, three-point shooting fouls were typically preceded by few or no dribbles across all competitive levels, reflecting their characteristic as quick, perimeter-oriented actions.

Table 1. Coded event outcomes and their numerical representations, as applied in the current study.

Event outcome	Numerical code assigned to each event
Successful pass (excluding assists)	1
Turnover from any ball action (dribble, pass, or offensive foul)	11
Missed two-point shot attempt	2
Missed three-point shot attempt	3
Made two-point shot (close-range)	4
Made two-point shot (mid-range)	8
Made three-point shot	6
Non-shooting foul drawn	0
Foul drawn on a two-point shot attempt	22
Foul drawn on a three-point shot attempt	33
Assist	7

For made two-point shots, a distinction was made between two distance ranges. However, this distinction was not applied to missed shots, as all missed two-point shots were documented together. For made shots, the close-range category referred to successful field goals scored from inside the paint, that is, from the area near the basket (designated as Area A in Figure 1). Shots made from outside this area but within the three-point arc were classified as mid-range shots (Area B in Figure 1)

Table 2. Average number of ball-related events per team per game across the four competitive levels.

	U16	U18	Europe	NBA
Average ball-action events per team per game	280	247	242	301

NBA = National Basketball Association; Europe = EuroLeague and European national teams; U16/18 = Under 16/18 European national teams

Table 3. Distribution of successful passes, assists, and turnovers by the number of preceding dribbles across four competitive levels.

		Number of dribbles preceding the action (with percentages)				
League	Play outcome	0	1	2	3+	All
NBA	Turnover	44 (18.80%)	31 (13.20%)	35 (15.00%)	124 (53.00%)	234 (100%)
NBA	Assist	94 (29.00%)	63 (19.40%)	39 (12.00%)	128 (39.50%)	324 (100%)
NBA	Successful pass	1042 (38.10%)	384 (14.10%)	253 (9.30%)	1053 (38.50%)	2732 (100%)
Europe	Turnover	38 (22.80%)	23 (13.80%)	27 (16.20%)	79 (47.30%)	167 (100%)
Europe	Assist	72 (30.90%)	26 (11.20%)	32 (13.70%)	103 (44.20%)	233 (100%)
Europe	Successful pass	832 (36.00%)	300 (13.00%)	195 (8.40%)	983 (42.60%)	2310 (100%)
U18	Turnover	31 (17.00%)	34 (18.70%)	30 (16.50%)	87 (47.80%)	182 (100%)
U18	Assist	42 (20.50%)	41 (20.00%)	28 (13.70%)	94 (45.90%)	205 (100%)
U18	Successful pass	943 (36.60%)	412 (16.00%)	229 (8.90%)	990 (38.50%)	2574 (100%)
U16	Turnover	50 (19.70%)	56 (22.00%)	47 (18.50%)	101 (39.80%)	254 (100%)
U16	Assist	57 (25.30%)	29 (12.90%)	36 (16.00%)	103 (45.80%)	225 (100%)
U16	Successful pass	1047 (37.20%)	427 (15.20%)	324 (11.50%)	1019 (36.20%)	2817 (100%)

Abbreviations as in Table 2

Table 4. Distribution of made shots from different distances by the number of dribbles preceding the shot, divided across the four studied leagues.

