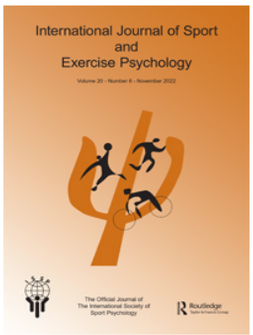

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"Don't think, just shoot" – The paradox of shooting three-point shots in basketball

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ABSTRACT

A two-phase study was conducted on shooting three-point shots in basketball in pressure/no-pressure game situations. In Phase 1 – a subjective approach, our aim was to discover what the players and coaches thought about shooting beyond the three-point arc when the shooters were performing under defensive pressure or when they were free of such pressure. In Phase 2 – an analysis of shooting success, we examined the actual success (i.e., percentage of successful shots) of shooting three-point shots under these two situations. In Phase 1, 97 Division 1 male basketball players and 12 elite coaches were asked how they perceived shooting three-point shots in various game situations. In Phase 2, the success of 382 three-point shots taken in actual Division 1 games was analyzed. The shots were classified by four expert coaches into two categories – shots taken in free-of-defense and shots taken in under-pressure game situations. The success of the two classified shots was analyzed under 10 conditions. Expected results were found in Phase 1 – both players and coaches believed that the success of three-point shots is higher when the shots are taken when the shooter is free of defense. In Phase 2, a surprising finding was revealed: shooting success was higher when the players shot under defensive pressure. We discuss the data in line with Kahneman's (2011), *Thinking, fast and slow*, model, and propose a number of practical implications for coaches who are preparing their three-point shooters to deal with real game situations.

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Shooting success; basketball; choking under pressure; System 1; System 2

Introduction

Since the advent of the three-point shot in basketball[1] on October 12, 1979, the shot has become an increasingly pivotal offensive weapon in National Basketball Association (NBA) teams. Over the past two decades, NBA teams have increased three-point production by gradually adopting certain lineup types and tactical sequences, and by the use of players who can score beyond the three-point arc (see Goldsberry, 2019). For example, during the 2001–2002 season, NBA shooters attempted 18.1% of their shots from the three-point range and 42.9% from the midrange. Sixteen years later, in the 2017–2018 season, they

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attempted about 27.1% of their shots from the midrange and about 34% from the three-point range. In that season (2017–2018), the Houston Rockets became the first team in NBA history to attempt more than half of their shots from beyond the three-point arc (42.3 out of 84.2 shots per game).

In terms of the classification of motor skills, shooting a three-point shot in basketball can be classified as an open skill (see Lidor, 2007; Schmidt et al., 2019). An open skill in sport is performed in an environment that is variable and unpredictable, or in motion, and requires performers (e.g., a three-point shooter) to adapt their movements in response to dynamic properties of the environment (e.g., players from the shooter's own team and players from the opposing team). Since the environment is dynamic and varied, the performer is challenged in predicting future moves, as well as his or her own subsequent responses to them (e.g., under what offensive conditions will the player choose to take the three-point shot).

Players can take a three-point shot under two main game situations. In Shooting Situation 1, the shooter performs under pressure of defense and therefore releases the ball while externally distracted. In Situation 2, the shooter is free of defense, and therefore may take advantage of a brief amount of time for preparation of the shot. In line with Kahneman's (2011) two-system model of how the brain forms thoughts, Shooting Situation 1 is associated with Kahneman's System 1 and Shooting Situation 2 with Kahneman's System 2. System 1 is associated with Shooting Situation 1, since this is the intuitive, "gut reaction" way of thinking and making decisions. It is believed that System 1 regulates unconscious activities such as recognising faces, avoiding obstacles, and playing practiced skills in sport (e.g., shooting a two- or a three-point shot during a basketball game). System 2 is related to Shooting Situation 2, since this is the analytical, slow, and "critical thinking" way of making decisions. It is associated with activities such as parking in a narrow space or shooting a free-throw shot in basketball. In System 1, the individual's reaction would be quick and automatic (i.e., the shooter is under pressure and is required to shoot the ball as fast as possible without thinking about the act or its outcome). In System 2, he or she would be more deliberate and reflective (i.e., the shooter is free of defense and may use a short interval of time to plan the shooting act).

Three-point shooters should expect to perform under Situation 1, namely under conditions of defensive pressure. Since a successful three-point shot attempt is worth three points, coaches caution their defensive players on the outcome of the shot, and therefore typically instruct them to put pressure on the shooter while they play defense. The rationale of the coaches' demand to pressure the three-point shooter is that pressure may negatively affect the shooters, and subsequently their performance will be hindered. More specifically, pressure changes the performer's attentional mechanisms and memory structures that support performance (Jackson & Beilock, 2008).

According to *distraction theories*, pressure influences task performance by creating a distracting environment that compromises one's working memory capacity and resources (a short-term memory system that maintains, in an active state, a limited amount of information with immediate relevance to the task at hand, while preventing the consideration of distractions from the environment or irrelevant thoughts) (Kane & Engle, 2000; Moran, 2012a; Wilson, 2012). From another perspective, *explicit monitoring theories* suggest that pressure situations raise self-consciousness and anxiety about performing correctly (Baumeister, 1984). For example, Masters (1992, 2000) suggested that the specific mechanism

governing explicit monitoring is, as he termed it, "dechunking". Pressure-induced attention on execution causes an integrated control structure – which normally operates without interruptions, to be broken back down into a sequence of smaller independent units – similar to how the performance was organised in early phases of skill acquisition. Once dechunked, each unit must be activated and performed separately, and therefore this process slows down performance as well as increases opportunities for error at each transition between the units. These errors would be avoided under an integrated control structure.

