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THE EFFECT OF FULL COURT SKILL AND DRILL TRAINING ON BASKETBALL PLAYERS SHOOTING ACCURACY UNDER FATIGUE CONDITIONS

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Abstract
Basketball shooting performance frequently declines under fatigue conditions, yet evidence regarding training approaches specifically designed to improve shooting accuracy in fatigue-related situations remains limited. While previous studies have examined the acute effects of fatigue on shooting performance, fewer studies have investigated training interventions that repeatedly expose players to game-like fatigue during shooting execution. This study aimed to determine the effect of full court skill and drill training on basketball players' shooting accuracy under fatigue conditions. The study used a pre-experimental one-group pretest–posttest design involving 15 players from Momentum Basketball Club selected through total sampling. The intervention was conducted for three weeks with a frequency of three sessions per week. Each session integrated dribbling, passing, transition movement, sprinting, and shooting drills across the full court to simulate game-like fatigue. Shooting accuracy was measured before and after the intervention using a shooting test performed after an intensive activity protocol. Data were analyzed using IBM SPSS Statistics through descriptive statistics, the Shapiro–Wilk normality test, paired-samples t-test, Wilcoxon signed-rank test, 95% confidence interval estimation, and Cohen's dz effect size. The results showed that the mean pretest score increased from 3.33 to 6.67 in the posttest, with a mean gain of 3.33 points. The paired-samples t-test indicated a significant improvement, $t(14) = 20.92$, $p < 0.001$, with a very large effect size (Cohen's $dz = 5.40$). The Wilcoxon signed-rank test confirmed the same conclusion, $W = 0.00$, $p < 0.001$. These findings indicate that full court skill and drill training is effective for improving shooting accuracy when players perform under fatigue. The study contributes practically to the design of basketball training programs that combine technical execution, physical load, and match-specific pressure.
Keywords: basketball; fatigue; full court skill and drill; shooting accuracy; SPSS; training.

INTRODUCTION

Basketball is a team sport characterized by intermittent high-intensity actions, rapid transitions, repeated accelerations and decelerations, technical execution, tactical decision-making, and sustained concentration across the duration of a match. Players are required to perform dribbling, passing, cutting, defensive movement, and shooting while responding to opponents, teammates, space, and time pressure. Contemporary evidence shows that basketball match play

imposes substantial internal and external loads, and these loads vary by playing level, playing position, tactical role, and training context (Stojanović et al., 2018; Petway et al., 2020; Russell et al., 2021; Power et al., 2022). Consequently, basketball performance cannot be understood only as the mastery of isolated technical skills, because the same skill must be reproduced repeatedly under physiological stress, perceptual pressure, and decision-making demands.

Shooting is one of the most decisive skills in basketball because scoring success is directly influenced by the player's ability to convert shooting opportunities into points. However, shooting is not merely a mechanical movement. It requires coordination between lower-limb force production, trunk stability, upper-limb control, release timing, visual attention, rhythm, and psychological readiness. Recent studies emphasize that shooting performance can be affected by fatigue, sleep restriction, mental fatigue, attentional focus, visual fixation behavior, and changes in kinematic parameters (Cao et al., 2021; Filipas et al., 2021; Daub et al., 2023; Bourdas et al., 2024; Daub et al., 2024; Li et al., 2025; Zhang et al., 2026). This evidence indicates that shooting accuracy should be evaluated not only in a fresh condition but also in game-like situations where the athlete is physically and mentally challenged.

The reason this study is necessary emerges from a practical problem commonly observed in basketball training and competition. Many players are able to shoot accurately during static drills or low-intensity practice, yet their accuracy declines when the shot is attempted after sprinting, transition play, repeated movement, and cumulative fatigue. This discrepancy between practice performance and match performance is critical because important scoring opportunities often occur late in possessions, after fast breaks, or in the final phases of the game when fatigue is high. A systematic review and meta-analysis has shown that moderate and severe fatigue can significantly alter basketball shooting accuracy, highlighting the need for training models that specifically prepare players to execute shooting skills under fatigue (Li et al., 2025).

The urgency of the present research is reinforced by the development of modern basketball training approaches that integrate technical skill, physical conditioning, and tactical decision-making. Small-sided games, game-based drills, high-intensity interval training, and skill-based conditioning have been widely discussed as methods for improving physical and technical adaptations in basketball players (Clemente, 2016; Delextrat et al., 2018; Sansone et al., 2020; Arslan et al., 2022; Hassan et al., 2023; Li et al., 2024; Cao et al., 2025; Zhang et al., 2025). Nevertheless, coaches still need more applied evidence on how full-court integrated drills influence specific technical outcomes, particularly shooting accuracy under fatigue. Such evidence is relevant for clubs and schools that require practical, time-efficient, and field-based training programs.