		Number of dribbles preceding the shot (with percentages)				
League	Shot outcome	0	1	2	3+	All
NBA	Made three-point shot	162 (75.00%)	13 (6.00%)	5 (2.30%)	36 (16.70%)	216 (100%)
NBA	Made close-range two-point shot	118 (40.30%)	51 (17.40%)	48 (16.40%)	76 (25.90%)	293 (100%)
NBA	Made mid-range two-point shot	17 (18.90%)	13 (14.40%)	14 (15.60%)	46 (51.10%)	90 (100%)
Europe	Made three-point shot	105 (70.90%)	8 (5.40%)	6 (4.10%)	29 (19.60%)	148 (100%)
Europe	Made close-range two-point shot	134 (46.90%)	28 (9.80%)	37 (12.90%)	87 (30.40%)	286 (100%)
Europe	Made mid-range two-point shot	8 (23.50%)	5 (14.70%)	6 (17.60%)	15 (44.10%)	34 (100%)
U18	Made three-point shot	93 (71.50%)	14 (10.80%)	2 (1.50%)	21 (16.20%)	130 (100.0%)
U18	Made close-range two-point shot	127 (43.30%)	35 (11.90%)	29 (9.90%)	102 (34.80%)	293 (100%)
U18	Made mid-range two-point shot	6 (15.80%)	3 (7.90%)	7 (18.40%)	22 (57.90%)	38 (100%)
U16	Made three-point shot	63 (70.80%)	8 (9.00%)	7 (7.90%)	11 (12.40%)	89 (100%)
U16	Made close-range two-point shot	116 (40.70%)	51 (17.90%)	42 (14.70%)	76 (26.70%)	285 (100%)
U16	Made mid-range two-point shot	10 (29.40%)	8 (23.50%)	2 (5.90%)	14 (41.20%)	34 (100%)

Abbreviations as in Table 2

Articles published in the Journal of Human Kinetics are licensed under an open access Creative Commons CC BY 4.0 license.

Table 5. Distribution of two- and three-point missed shots by the number of preceding dribbles, divided across the four studied leagues.

		Number of dribbles preceding the shot (with percentages)				
League	Shot outcome	0	1	2	3+	All
NBA	Missed three-point shot	272 (70.30%)	35 (9.00%)	11 (2.80%)	69 (17.80%)	387 (100%)
NBA	Missed two-point shot	65 (19.60%)	52 (15.70%)	54 (16.30%)	161 (48.50%)	332 (100%)
Europe	Missed three-point shot	173 (64.60%)	28 (10.40%)	12 (4.50%)	55 (20.50%)	268 (100%)
Europe	Missed two-point shot	65 (30.00%)	21 (9.70%)	44 (20.30%)	87 (40.10%)	217 (100%)
U18	Missed three-point shot	207 (71.90%)	18 (6.20%)	11 (3.80%)	52 (18.10%)	288 (100%)
U18	Missed two-point shot	68 (22.40%)	55 (18.20%)	44 (14.50%)	136 (44.90%)	303 (100%)
U16	Missed three-point shot	199 (78.00%)	12 (4.70%)	11 (4.30%)	33 (12.90%)	255 (100%)
U16	Missed two-point shot	79 (27.10%)	57 (19.50%)	57 (19.50%)	99 (33.90%)	292 (100%)

Abbreviations as in Table 2

Table 6. Distribution of drawn fouls by the number of preceding dribbles, the foul type (non-shooting, two-point, and three-point shooting fouls), and the competitive level.

		Number of dribbles preceding the action (with percentages)				
League	Foul type	0	1	2	3+	All
NBA	Non-shooting fouls	14 (17.70%)	5 (6.30%)	12 (15.20%)	48 (60.80%)	79 (100%)
NBA	Two-point shooting fouls	27 (22.70%)	20 (16.80%)	22 (18.50%)	50 (42.00%)	119 (100%)
NBA	Three-point shooting fouls	3 (60.00%)	0 (0.00%)	0 (0.00%)	2 (40.00%)	5 (100%)
Europe	Non-shooting fouls	31 (24.00%)	20 (15.50%)	19 (14.70%)	59 (45.70%)	129 (100%)
Europe	Two-point shooting fouls	22 (28.90%)	8 (10.50%)	10 (13.20%)	36 (47.40%)	76 (100%)
Europe	Three-point shooting fouls	0 (0.00%)	1 (50.00%)	0 (0.00%)	1 (50.00%)	2 (100%)
U18	Non-shooting fouls	3 (3.20%)	18 (19.40%)	14 (15.10%)	58 (62.40%)	93 (100%)
U18	Two-point shooting fouls	15 (16.70%)	13 (14.40%)	21 (23.30%)	41 (45.60%)	90 (100%)
U18	Three-point shooting fouls	1 (33.30%)	2 (66.70%)	0 (0.00%)	0 (0.00%)	3 (100%)
U16	Non-shooting fouls	9 (8.80%)	8 (7.80%)	25 (24.50%)	60 (58.80%)	102 (100%)
U16	Two-point shooting fouls	38 (32.20%)	21 (17.80%)	21 (17.80%)	38 (32.20%)	118 (100%)
U16	Three-point shooting fouls	1 (11.10%)	1 (11.10%)	3 (33.30%)	4 (44.40%)	9 (100%)