According to another approach – the ecological approach to cognition and action in sport, performers (e.g., three-point shooters in basketball) are able to perceive themselves, their environment, and the changing relationship between themselves and their surroundings (see, for example, Araújo & Davids, 2009; Araújo et al., 2009; Gibson, 2015). As Araújo and Davids (2010) emphasised, performers should be aware not only of *what* they are doing, but also *where* they do it. The performer's awareness of the environment is based on the adjustment of the performer's entire perceptual system to the information surrounding it. This adjustment includes a range of processes that can be described as the simultaneous extraction of persisting and changing properties of stimuli, regardless of the disturbances to this array of information. In essence, the perception of the information associated with the environmental settings, events, and individuals influences the actions made by the performer.

The abovementioned assumption, namely that the perception of the information associated with the environmental settings, events, and individuals influences the actions made by the performer, was also adopted by Raab (2017, 2021). In order to explain how performers act in a given complex sport situation (e.g., a three-point shooter aiming at the rim while being closely guarded), Rabb proposed to combine two concepts: motor heuristics and embodied choices. A motor heuristic is a simple rule of thumb that allows the performer to choose between options (i.e., movements) in order to meet the needs of a given situation. Embodied choices are rules of thumb that are useful when limited time and resources force the performer to decide quickly between two or more options. Both strategies – motor heuristics and embodied choices – consider simple heuristics, and therefore are used by performers for fast and economical choices when limited time and resources are available, such as in a shooting situation where the shooter is under pressure. However, embodied choices use body cues through sensorimotor experience which can influence the choices made by the performer (e.g., the three-point shooter).

Coaches are apparently aware of the negative effects of pressure on shooting performance, and therefore attempt to prepare their shooters to cope with this pressure. One of the instructional strategies that coaches implement to assist three-point shooters in avoiding defensive pressure during the game is the planning of structured offensive plays (see, for example, Krause & Nelson, 2019). These offensive plays are composed of sets of movements shared by certain members of the team, and their main objective is to free the shooter for the shooting act. For example, the pick and roll (an offensive play in which a player sets a screen [pick] for a teammate handling the ball, and then moves forward towards the basket [rolls] to receive a pass) is one of the offensive plays used regularly by basketball players prior to shooting acts (see Krause & Nelson, 2019). Another strategy that is used by coaches is encouraging their shooters to produce

their own creative moves (e.g., faking the defensive player) in order to free themselves for the shot (Hopla, 2012). The assumption of the coaches in these instructional attempts is that it is better to shoot free of defensive pressure rather than to shoot under such pressure.

In the current two-phase study, we aimed at examining success (i.e., percentage of shooting successfully) in three-point shots performed under two game situations: when the shooter is under defensive pressure, and when the shooter is free of pressure. We hypothesised that shooting success would be lower under defensive pressure, while shooting success would be higher when shooters were free of pressure. This hypothesis is in line with distraction theories, namely that pressure negatively influences task performance (e.g., shooting in basketball) by creating a distracting environment that compromises the performer's (e.g., a three-point shooter) cognitive mechanisms (see Kane & Engle, 2000; Wilson, 2012). In addition, this hypothesis reflects arguments of explicit monitoring theories which are that pressure situations raise self-consciousness and anxiety about how to perform the task at hand (see Masters, 2000). Although not investigated in the literature up to now, and therefore we cannot provide a solid theoretical basis for this assumption, we also assumed that the success of shooting as an outcome of a structured offensive play, practiced repeatedly in training sessions, would be higher than after a shooter's own offensive action.

Research approach

We performed a two-phase study in order to examine how pressure influences the success of shooting from the three-point arc. The two phases were conducted independently, however they complemented each other.

Phase 1 – A subjective approach. Our aim in Phase 1 was to explore how players and coaches viewed achieving success in shooting three-point shots when the players had to shoot under pressure of defense, or when they were free to aim at the target and therefore had more time to prepare for the shooting act. We assumed that both players and coaches would view a three-point shot that is taken free of defense as a better shooting option than a shot that is performed under such pressure. This assumption reflects findings that emerged from distraction theories and explicit monitoring theories.

Phase 2 – An analysis of shooting success. The purpose of this analysis was to determine if shooting success was higher when the three-point shooter was free of defensive pressure than when the shooter was under pressure. In Phases 1 and 2, we collected data on players playing at the same level of competition and from coaches who coached at that level.

Phase 1

Participants

Ninety-seven players who played basketball in Division 1 in Israel (males; mean age = 24.7 yrs.; mean number of years playing in Division 1 = 5.5 yrs.) participated in Phase 1. Players join teams of Division 1 in Israel at age 19, after transferring from youth programmes to the professional clubs. Typically, children start playing basketball at age 8 (see Lidor et al.,

2010, 2021), and therefore those who reach the level of Division 1 have had at least 11 years of experience playing competitive basketball.