Full court skill and drill training is a training model that combines basic basketball skills with

moderate-to-high intensity activity across the entire court. In this model, players repeatedly perform dribbling, passing, sprinting, transition movement, cutting, finishing, and shooting within a continuous sequence. The training stimulus therefore resembles important demands of actual basketball performance: players must control the ball while moving at speed, maintain body control, make technical decisions, and shoot after experiencing fatigue. From the perspective of training specificity, a drill that approximates the movement pattern, intensity, and contextual pressure of competition is expected to generate more transferable adaptations than isolated technical repetition.

Previous research has shown that game-based and small-sided training can enhance physiological responses, technical involvement, enjoyment, tactical behavior, neuromuscular parameters, and training engagement (Clemente et al., 2021; O'Grady et al., 2020; Sansone et al., 2020; Poureghbali et al., 2020; Arslan et al., 2022; Zeng et al., 2023; Cao et al., 2024). However, most studies focus on small-sided games, general technical skills, training load, or physical fitness indicators. Studies directly examining shooting accuracy under fatigue after a structured full-court skill-and-drill intervention remain limited. Moreover, fatigue-related shooting studies often examine acute fatigue effects, whereas intervention-based studies are needed to determine whether repeated exposure to match-like fatigue can improve shooting performance.

Although previous studies have established that fatigue negatively affects shooting accuracy and that game-based training methods may improve basketball performance, several important gaps remain. First, most fatigue-related studies have focused on the acute effects of fatigue rather than examining whether repeated exposure to fatigue-oriented training can improve shooting performance over time. Second, intervention studies have predominantly investigated small-sided games or general conditioning approaches, while evidence regarding structured full-court skill-and-drill programs remains limited. Third, little attention has been given to shooting accuracy under fatigue as a primary performance outcome, despite its practical importance during competitive play. Consequently, empirical evidence linking integrated full-court training and fatigue-resistant shooting performance remains insufficient.

The novelty of this study lies in its focus on full court skill and drill training as an integrated intervention for improving shooting accuracy under fatigue conditions. This focus differs from studies that assess static shooting drills, separate physical conditioning, or small-sided games without isolating fatigue-based shooting accuracy as the primary outcome. The present study positions shooting accuracy as a performance variable that must be trained within the same physiological and technical context in which it occurs during competition. The scientific contribution of this study lies in examining shooting accuracy within a training context that

simultaneously incorporates technical execution and fatigue-inducing movement demands. By focusing on shooting performance under fatigue, the study contributes to the growing body of evidence supporting representative and sport-specific training approaches in basketball.

Based on this rationale, the purpose of this study was to determine the effect of full court skill and drill training on basketball players' shooting accuracy under fatigue conditions. The research hypothesis stated that players would demonstrate a significant improvement in shooting accuracy after participating in the full court skill and drill training program. The findings are expected to provide empirical support for coaches in designing basketball training programs that integrate technical execution, physical conditioning, and fatigue-resilient shooting performance

METHODOLOGY

Research design

This study employed an experimental method using a pre-experimental one-group pretest–posttest design. The design was selected because the study aimed to compare players' shooting accuracy before and after the full court skill and drill training intervention. Although this design does not include a control group, it is appropriate for preliminary applied research in a club setting where all available players participate in the same training program. The main variable measured in this study was basketball shooting accuracy under fatigue conditions.

Participants

The participants were 15 players from Momentum Basketball Club. They were selected using total sampling because all active players who met the inclusion criteria were involved in the study. The inclusion criteria were active membership in the club, regular participation in training, willingness to follow all measurement and intervention procedures, and absence of injury during the research period. The use of total sampling was intended to maintain the ecological validity of the intervention in the real training environment of the club.

The sample represented the entire population of active players available within the club during the study period. Therefore, total sampling was considered appropriate for this preliminary applied investigation.

Instruments and procedures

The research instrument was a shooting accuracy test performed under fatigue conditions. The score was obtained from the number of successful shots made after the players completed an intensive full-court activity protocol. The fatigue protocol included dribbling, passing, sprinting, transition movement, and repeated full-court actions before the shooting attempt. This procedure was designed to ensure that the shooting test represented a more game-like situation rather than a

static shooting condition. The same testing procedure was applied during the pretest and posttest to maintain measurement consistency.

The shooting test protocol was adapted from previously published basketball shooting assessment procedures (Daub et al., 2023). Previous research has reported acceptable reliability for standardized basketball shooting assessments. To improve measurement consistency, identical testing conditions, equipment, shooting locations, and fatigue protocols were applied during both pretest and posttest sessions.

Full Court Skill and Drill Training Program

Before the shooting test, players completed a standardized fatigue protocol consisting of repeated full-court sprinting, dribbling, passing, and transition movements performed continuously for approximately 3–5 minutes. The protocol was designed to simulate the physiological demands commonly experienced during competitive basketball play.

