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A Novel Approach to Investigating Basketball Expert's Perceptions of the Hot Hand

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The hot hand and psychological momentum (PM) are two closely related concepts that propose that previous success increases the chances of future success (Jackson & Mosurski, 1997). Statistical evidence for the existence of the hot hand or PM is mixed (Bar-Eli, Avugos, & Raab, 2006; Bocskocsky, Ezekowitz, & Stein, 2014; Sun, 2004). However players', coaches', and fans' perspectives show that PM or the hot hand is believed to be an extremely important aspect within sport (Gilovich, Tversky, & Vallone, 1985; Jones & Harwood, 2008). A key component of this phenomenon is the ability to predict future performance based on the appearance of momentum and this ability relies on human decision-making. The current study examined how the hot hand impacts human decision making by having collegiate level basketball players (N = 18) and coaches (N= 5) predict shot outcome while watching a taped college game. While the players and coaches were no more accurate than a random model at predicting shot outcome, they did outperform the random model when predicting shots taken by a hot shooter. The implications of basketball player and coaches relying on the hot hand when making decisions are discussed. Additionally, a positive correlation was seen between basketball expertise (number of years as player/coach) and prediction accuracy. This result and implications for future research to better understand how the hot hand is used to make decisions are discussed.

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The hot hand phenomenon, or similar permutations of the concept, has been studied in a variety of contexts. Croson and Sundali (2005) define the hot hand as a "belief in positive autocorrelations of a non-autocorrelated random sequence" (p.195) or the belief that a string of the same outcome increases the chances of the next event being the same, despite the fact that each outcome is independent and therefore has the same chance of occurring. For example, in a series of coin flips a person who has successfully predicted the outcome of the toss three times in a row may feel that they are able to predict the next outcome; they believe that they are "hot." This belief has been shown to exist in many different arenas. By using videotape of casino patrons' betting behavior while playing roulette, Croson and Sundali found that only 20% of players quit after winning. Players who have just won believe they are hot, and as such they continue to play despite the fact that their odds of winning the next round were exactly the same as the previous round. The belief in the hot hand is not isolated to betting. Individuals' behavior often follows the hot hand belief in a variety of settings, such as investment markets (Huber, Kirchler, & Stockl, 2010), foraging for food (Wilke & Barrett, 2009), and basketball (Gilovich, Vallone, & Tversky, 1985). Researchers posit that the hot hand belief represents a misconception of the laws of chance (Tversky & Kahneman, 1971) and patterns are seen where none exist in order to make sense of randomness. Sports represent a different context to study this phenomenon as the odds of winning, making a shot, or getting a base hit are more dynamic than placing bets at a casino.

The hot hand belief, or the idea of a "streaky" performance, has received considerable attention. A survey of professional basketball coaches, players, and fans by Gilovich et al. (1985) revealed that the hot hand influenced participants' perception of the game. They found that fans overestimated a player's chance of making their next shot if the player had made their previous shots. It also been found that competitive soccer players believe in the importance of being hot (Jones & Harwood, 2008), as do collegiate volleyball players (Miller & Weinberg, 1991). Research by Smisson, Burke, Joyner, Munkasy, and Blom (2007) sought to identify what events started a momentum (i.e., "hot") sequence. They found that the two-point lay-up, three-point shot, and crowd noise were the most commonly reported actions that participants, all of whom had basketball experience, believed created and sustained momentum. Similar research looking at tennis (Vallerand, Colavecchio, & Pelletier, 1988) and college basketball (Markman & Guenther, 2007) revealed that coming from behind was perceived as a catalyst for momentum. The hot hand is a well-established belief among sport fans and players, and across different sports, yet the benefits of the hot hand are still equivocal.