Division 1 is the highest division for competitive basketball in Israel. Players who play in this division are considered to be professionals (that is, they are not employed in a job other than playing basketball). The players typically take part in between six to eight practice sessions on a weekly basis; each session lasts about 90 min. In addition, they play one to two league games per week. Division 1 is composed of players who were born in Israel (native players; about 60% of the total number of players playing in Division 1) and foreign players who were not born in Israel and therefore do not have the status of being an Israeli citizen. All players who participated in Phase 1 were native Israelis.

In addition, 12 coaches who coached in Division 1 (males; mean age = 44.1 yrs.; mean number of years coaching in Division 1 = 10.9 yrs.) also participated in Phase 1. All of the coaches were certified by the Israel Basketball Association.

Questions

Both players and coaches were asked to answer a number of questions associated with two cases in which three-point shots are taken. In Shooting Case 1, the three-point shot was taken free of defense (a free shot; the distance between the shooter and the defensive player was long enough so that the defensive player could not reach the shooter and therefore could not put pressure on him, and when other defensive players could not disturb the shot as well). In Shooting Case 2, the three-point shot was taken under pressure of a defensive player (a contested shot; the defensive player was close to the shooter and put pressure on him while he was making the shot). The distance between the shooter and the defensive player was short.

The set of questions for the players was composed of six questions related to Shooting Case 1 and Shooting Case 2, and the one for the coaches included five questions about the two shooting cases. The questions were developed by the authors of this article, who used their different backgrounds to validate them. The first and fourth authors are academicians who teach classes in sport psychology and conduct research in this field. The second author played professional basketball in Division 1 in Israel for about 10 years, and is now a graduate student in exercise and sport sciences. The third author is an academician specialising in research methods and statistics in sport and exercise sciences.

The first version of the two sets of questions was developed by the first and second authors. Then, this version of each set was given to the third and fourth authors, who reviewed them independently and provided the first and second authors with a number of comments/suggestions. The comments/suggestions made by the third and fourth authors were applied to the first version. The improved version of both sets of questions was discussed by all four authors, who approved the final version of the questions, which were then administered to the players and coaches. Two basketball players and two coaches who did not take part in Phase 1 and Phase 2 of the study completed the two sets of the questions as a pilot step. No comments on the clarity of the questions were provided in the pilot step. The questions for the players and coaches are presented in Table 1.

Table 1. The responses of the players and coaches to the three-point shot's questions.

	Question	A free shot (Case 1)	A contested shot (Case 2)
Players	1) As a shooter, would you prefer to take a three-point shot like the one described in Shooting Case 1 or the one in Shooting Case 2?	92.7%	7.3%
	2) When the game is tied and your team has the last chance to score and win the game, would you prefer to take a three-point shot as described in Shooting Case 1 or the one in Shooting Case 2?	84.5%	14.5%
	3) In what shooting case – 1 or 2 – will the percentage of shooting be higher?	92.8%	7.2%
	4) If you have to guard a three-point shooter, do you prefer to be in a shooting situation as described in Case 1 or the one described in Case 2?	4.1%	95.9%
	5) If you took three-point shots during a game as described in Cases 1 and 2, did you think about what were you doing?	93%	7%
	6) Assuming that you have to take a three-point shot as described in Case 1 or Case 2, in which case are the expectations from you to shoot successfully higher?	96%	7%
Coaches	1) In which shooting case – 1 or 2 – do you prefer that your three-point shooters will be?	100%	
	2) If your team plays defense, do you prefer that the player who guards the three-point shooter will be in a shooting situation as described in Case 1 or the one described in Case 2?		100%
	3) When the game is tied and your team has the last chance to score and win the game, would you prefer that your shooter will be in a situation as described in Shooting Case 1 or the one in Shooting Case 2?	100%	
	4) When the game is tied and the opposing team has the last chance to score and win the game, would you prefer that the opposing team's three-point shooter will be in a situation as described in Shooting Case 1 or the one in Shooting Case 2?		100%
	5) In what shooting case – 1 or 2 – will the percentage of shooting be higher?	100%	

Procedure

The questions for the players and coaches were administered prior to one of their practice sessions. The players answered the questions in the locker room, where they were preparing themselves for the practice. Each player sat in his own dressing area. The coaches answered the questions in their office. It took the players and coaches about 15 min to answer the questions.

Results

The responses of the players and coaches are presented in Table 1. A number of observations can be made based on these responses. For the players, it is observed that (a) most of them (about 93%) preferred to take the three-point shots when they were free of defense; this is also the case for a tied-game situation where the shooter has the last opportunity to win the game (about 85%); (b) the players assumed that the rate of

success would be higher when the shot is taken free of defense (about 93%); (c) only a small portion of the players (4%) would think about their strategy if they were taking a shot free of defense; (d) most of the players (96%) reported that they are aware of the high expectations of their coaches and teammates to successfully complete a three-point shot that is taken free of defense.

For the coaches, two main observations can be made: (a) all of the coaches preferred that their players take shots when they are not under pressure; and (b) they expected their players to perform successfully when shooting free of defense.

Based on the responses of both the players and coaches, it can be concluded that most of them argued that it would be preferable for the three-point shooter to perform the shot free of defense. It is true that 15% of the players reported that when the game was tied, and they had the last chance to score and win the game, they would prefer to take the shot under pressure of defense. However, from the responses of all the other players, and particularly from those of the coaches, it was clear that they preferred that the three-point shot would be taken when the shooter is free from defensive pressure.

Phase 2

The main purpose of Phase 2 was to determine if shooting success was higher when the three-point shooter was free of defensive pressure than when the shooter was under pressure.