Dribble count was analyzed as a capped variable (0–3, where 3 represents three or more dribbles)

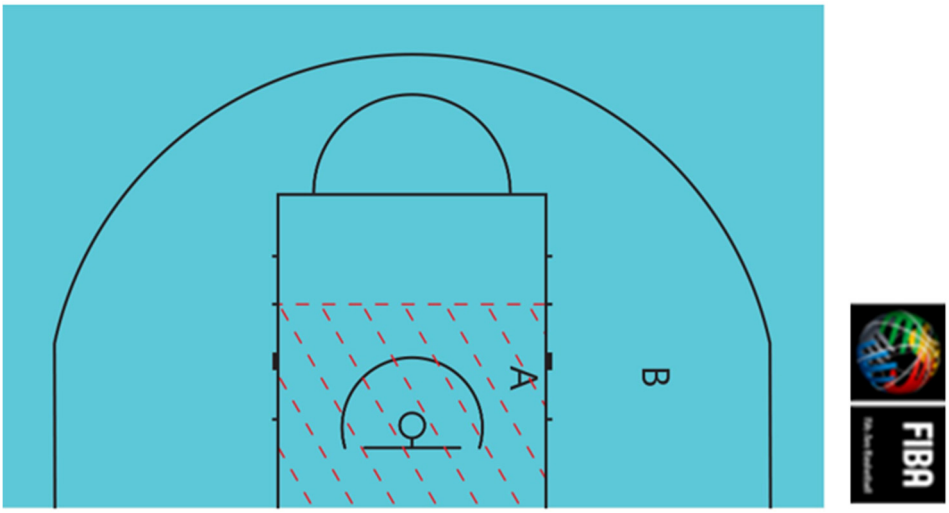


Figure 1. An illustration of two areas in the basketball field: the area near the basket (A), marked in the data spreadsheet as "close-range", and the area outside area A but within the three-point arc (B), classified in the data spreadsheet as "mid-range".

The image is adapted from the FIBA Official Basketball Rules (2024). Additional markings (A-close-range area; B-mid-range area) were added by the author to distinguish between the two court areas

Discussion

In basketball, prior research has identified assists, along with rebounds and shooting efficiency, as key factors distinguishing winning from losing teams (Canuto and de Almeida, 2022; de Almeida et al., 2022). In the present study, we found that assists most often followed either no dribbles or three or more dribbles, with only few occurring after one or two dribbles.

It appears that quick decisions made without any preceding dribbles provide a clear advantage over one- or two-dribble situations, which tend to reduce the element of surprise and delay execution without offering genuine opportunities for penetration or creating space. Conversely, when the number of dribbles increases to three or more before the action, it indicates that players have more time not only to explore available options, but also to create driving lanes, draw defensive help to free teammates, and allow off-ball players to reposition into open spaces.

From the perspective of the two cognitive systems described by Kahneman (2011), this represents an intriguing interplay: both extremes offer distinct advantages, and players effectively utilize each, particularly at the professional level. On the one hand, quick, intuitive passing and assist decisions occur without dribbling; on the other hand, longer sequences involving three or more dribbles provide offensive players with more time for deliberate, well-reasoned decision-making.

The finding that adult players, more than youth players, demonstrated a greater ability to execute assists without dribbling, underscores quick passing as a core component of expertise, which is also a function of both individual skill and synchronized team movement. Basketball players should strive to refine and master both of these abilities as they advance to higher levels of competition. These results align with previous research highlighting the advantage of rapid and accurate decision-making among highly skilled players (Gou and Li, 2023; Guo and Wang, 2025). Likewise, prior studies comparing EuroLeague players with European NBA players reported no significant differences in assists and turnovers between these top-tier groups (Paulauskas et al., 2018).