The intervention was conducted for three weeks with a frequency of three sessions per week on Monday, Wednesday, and Friday. Each session consisted of warm-up, core training, and cool-down activities. The core training included full-court dribbling sequences, passing in transition, off-ball movement, sprinting, finishing actions, and shooting after repeated movement. The drill structure was intended to combine technical execution and physical load so that players repeatedly practiced shooting after performing movements that produced fatigue. The training progression emphasized continuity, speed, body control, and accuracy in finishing.

Data Analysis

The pretest and posttest data were analyzed using IBM SPSS Statistics. Descriptive statistics and pre–post comparisons were conducted to evaluate changes in shooting accuracy following the intervention.

RESULTS

The results showed that all players improved their shooting accuracy scores after completing the full court skill and drill training program. Individual pretest and posttest scores are presented in Table 1.

Table 1. Pretest and posttest scores of players' shooting accuracy

No.	Player Initial	Pretest	Posttest	Gain
1	Adit	3	6	3
2	Rian	4	7	3
3	Yudi	2	5	3

4	Gede	3	7	4
5	Farel	5	8	3
6	Afred	3	5	2
7	Jaya	4	8	4
8	Agung	2	6	4
9	Heri	3	6	3
10	Viko	5	9	4
11	Rudi	4	7	3
12	Krisna	3	6	3
13	Alvin	2	5	3
14	Minmin	4	8	4
15	Oki	3	7	4

Table 1 indicates that the lowest gain was 2 points and the highest gain was 4 points. No player experienced a decline in shooting accuracy after the training program. Descriptive statistics of the pretest, posttest, and gain scores are presented in Table 2.

Table 2. Descriptive statistics of shooting accuracy scores

Variable	N	Mean	Standard Deviation	Range
Pretest	15	3.33	0.98	2–5
Posttest	15	6.67	1.23	5–9
Gain	15	3.33	0.62	2–4

The descriptive results show that the mean pretest score was 3.33, while the mean posttest score was 6.67. This indicates a mean improvement of 3.33 points, which represents an increase of approximately 100% from the initial mean score. Before conducting the paired comparison, the normality assumption was examined using the Shapiro–Wilk test.

Table 3. Shapiro–Wilk normality test results

Variable	W	Sig.	Interpretation
Pretest	0.891	0.070	Normal
Posttest	0.925	0.230	Normal
Gain	0.766	0.001	Not normal

The Shapiro–Wilk results showed that the pretest and posttest scores were normally distributed, while the gain score was not normally distributed. Because the gain score is an important assumption in the paired-samples t-test, the Wilcoxon signed-rank test was reported as a supporting nonparametric analysis. The inferential analysis is summarized in Table 4.

Table 4. Summary of inferential analysis

Analysis	Statistic	df/N	Sig.	Interpretation
Paired-samples t-test	t = 20.92	df = 14	p < 0.001	Significant
Wilcoxon signed-rank test	W = 0.00	N = 15	p < 0.001	Significant
Cohen's dz	5.40	N = 15	—	Very large effect
95% CI of mean difference	2.99–3.68	df = 14	—	Positive difference

The paired-samples t-test showed a statistically significant improvement in shooting accuracy after the full court skill and drill training program, $t(14) = 20.92$, $p < 0.001$. The mean difference was 3.33 points, with a 95% confidence interval ranging from 2.99 to 3.68. The effect size was very large, Cohen's $dz = 5.40$, indicating that the improvement was not only statistically significant but also practically meaningful. The Wilcoxon signed-rank test produced the same conclusion, $W = 0.00$, $p < 0.001$. These findings support the hypothesis that full court skill and drill training improves basketball players' shooting accuracy under fatigue conditions.

DISCUSSION

The findings of this study demonstrate that The observed improvement suggests that participation in the full court skill and drill program may have contributed to better shooting accuracy under fatigue conditions. The mean score increased from 3.33 in the pretest to 6.67 in the posttest, and every participant showed improvement. This pattern indicates that the intervention produced a consistent positive response across players, not merely an isolated improvement in a small number of participants. The very large effect size further suggests that the training program had meaningful practical value for improving the ability to shoot accurately after repeated high-intensity movement.

The improvement can be interpreted through the principle of training specificity. Full court skill and drill training required players to perform shooting after dribbling, passing, sprinting, and transition movement across the entire court. These sequences resemble actual basketball situations in which shots are rarely performed in a fully rested condition. Evidence from studies of basketball match demands shows that players repeatedly experience high-intensity activity, direction changes, and intermittent workloads during games (Stojanović et al., 2018; Petway et al., 2020; Russell et

al., 2021). Therefore, training that exposes players to similar movement demands is more likely to develop technical stability under competitive fatigue.