The three-point shots

The three-point shots, performed in league games, were taken from behind the three-point line (radius = 7.25 m) on a regulation basketball court (see http://www.fiba.basketball/europe). The shots were performed by 12 players who played in Division 1 in Israel (males; mean age = 25.4 yrs.; mean number of years playing in Division 1 = 7.1 yrs.). The players – point guards and shooting guards – played for the four best teams in Division 1 – teams that were ranked first, second, third, and fourth at the final ranking of the 2013–2014 season. These players were considered to be the best three-point shooters on their teams, and took the highest number of three-point shots in that season among their teammates. Seven of the players were Israeli-born and five were foreign players (all from the U.S.A.).

The decision to analyze the success of three-point shots made only by point guards and shooting guards was based on the findings of a pilot study that we conducted on the distribution of three-point shots among the players who played in Division 1 in the 2013–2014 season. The main findings of this pilot study were that in all of the teams that played in that season, point guards and shooting guards took the majority of the three-point shots. For example, in the team that ranked first in the league, one point guard and one shooting guard took 166 shots compared with one forward and one centre who took only five shots throughout the season. In the team that ranked second in this season, two shooting guards took 257 shots, while the two centres of the team took only two shots during the season.

Coaches

Four coaches (males; mean age = 40.2 yrs.; mean number of years coaching at an international level = 9.2 yrs.) participated in Phase 2 of the study, and served as experts who classified the type of the performed three-point shots (see Step 2 in the next section). The coaches coached either the Israeli adult national team or the Under-21 Israeli national team. In addition to their experience at the international level, all four coaches coached in clubs playing in Division 1 in Israel. The coaches who participated in Phase 2 did not take part in Phase 1.

Procedure

Three steps were performed: preparation (selection of the three-point shots), classification (coaches' determination whether the shot was taken under no-pressure or under pressure conditions), and analysis of the shooting success.

Step 1 – Preparation

Four hundred and thirty-three three-point shots were recorded. Shots that were taken during the last three seconds of the restricted 24-sec offensive time limit in any offensive play (including the shots that were taken during the last three seconds of each quarter/overtime) were excluded from the data analysis. The three-point shots taken during the last three seconds of the restricted 24-second rule were also performed under unpredictable and varied settings, and therefore met the environmental characteristics of an open skill. However, the reason that we did not include these shots in our data analysis is because according to the expert coaches who observed the shots and classified them into shots taken under pressure and shots taken free of defense, the shooters changed their own style/technique of shooting. Presumably, this change of style/technique might negatively influence their chance of scoring, and therefore we preferred to analyze the outcome of the shots performed by the shooters who were using their usual style/technique of shooting. Indeed, the de-selection of the shots performed during the last three seconds of the restricted 24-second rule might decrease the ecological validity of the shooting task (see Araújo & Davids, 2009; Gibson, 2015).

Twelve games were observed: four games in the first round of the league, four games in the second round of the league, and four games in the last round of the league – the Playoffs. Our aim was to analyze the success of shooting in three different stages of the basketball season – the first round of the league, the second round of the league, and the Playoffs. We wanted to observe these phenomena throughout the entire season, and not at a particular stage of the season. Based on this rationale, we could not use a G-power analysis prior to the data collection, since we did not know what the exact number of the three-point shots to be taken in each game would be. In addition, we could not determine in advance the number of shots taken under pressure or the number of those taken free of defense.

A professional staff from the Israel Basketball Association filmed the games. All the shooting events were edited by the experimenter (the second author of this article), who used an editing program developed by WSC Sports Technologies (Givatayim, Israel). Out of the 433 recorded three-point shots, 382 shooting events were prepared

for classification and grouped into video clips. Fifty-one shots were removed from the data analysis since they were performed during the last three seconds of the restricted 24-sec offensive time limit. Each video clip was composed of 20 three-point shots. The length of each video clip was about six minutes.

Step 2 – Classification

In the first sub-phase, two independent coaches (among the four participating coaches in the study) classified each shooting event. Each of the coaches sat in front of a computer screen (size: 21-inch) in a quiet room. The video clip began with a brief introduction, and then the experimenter commenced with a short training session, where three trial events were viewed and discussed to ensure that the coach would be familiar with the requirements of the observational shooting task. This preparation routine was also used in previous observational studies (e.g., Plessner & Betsch, 2001; Sabag et al., 2018).

The aim of the two observers was to determine whether the shot was taken under no-pressure or under pressure conditions. The three criteria of the no-pressure shot were that: (a) the defensive player who guarded the shooter was far enough from him that he was not able to prevent the shot, namely that the hand/s of the defensive player could not reach the shooter; (b) no other defensive player could put pressure on the shooter during the shot; and (c) the shooter completed the shot using his own style of shooting without any external distractions. The two criteria of the shot taken under defensive pressure were that: (a) the defensive player was close to the shooter while his one hand or two hands distracted the shooter during his shooting act; and (b) the shooter was able to complete the shot while maintaining his style of shooting.

Each coach observed between four to five clips of shooting events. That is, each coach observed 80–100 three-point shots. The coaches had no time limits for making their decisions – they could use the time they needed. The coaches observed only the shooting act, without seeing the outcome of the shot (a success or a miss). A decision was recorded on whether the shot was taken under no-pressure or under pressure conditions only after the two coaches were in full agreement.