When examining the turnover data, a clear

Articles published in the Journal of Human Kinetics are licensed under an open access Creative Commons CC BY 4.0 license.

pattern emerged: the more players dribbled, the higher the number of turnovers. Thus, alongside the effectiveness of using three or more dribbles, it is no less important to teach players to execute both shots and passes without dribbling. Notably, although longer dribbling sequences resulted in more turnovers across all groups, NBA players demonstrated a greater tendency to draw fouls during these plays, which may reflect a higher level of technical adaptability.

When analyzing shot attempts from different distances, consistent patterns emerged across all leagues. Most successful close-range shots occurred either without any dribble, typically following a quick assist, or after three or more dribbles, reflecting individual drives to the basket. These findings align with prior research showing that the most efficient offensive actions, such as quick cuts, transition plays, and pick-and-rolls, combine rapid execution with occasional extended individual efforts (Matulaitis and Bietkis, 2021). Together, these results illustrate two complementary pathways to offensive success in basketball: collective, quick-decision playmaking and deliberate, individual execution.

The analysis of dribble counts preceding three-point and mid-range shot attempts reflects key trends in modern basketball. Over the past decade, long-range shooting has surged, driven by teams such as the Golden State Warriors, whose success with Stephen Curry and Klay Thompson redefined offensive play. This evolution has forced defenses to tighten perimeter coverage, increasing the prevalence of catch-and-shoot three-pointers (zero dribbles). In contrast, mid-range shots are typically preceded by 3+ dribbles, often as a response to defensive pressure that limits perimeter options and compels players to create space for pull-up jumpers.

Overall, these results highlight the dynamic interplay between decision-making and motor execution in expert performance. The ability to act swiftly when needed, while maintaining control in critical moments, allows players to generate high-value plays, create scoring opportunities, and draw fouls under pressure, hallmarks of elite-level expertise.

From an ecological dynamics perspective, these findings align with the framework proposed by Araújo (2016), which conceptualizes team sports as complex dynamic systems. Within this approach, players' behavior and performance emerge from continuous interactions among individual constraints, environmental affordances, and task demands. Therefore, rather than relying solely on static or isolated "box-score" indicators, basketball performance should be examined through dynamic, context-dependent statistics that capture how decisions and actions co-evolve in real time.

Conclusions

This study extends previous research on rapid decision-making by underlining the importance and potential benefits of longer, dribble-based decisions. Unlike the study by Lidor et al. (2022), which focused on shooting and accounted for defensive positioning, the present study did not examine defender proximity to the decision-maker. Similarly, the present study did not account for whether possessions occurred in full-court or half-court settings, which have been shown to influence decision-making and technical-tactical performance in basketball (de Souza et al., 2025). It is also acknowledged that no-dribble decisions are sometimes technically easier to execute. The findings demonstrate that a higher number of dribbles can, in certain situations, have a markedly positive impact on the outcome of the play. Hence, training should also develop players' ability to adapt to longer dribbling sequences and to recognize when these can be used most effectively. Fast decision-making processes, such as catch-and-pass or catch-and-shoot actions from nearly any distance, represent essential skills that coaches should prioritize to enhance players' performance. Therefore, training programs should integrate both rapid, instinctive actions and more deliberate, prolonged motor sequences. Finally, when it comes to three-point shots, developing a quick-release technique from beyond the arc is crucial, a skill that can also generate subsequent mid-range opportunities, typically after dribbling rather than through catch-and-shoot situations.

ORCID iD:

Eran Sabag: https://orcid.org/0009-0005-4736-8405

Funding Information: This research received no external funding.

Institutional Review Board Statement: This study was conducted following the principles of the Declaration of Helsinki, and approved by the Institutional Ethics Committee of the Levinsky-Wingate Academic College, Netanya, Israel (protocol code: 11-301124; approval date: 30 November 2024).

Informed Consent: Not applicable.