The results are also consistent with recent literature showing that fatigue can influence basketball shooting performance. Li et al. (2025) reported that shooting accuracy is significantly affected by moderate and severe fatigue, while Bourdas et al. (2024) demonstrated that basketball-induced fatigue can alter shooting kinematics and three-point shooting accuracy. Yasar et al. (2025) further showed that upper-extremity fatigue affects shooting accuracy, movement mechanics, and muscle activation. These findings support the argument that fatigue is not merely a general physical state but a factor that directly changes the neuromuscular and technical components required for accurate shooting.

The present intervention may have improved players' ability to maintain shooting accuracy by repeatedly exposing them to fatigue-related constraints in training. When players practice shooting after full-court movement, they learn to control posture, breathing, rhythm, foot placement, and release mechanics despite physiological stress. This type of adaptation is relevant because fatigue can reduce coordination, alter timing, and increase movement variability. The improvement observed in the posttest suggests that players became more capable of stabilizing their shooting technique after repeated exposure to the integrated drill.

From a cognitive perspective, the findings also align with evidence that mental fatigue and attentional demands influence basketball performance. Cao et al. (2021) concluded that mental fatigue can affect physical, technical, tactical, and cognitive aspects of basketball performance. Filipas et al. (2021) showed that sleep restriction and mental fatigue can impair free-throw performance, while Daub et al. (2024) reported a relationship between mental fatigue and shooting performance during a competitive season. Luo et al. (2025) and Zhu et al. (2026) further emphasized the role of attentional focus under fatigue. In the present study, the full-court drill likely required players to preserve attention and decision-making quality while experiencing fatigue, which may have contributed to better shooting outcomes.

The results are supported by research on game-based and small-sided training approaches. Small-sided and conditioned games are widely recommended because they integrate technical, tactical, physiological, and perceptual demands in a more representative learning environment (Clemente, 2016; Clemente et al., 2021). Delextrat et al. (2018) found that small-sided games and high-intensity interval training can improve aerobic and repeated sprint performance in basketball players. Sansone et al. (2020) showed that different tactical tasks and training regimes in small-sided games produce specific technical-tactical profiles, perceived exertion, mental demands, and enjoyment. These studies support the idea that basketball training should be designed to combine

physical and technical stimuli rather than separating them into isolated components.

However, full court skill and drill training has a specific advantage for the purpose of this study because it emphasizes transition movement across the entire court and ends with shooting execution. In this sense, the intervention is closer to fast-break and transition situations than half-court static shooting drills. Arslan et al. (2022) found that small-sided games can be effective for improving performance responses and technical skills in young basketball players, while Zeng et al. (2023) reported acute physiological and enjoyment responses during basketball training using small-sided games and high-intensity interval training. The present study extends these findings by showing that a full-court integrated drill can specifically improve shooting accuracy under fatigue.

The practical implication of this study is that coaches should not rely exclusively on static shooting drills when preparing players for competition. Static drills remain useful for building basic technique, but match performance requires players to shoot accurately after running, changing direction, receiving passes, and making rapid decisions. Therefore, coaches should include shooting tasks after transition runs, sprint repetitions, defensive recovery, and full-court skill sequences. The training program should also monitor intensity and recovery so that fatigue is used as a purposeful stimulus rather than as an uncontrolled source of excessive load.

This study has several limitations. First, the sample size was relatively small and involved only one basketball club, so the findings should be generalized cautiously. Second, the design did not include a control group, which means that other factors such as regular club training or familiarization with the test may have contributed to the improvement. Third, physiological indicators of fatigue, such as heart rate, blood lactate, rating of perceived exertion, or movement tracking data, were not recorded. Future studies should use a randomized controlled design, involve larger samples, compare different training models, and include objective fatigue markers to clarify the mechanism through which full court skill and drill training improves shooting accuracy.

CONCLUSION

The present study found that basketball players demonstrated higher shooting accuracy scores under fatigue conditions following participation in a three-week full court skill and drill training program. These findings suggest that training activities integrating technical execution with game-like movement demands may support the development of shooting performance in physically demanding situations. From a practical perspective, the study provides preliminary evidence that coaches may consider incorporating full-court, fatigue-oriented drills as part of basketball training programs aimed at enhancing skill execution under competitive conditions.

The scientific contribution of this study lies in its focus on shooting accuracy under fatigue as

a specific performance outcome and in its application of an integrated training approach that combines technical and physical demands within a representative basketball context. However, because the study employed a pre-experimental one-group pretest–posttest design without a control group, the findings should be interpreted cautiously and should not be regarded as definitive evidence of causal effectiveness. Future research involving larger samples, control groups, randomized designs, and objective fatigue indicators is required to further clarify the relationship between full court skill and drill training and fatigue-resistant shooting performance.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest in this research.

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