Step 3 – Analysis

Based on the coaches' classification, statistical analyses were performed in order to determine if shooting success was higher when the three-point shooter was free of defensive pressure than when the shooter was under pressure.

Dependent variables

Success of shooting was analyzed under 11 different conditions: (a) the shot was taken under pressure/no pressure; (b) the shot was taken after a dribble or a pass; (c) the shot was taken as an outcome of a team drill (a pick), a pick and roll, or as a result of the player's own offensive action (i.e., faking); (d) the phase of the season (first round, second round, Playoffs); (e) the shot's area (top of the key, at 45^0 from the basket, corners of the court); (f) the location of the game (home/away); (g) the position of the player (point guard, guard/forward); (h) the quarter of the game (first, second, third, fourth); (i) the distance of the shot from the fans (less/more than 1 m); (j) the number

of fans (less/more than 2,100); and (k) the score's margin (−3 and more, between −3 to +3, +3 and more).

Dribbling and passing are considered to be basic offensive fundamentals in basketball. These fundamentals are frequently used by players prior to the execution of the shooting act (Krause & Nelson, 2019), and therefore we included them in a separate condition (the After Dribble/Pass Condition) and did not include them in a related condition (e.g., the Shot's Setting Condition). The two categories of distance in the Distance from Fans Condition were determined based on an analysis of the distance between the corners of the gym and the first row of seats in each of the sport halls where basketball is played in Division 1. Similarly, the two categories of fans (the Number of Fans Condition) were selected based on the information collected on the number of fans who attended each game in Division 1 in that given season. That is, we used the value of 2,100 fans as a median.

Data analyses

Chi-square tests were performed in order to indicate the degree of shooting success of the three-point shots performed in each of the 11 classified conditions. Chi-square tests were also used to indicate the degree of shooting success between the shots taken under no-pressure and those taken under pressure game situations in each of the 10 classified conditions. In addition, a two-step logistic regression was performed to model the probability of a certain existing condition to contribute to shooting success.

Results

Analyses are presented separately for the total shots analyzed in Phase 2, the shots taken under no-pressure and pressure game situations, and the logistic regression.

Analysis of the total shots

The number of shots taken by each player and the percentage of success of the shots are presented in Table 2. As can be seen in Table 2, the lowest number of shots taken by a player was 14 (Player 1) and the highest numbers of shots were 50 and 51 (Players 4 and 11, respectively). The lowest percentage of successful shots for a player was 20.8%, 28.6%, and 30.8% (Players 3, 1, and 9, respectively), and the highest percentage of successful shots was 78.9% (Player 7).

Out of the 382 successful three-point shots analyzed in our observational study, agreement between the two observers was reached in 378 cases (98.9%; in only four shots was agreement not reached). In total, more shots were taken under pressure ($n = 233$; 61.6% of the total shots) than those taken under no-pressure ($n = 145$; 38.4% of the total shots) game situations. The distribution (number and percentage) of the total three-point shots analyzed in our study ($n = 382$) and the values of the Chi-square tests for each condition are presented in Table 3. It should be noted that in most of the analyses presented in Table 3 we analyzed all of the 382 observed shots, since our aim was to examine shooting success of all shots in the various 11 conditions. When we compared the shots that were taken under pressure to those taken under no-pressure, we analyzed only the classified 378 shots. The analysis performed for each condition revealed a surprising

Table 2. The number of shots and percentage of success among the 12 players.

Players	Number of three-point shots	Number of successful shots	% of success
Player 1	14	4	28.6%
Player 2	28	15	53.6%
Player 3	24	5	20.8%
Player 4	50	16	32.0%
Player 5	19	11	59.7%
Player 6	34	12	35.3%
Player 7	19	15	78.9%
Player 8	45	20	44.4%
Player 9	26	8	30.8%
Player 10	43	23	53.5%
Player 11	51	20	39.2%
Player 12	29	15	51.7%
Total	382	164	42.9%

finding: success of shooting was higher in the shots that were taken under defensive pressure (53.6%; 125 out of 233) compared with the shots taken under no-pressure (26.9%; 39 out of 145).

In addition, significant findings were obtained for the Shots' Setting Condition: success of shooting when players shot as a result of their own offensive actions (32.5%) was significantly lower than the success of shooting in situations where (a) the shot was an outcome of a pick and roll (58.8%) or (b) the shot was an outcome of a drill performed by the team (52.6%). No significant findings were found for the rest of the analyzed conditions.

Analysis of the shots taken under no-pressure and pressure game situations

The distribution (number and percentage) of the shots taken under pressure ($n = 233$) and those taken under no-pressure ($n = 145$) game situations, and the values of Chi-square analysis for each analyzed condition, are presented in Table 4.

A paradoxical finding, namely that the rate of shooting success was higher when the shooter performed under pressure, was indicated in most of the analyzed conditions (see Table 4). In only four sub-categories within the analyzed cases was the abovementioned finding not observed: (a) when the shots were taken after dribbling ($p = 0.12$); (b) when the players played the pick and roll ($p = 0.48$); (c) when point guards took the shots ($p = 0.14$); and (d) when the shots were taken in the second quarter of the game ($p = 0.06$). The abovementioned results strengthen the finding that players shoot with more success when they are under defensive pressure than when they shoot the ball at a distance from their opponents.