Conflicts of Interest: The author declares no conflict of interest.

Acknowledgements: The author would like to thank Dr. Dana Savulescu for scientific editing support.

Received: 13 November 2025

Accepted: 22 July 2026

References

Araújo, D. (2016). Variables characterising performance and performance indicators in team sports. In *Performance Analysis in Team Sports* (pp. 52–66). Routledge. https://doi.org/10.4324/9781315739687

Ashford, M., Abraham, A., & Poolton, J. (2021). Understanding a player's decision-making process in team sports: a systematic review of empirical evidence. *Sports*, *9*(5), 65. https://doi.org/10.3390/sports9050065

Bar-Eli, M., Azar, O. H., Ritov, I., Keidar-Levin, Y., & Schein, G. (2007). Action bias among elite soccer goalkeepers: The case of penalty kicks. *Journal of Economic Psychology*, *28*(5), 606–621. https://doi.org/10.1016/j.joep.2006.12.001

Canuto, S. C., & de Almeida, M. B. (2022). Determinants of basketball match outcome based on game-related statistics: A systematic review and meta-analysis. *European Journal of Human Movement*, *48*, 4–20. https://doi.org/10.21134/eurjhm.2022.48.2

de Almeida, M. B., Canuto, S. C., Lima, G. S., & Oliveira, W. G. (2022). Performance analysis in elite basketball differentiating game outcome and gender. *European Journal of Human Movement*, *49*, 105–117. https://doi.org/10.21134/eurjhm.2022.49.7

de Souza, W. J. F., Clemente, F., Aguiar, S. D. S., Pittner, L., Araújo, E. M., Rocha, M. D. S., Silva, F. E. L., Silva, A. F., & Castro, H. D. O. (2025). Exploring the Effects of Players' Numbers and Court Size on Tactical-Technical Performance Analysis of Novice Players in Basketball Small-Sided Games. *Journal of Human Kinetics*, *97*, 127–140. https://doi.org/10.5114/jhk/190400

Francis, J., Owen, A., & Peters, D. M. (2019). A new reliable performance analysis template for quantifying action variables in elite men's wheelchair basketball. *Frontiers in Psychology*, *10*, 16. https://doi.org/10.3389/fpsyg.2019.00016

Gigerenzer, G. (2004). Fast and frugal heuristics: The tools of bounded rationality. In D. J. Koehler & N. Harvey (Eds.), *Blackwell handbook of judgment and decision making* (pp. 62–88). Blackwell Publishing. https://doi.org/10.1002/9780470752937.ch4

Gilovich, T., Vallone, R., & Tversky, A. (1985). The hot hand in basketball: On the misperception of random sequences. *Cognitive Psychology*, *17*(3), 295–314. https://doi.org/10.1016/0010-0285(85)90010-6

Gou, Q., & Li, S. (2023). Study on the correlation between basketball players' multiple-object tracking ability and sports decision-making. *PLoS One*, *18*(4), e0283965. https://doi.org/10.1371/journal.pone.0283965

Guo, Z., & Wang, Q. (2025). The impact of time pressure on decision-making and visual search characteristics in basketball players. *Frontiers in Psychology*, *16*, 1660732. https://doi.org/10.3389/fpsyg.2025.1660732

Hepler, T. J., & Feltz, D. L. (2012). Take the first heuristic, self-efficacy, and decision-making in sport. *Journal of Experimental Psychology: Applied*, *18*(2), 154–161. https://doi.org/10.1037/a0027807

Articles published in the Journal of Human Kinetics are licensed under an open access Creative Commons CC BY 4.0 license.