Logistic regression

The values of the two-step logistic regression are presented in Table 5. In Step 1 (simple logistic regression), all conditions (the independent variables) were analyzed. In Step 2 (stepwise), only the significant conditions found in Step 1 were analyzed. The results provide additional support for the findings that emerged from the Chi-square analyses: success of shooting can be explained by the pressure/no-pressure game situation (see Table 5, Step 1). When the shooter shot under defensive pressure he was more successful

Table 3. The distribution of the total three-point shots ($n = 382$) and the values of the chi-square analysis for each condition.

Condition		Number of shots	% of the total shots taken by the players	Number of successful shots	% of successful shots	χ^2	df	*P*
Pressure/no pressure	Under pressure	233	61.6%	125	53.6%			
	No pressure	145	38.4%	39	26.9%			
	Total	378[a]	100%	164	43.4%	26.04	1	.00
After dribble/pass	After a pass	309	80.9%	132	42.7%			
	After a dribble	73	19.1%	32	43.8%			
	Total	382	100%	164	42.8%	.030	1	.862
Shot's setting	An outcome of an offensive team maneuver	154	40.3%	81	52.6%			
	Pick and roll	34	8.9%	20	58.8%			
	Player's own action	194	50.8%	63	32.5%			
	Total	382	100%	101	26.4%	18.03	2	.00
Season's phase	First round	128	33.5%	64	50%			
	Second round	114	29.8%	46	40.4%			
	Playoffs	140	36.6%	54	38.6%			
	Total	382	100%	164	42.9%	4.00	2	.135
Shot's area	Top of key	44	11.5%	22	50%			
	45^0	191	50.1%	80	41.9%			
	Corners	146	38.3%	62	42.5%			
	Total	381[b]	100%	164	43.0%	.99	2	.609
Home/away game	Home	209	54.7%	90	43.1%			
	Away	173	45.3%	74	42.8%			
	Total	382	100%	164	43.9%	.00	1	.995
Player's position	Point Guard	69	18.1%	27	39.1%			
	Guard/Forward	313	81.9%	137	43.8%			
	Total	382	100%	164	43.9%	.49	1	.481
Quarter	First	94	26.8%	44	46.8%			
	Second	87	24.8%	36	41.4%			
	Third	99	28.2%	44	44.4%			
	Fourth	71	20.2%	28	39.4%			
	Total	351[c]	100%	152	43.3%	1.08	3	.780
Distance from fans	< 1 m	209	54.7%	92	44.0%			
	> 1 m	173	45.3%	72	41.6%			
	Total	382	100%	164	42.9%	.223	1	.637
Number of fans	< 2,100	229	59.9%	99	43.2%			
	> 2,100	153	40.1%	65	42.5%			
	Total	382	100%	164	42.9%	.021	1	.885
Score's margin	− 3 and more	69	19.4%	30	43.5%			
	− 3 up to + 3	138	38.9%	62	44.9%			
	+ 3 and more	148	41.7%	59	39.9%			
	Total	355[d]	100%	151	42.5%	0.78	2	.677

[a]Agreement was not reached for four shots
[b]Agreement was not reached for one shot
[c]Thirty-one shots were taken in overtime
[d]The game's score could not be identified in 27 shots

Table 4. The distribution (Number and percentage) of the successful shots taken under no-pressure (n = 145) and Pressure ($n = 233$) game situations and the values of the chi-square analysis for each condition.

Condition		Free Shots ($n = 145$)			Shots under pressure ($n = 233$)			χ^2	p
		Number of shots	Number of successful shots	% of successful shots	Number of shots	Number of successful shots	% of successful shots		
After dribble/ pass	After a pass	120	30	25%	186	102	55%	5.15	.001**
	After a dribble	25	9	36%	47	23	50%	1.13	0.12
Shot's setting	An outcome of an offensive team maneuver	53	14	26%	101	67	67%	4.79	.001**
	Pick and roll	12	7	58%	22	13	59%	0.04	0.48
	Player's own action	80	18	23%	110	45	41%	2.66	.004**
Season's phase	First round	50	18	36%	76	46	61%	2.69	.004**
	Second round	40	8	20%	74	38	51%	3.26	.001**
	Playoffs	55	13	24%	83	41	50%	3.1	.001**
Shot's area	Top of key	16	5	31%	28	17	61%	1.88	.03*
	45^0	71	17	24%	119	63	53%	3.92	.001**
	Corners	58	17	29%	85	45	53%	2.8	.003**
Home/away game	Home	82	23	28%	123	67	55%	3.85	.001**
	Away	62	16	26%	110	58	53%	3.42	.001**
Player's position	Point guard	28	9	32%	40	18	45%	1.07	0.14
	Guard/forward	117	30	26%	193	107	56%	5.16	.001**
Quarter	First	38	10	26%	56	34	61%	3.28	.001**
	Second	34	11	32%	51	25	49%	1.52	0.06
	Third	35	7	20%	63	37	59%	3.69	.001**
	Fourth	25	6	24%	45	22	49%	2.04	.021**
Distance from fans	< 1 m	75	23	31%	131	69	53%	3.06	.001**
	> 1 m	70	16	23%	102	56	55%	4.18	.000**
Number of fans	< 2,100	83	25	30%	143	74	52%	3.16	.001**
	> 2,100	62	14	23%	90	51	57%	4.17	.000**
Score's margin	− 3 and more	16	5	21%	44	25	57%	2.56	.005**
	− 3 up to + 3	87	18	32%	81	44	54%	2.86	.002**
	+ 3 and more	53	10	19%	93	49	53%	4.00	.000**

* $p<.05$, ** $p<.01$

Table 5. The values of the two-step logistic regression.

	Condition	*B*	Standard error	Wald	df	*p*	Exp (*B*) odds ratio	Confidence interval (95%)	
Step 1	Pressure/no pressure	1.15	0.23	25.10	1	0.000	3.15	2.01	4.93
	Constant	−1.00	0.19	28.50	1	0.000	0.37		
Step 2	Pressure/no pressure	1.13	0.23	23.35	1	0.000	3.09	1.95	4.88
				14.51	2	0.001			
	An outcome of an offensive team maneuver	0.77	0.23	11.23	1	0.001	2.17	1.38	3.41
	Pick and roll	1.06	0.40	7.14	1	0.008	2.87	1.32	6.23
	Constant	−1.41	0.23	39.32	1	0.000	0.24		

than when he was free of defense ($B = 3.15$). In other words, the shooting success under defensive pressure was triple that of the success under a no-pressure condition (the reference category was a no-pressure game situation).

In addition, shooters gained the greatest success when the shot was taken because of an offensive team maneuver ($B = 2.17$) or a pick and roll ($B = 2.87$) (see Table 5, Step 2). In other words, structured offensive maneuvers were more beneficial for the three-point shooters than non-structured maneuvers (the reference category was a game situation where the shooter acted on his own).

In summary, two main findings emerged from our shooting analyses (a) shooting success was greater when the shooters shot under defensive pressure than when shooting when they were free of defense; this finding was consistent in most of the analyzed conditions; and (b) shooting as an outcome of structured offensive plays performed by the team resulted in a higher degree of accuracy than shooting as an outcome of movements taken by the shooter (i.e., faking) prior to the shooting act.

Discussion

Our aim in Phase 1 was to learn what players and coaches thought about shooting beyond the three-point arc when the shooters executed the shots under defensive pressure or when they were free of such pressure. In Phase 2, our aim was to examine the actual success of shooting three-point shots under these two situations: when a defensive player pressured the shooter or when the shooter was free of defense. In Phase 1, we found that both players and coaches believed that players would achieve greater success when the shot is taken free of defensive pressure. However, the opposite findings were obtained in Phase 2: shooting success under defensive pressure was higher than in shots taken in free-of-defense situations.

Typically, we expect sport performers to be less effective when they act under pressure, due to negative changes that take place in their cognitive functions – among them perception, attention, and decision-making (Jackson & Beilock, 2008; Wilson, 2012). Under defensive pressure, three-point shooters in basketball perceive themselves, their game environment, and the relationship between them and their surroundings (e.g., the closeness of the players who guard them) differently than in a game situation where they are free to aim at the target (Araújo & Davids, 2009; Raab, 2017). Therefore, the reports of the players and coaches analyzed in Phase 1 are not surprising. However, the findings of the

analysis of the 382 three-point shots taken in real-game situations (Phase 2) contradicted the reports made by the players and coaches in Phase 1.

Although both the players and coaches who participated in Phase 1 had similar responses to the set of questions that they were asked, it should be noted that there are a number of constraints in the use of verbal reports as a valid measure of tactical skills (see, for example, Araújo et al., 2009; Araújo et al., 2010). Among these constraints are the inter-individual inconsistencies in reports in the same domain of expertise, the discrepancies between the reported strategies and the observed behaviours, and the fact that verbal descriptions lack sufficient detail about the evaluated knowledge.

The main finding of Phase 2 – namely that the three-point shooters were able to shoot more successfully in game situations where they were pressured by the defensive team than when they shot free of defense, was observed in most of the analyzed conditions. Therefore, the main question that should be asked is: Why was the shooting success higher under defensive pressure? Alternatively, why are the findings of Phase 2 not in line with those obtained in Phase 1?

One of the explanations of the findings of Phase 2 is associated with the two-system model proposed by Kahneman (2011). The three-point shooters participating in Study 2 were skilled performers who played competitive basketball at the highest level of proficiency. Therefore, when aiming at the basket under a defensive-pressure situation, they acted automatically. They shot the ball without paying attention to environmental cues, such as players from the opposing team who were putting pressure on them while they were shooting. It is assumed that they were able to ignore the environmental-external distractions they had to face. Presumably, they used System 1 in Kahneman's model – an intuitive and automatic way of thinking.

When the shooters were not being pressured by the defensive players, they found themselves in a situation where they had some time (although a very brief amount) to prepare themselves for the shot. They could have thought about the shot and the way they were going to execute it. They might also have considered the outcome of the shot, particularly about the possibility of missing the target. In this situation, when the players were free from defensive pressure, they probably used Kahneman's System 2 – a more deliberate and reflective way of thinking.