Hughes, M. (2015). Analysis of notation data: reliability. In *Essentials of Performance Analysis in Sport* (pp. 169–179). Routledge. https://doi.org/10.4324/9781315776743

Johnson, J. G. (2025). Decision making in sports. *Psychology of Sport and Exercise*, *80*, 102919. https://doi.org/10.1016/j.psychsport.2025.102919

Kahneman, D. (2011). *Thinking, Fast and Slow*. Farrar, Straus and Giroux. https://www.penguin.co.uk/books/56314/thinking-fast-and-slow-by-kahneman-daniel/9780141033570

Lidor, R., Lipshits, L., Arnon, M., & Bar-Eli, M. (2022). "Don't think, just shoot"–The paradox of shooting three-point shots in basketball. *International Journal of Sport and Exercise Psychology*, *20*(6), 1523–1541. https://doi.org/10.1080/1612197X.2021.1987957

Matulaitis, K., & Bietkis, T. (2021). Prediction of offensive possession ends in elite basketball teams. *International Journal of Environmental Research and Public Health*, *18*(3), 1083. https://doi.org/10.3390/ijerph18031083

Miller, J. B., & Sanjurjo, A. (2014). *A cold shower for the hot hand fallacy: Robust Evidence that Belief in the Hot Hand is Justified*. IGIER working paper No. 518. https://doi.org/10.2139/ssrn.2450479

Paulauskas, R., Masiulis, N., Vaquera, A., Figueira, B., & Sampaio, J. (2018). Basketball game-related statistics that discriminate between European players competing in the NBA and in the Euroleague. *Journal of Human Kinetics*, *65*, 225. https://doi.org/10.2478/hukin-2018-0030

Pinilla-Arbex, J., Pérez-Tejero, J., Van Biesen, D., Polo, I., Janssens, L., & Vanlandewijck, Y. (2024). Cognitive development and decision making in basketball: a comparison between male players with and without intellectual impairment and across different age-groups. *Journal of Human Kinetics*, *93*, 231–243. https://doi.org/10.5114/jhk/185430

Raab, M. (2012). Simple heuristics in sports. *International Review of Sport and Exercise Psychology*, *5*(2), 104–120. https://doi.org/10.1080/1750984X.2012.654810

Raab, M., Bar-Eli, M., Plessner, H., & Araújo, D. (2019). The past, present and future of research on judgment and decision making in sport. *Psychology of Sport and Exercise*, *42*, 25–32. https://doi.org/10.1016/j.psychsport.2018.10.004

Raab, M., & Johnson, J. G. (2007). Expertise-based differences in search and option-generation strategies. *Journal of Experimental Psychology: Applied*, *13*(3), 158–170. https://doi.org/10.1037/1076-898X.13.3.158

Schmidt, R. A., & Wrisberg, C. A. (2008). *Motor learning and performance: A situation-based learning approach*. Human Kinetics.

Schweizer, G., Plessner, H., & Brand, R. (2013). Establishing standards for basketball elite referees' decisions. *Journal of Applied Sport Psychology*, *25*(3), 370–375. https://doi.org/10.1080/10413200.2012.741090

Simonet, M., Ruggeri, P., Sallard, E., & Barral, J. (2022). The field of expertise modulates the time course of neural processes associated with inhibitory control in a sport decision-making task. *Scientific Reports*, *12*(1), 7657. https://doi.org/10.1038/s41598-022-11580-3

Voigt, L., & Raab, M. (2024). Mind in action: the interplay of cognition and action in skilled performance. *International Journal of Sport and Exercise Psychology*, *22*(2), 307–313. https://doi.org/10.1080/1612197X.2023.2289328

Voudouri, A., Bago, B., Borst, G., & De Neys, W. (2023). Reasoning and cognitive control, fast and slow. *Judgment and Decision Making*, *18*, e33. https://doi.org/10.1017/jdm.2023.32

Zemková, E., Horníková, H., Skala, F., & Argaj, G. (2025). Association of Game-Specific Performance of Young Skilled Basketball Players with Sensorimotor Factors of Agility Skills. *Journal of Human Kinetics*, *96*(Spec Issue), 213–223. https://doi.org/10.5114/jhk/202260

Zhang, K., Chan, W. S., Lau, H. S., Huang, D. & Chow, D. H. K. (2026). The Crossover Effects of Visuomotor Task Complexity in Training Reactive Agility of Ball Sports Athletes. *Journal of Human Kinetics*, *100*, 5–15. https://doi.org/10.5114/jhk/210502