As argued by Moran (2012b), thinking too much about what one is doing, or trying to exert conscious control over actions that are normally performed automatically, has the potential to cause one's skills to unravel. In fact, this way of thinking can create internal distractions, such as negative thoughts, irrelevant thoughts, unpleasant emotions, and anxiety, which apparently negatively influence the shooter's ability to aim successfully at the target. The need to adjust to a situation where the shooter can think about what he or she is going to do also influences the shooter's awareness of the situation (Araújo & Davids, 2010). He or she has to adjust a range of cognitive processes – among them perception, memory, and decision making, to a new and challenging shooting situation. When athletes reach such a mental state, they attempt to ensure task success by reverting to a mode of conscious control that is associated mainly with an early stage of motor skill acquisition, a stage that relies on explicit rules and that typically results in slow and effortful movements (see Masters & Maxwell, 2008). However, in order to strengthen the argument that the three-point shooters digressed to an early stage of skill acquisition in the no-pressured conditions, additional analyses should be made in

future studies. For example, differences in the duration of the three-point shots taken by each player should be analyzed, as well as the movement kinetics of the shots.

The three-point shots that were analyzed in Phase 2 were performed by 12 basketball players who played in Division 1 in Israel – the highest competitive division in the country. They were considered the best three-point shooters on their teams, which ranked first, second, third, and fourth at the final ranking of the observed season. However, only four of them reached above 50% of success in their three-point attempts (see Table 2). This means that also among elite basketball players can a number of levels of shooting expertise be observed. Since different levels of expertise influence decision-making processes in sport (see Bar-Eli et al., 2011; Memmert & Roca, 2019), it might be beneficial in future observational studies to increase the number of shooters, and to analyze their shooting success based on their season shooting average. If this is done, then it might be observed that the best shooters (e.g., above 50% of success) gain more success than those who shoot under the 50% threshold under game situations where they find themselves free of defense.

We also found in Phase 2 that planned and structured offensive plays helped the shooters to achieve a better performance than when they performed their own offensive maneuvers prior to the shooting act. While searching the literature on technical and tactical aspects of the game of basketball (e.g., Hopla, 2012; Krause & Nelson, 2019), we found that efforts are typically made in basketball training programmes to assist shooters in freeing themselves of defensive pressure. Coaches who plan and structure offensive drills that are performed by the individual player during the actual game assume that these drills can help three-point shooters to cope with defensive pressure. According to our results, this practice may not be useful if the shooter finds him- or herself in a no-pressure situation.

Finally, based on the findings of Phase 2, basketball coaches may ask themselves: To pressure or not to pressure the three-point shooter when he or she aims at the rim? Since we consider this study to be an exploratory one, we have to adopt a cautious approach in our attempt to implement the obtained findings, and therefore we assume that based on an analysis of only 382 shots, it would not be possible at this stage of inquiry to instruct defensive players to let three-point shooters shoot free of defensive pressure.

Limitations

There were three limitations to our study:

(a) The closeness of the defensive player from the three-point shooter. Expert coaches were the ones to classify the pressure/no-pressure game-shooting situations. Indeed, the coaches who participated in our study were experienced coaches who coached on the highest national level in Israel, as well as on the international level. Subsequently, their classification of the shots was based on this experience and knowledge. However, the validity of relying only on a short video clip showing the distance of the defensive player from the three-point shooter should be strengthened. In future studies it might be beneficial to take advantage of currently available advanced technology to measure a number of variables that strengthen the

classifications made by experts. Among these variables are the actual distance (in centimetres) between the defensive player and the shooter, and the time (in milliseconds/seconds) it takes for the shooter to release the ball.

(b) Level of pressure. We actually did not measure the level of pressure that the three-point shooters felt prior to the shooting act. Indeed, the closeness of the defensive player to the shooter can cause him or her to experience psychological pressure. However, psychological pressure can be induced by other factors as well, such as the level of anxiety of the shooter or his/her self-confidence. Although we analyzed the accuracy of shooting under various game conditions – among them the distance from the fans, the number of fans attending, and the score's margin, it is proposed that in future studies more information should be gathered on relevant factors associated with psychological pressure.

(c) The number of the analyzed shots. We analyzed 382 three-point shots in Phase 2 taken by elite players in a number of parts of one season in one local Division 1. In additional studies, three-point shots taken in several seasons and at different levels of competitive basketball should be analyzed. An analysis of a larger sample of shots may strengthen the findings of Phase 2.

Practical implications

Two practical implications are provided to basketball coaches based on the data that emerged from this two-study investigation:

(a) It is our contention that basketball coaches need to increase their awareness of specific game situations – those where players have some time to think about what they are going to do, as in the case of three-point shooters who find themselves shooting free of defense. We speculate that for some shooters it would be a real challenge to shoot successfully if they have time to think about what they are going to do or about the outcome of the act. For example, for those shooters who lack confidence in their shooting ability, are returning after an injury, or have to shoot in crucial moments of the game, the extra time they are given prior to the shooting act may negatively affect their mental state, such as their attention and self-confidence, and subsequently lead to poor performance.

(b) Coaches and sport psychology consultants should include task-enhancement physical and psychological routines in their practice sessions and training programmes that can be used when shooters have time to prepare themselves for the shot during an actual game. Since it was found in Phase 2 that under such situations shooting performance is hindered, these shooting situations cannot be left out of the practice. For example, coaches can teach their shooters routines to be used in a game situation where the shooter has some time for preparation for the three-point shot. Shooters should be aware first of internal distractions, such as negative thoughts, irrelevant thoughts, unpleasant emotions, and anxiety (see Keenan & Taylor, 2020), and then apply psychological routines they have learned (e.g., external focusing of attention, self-talk) which have the potential to facilitate performance (Lidor et al., 2013).

Notes

1. A field goal made from beyond the three-point line – a designated 7.24 m arc surrounding the centre of the basket.

Disclosure statement

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