Research into the existence of athletes being "hot" is mixed (see Bar-Eli, Avugos, & Raab, 2006 for a review). A study of the Philadelphia 76ers' field goal data from one season by Gilovich et al. (1985) found no evidence for streaky or hot shooting. Player performances were compared to see if players had more streaks of hot nights than what a random model would predict. The streaks found were best explained by a random model. Studies of hitting streaks in baseball (Albright, 1993), three-point shooting in basketball (Koehler & Conley, 2003), hole-to-hole golf scores (Clark, 2005), and winning streaks in baseball and basketball (Vergin, 2000) have also found no evidence of hot or streaky performances. However, these results do not necessarily mean that a random model best describes the performance fluctuations seen in sport. Sun (2004) created a hot hand model to test whether a hot hand or the binomial model (i.e., random) best described fluctuations in performance. The hot hand model gave players a hot and a cold shooting percentage, which, when averaged, would result in the player's overall shooting percentage. Using the data from Gilovich et al. Sun ran 10,000 simulations with both the binomial and hot hand model. The results found the hot hand model to be more accurate in describing both individual player results and the results of the entire 16-player sample. Further complicating the debate over the existence of the hot hand is a recent study by Bocskocsky, Ezekowitz, and Stein (2014) who analyzed 83,000 shots from the 2012-2013 National Basketball Association season. Using optical tracking of player and ball movement they were able to create a model that accounted for shot difficulty based on the position a shot was taken from and the defense it was taken against. This model revealed that prior success did boost a player's shot percentage by 1.2 to 2.4 percentage points, a small but significant effect on player performance. Additional studies using new statistical models have found that golfers exhibit streaks that support the presence of the hot hand (Livingston, 2012; Savage, 2013). How players respond to recent positive or negative performance is a complex situation that depends on a number of psychological and physiological factors and it is likely that the right balance must be achieved in order for a link between momentum and performance to appear. The research to date has yet to clearly understand this phenomenon and the impact it has on performance.

Similar to the hot hand, psychological momentum (PM) has received much attention in the world of sport. PM is defined by Jackson and Mosurski (1997) as a change in the probability of success based on the previous trial. PM differs from the hot hand in that prior success can impact the probability of future success, as opposed to the assumed random nature of the hot hand phenomenon. This definition better represents the popular belief of sport fans, players, and coaches. Similar to the hot hand research, a strong belief in the benefit of possessing PM has been found (Demian, 2011; Jones & Harwood, 2008; & Miller & Weinberg, 1991). Jones and Harwood (2008) interviewed elite soccer players about the effect of PM on individual and team performance. They found that PM was perceived as very important to success and closely tied to confidence. As one player explained, "it's a massive confidence thing in that you've got momentum, you are feeling good about yourself and you have a good chance of performing to a high standard" (p. 64). The players identified PM as being positive or negative, and having positive PM led to better performance and a better chance of winning. Basketball players in-game behavior supports a strong belief in the positive effects of PM as basketball players perceived as hot shoot from further away even against tighter defenses, and are more likely to take the teams next shot (Bocskocsky et al., 2014).

It has been shown that players, coaches, and fans believe PM increases performance, yet research studying this connection is less than conclusive. Perreault, Vallerand, Montgomery, and Provencher (1998) manipulated PM during a stationary bicycle race and measured participant power output to determine if PM impacts performance. Participants who came from behind to tie (i.e., PM condition) generated significantly more power during the last minute of the race than those in the no-PM group. These results suggest that perceived PM may lead to an increase in effort. Additional studies have found that a previous success creates PM and this leads to improved performance and greater chance of future success (Bocskocsky et al., 2014; Gayton, Very, & Hearns, 1993; Jackson & Mosurski, 1997; Jordet, Hartman, & Vuijk, 2012; Richardson Adler, & Hankes, 1988; Silva, Hardy, & Crace, 1988). However, Kerick, Iso-Aloha, and Hatfield (2000) manipulated PM by altering the feedback on a rifle-shooting task and found that there was no influence on performance. Those given task-focused feedback after a successful shot reported feeling more PM than those who received feedback after a poor shot. Yet this perceived increase in PM failed to increase rifle shooters performance. Belief in PM by coaches, players, and the general population is without question, yet the performance benefits of possessing momentum remain unclear.

If the hot hand or PM were to exist within a sporting context, the ability to notice these phenomena would be advantageous to athletes and coaches. A key component of this phenomenon is the ability to predict future performance based on the appearance of momentum and this ability relies on human decision-making. Wilson (2003) and Dijksterhuis and Nordgren (2006) break human-decision making into two pathways: conscious and unconscious. Unconscious and intuitive decisions signify a decision that comes about with little or no awareness to the cues that led to such a decision (Kahneman & Klein, 2009). Dreyfus and Dreyfus (2005) argue that accurate intuition is the hallmark of expertise as an accurate intuitive decision happens so quickly that it requires a great deal of prior experience that only an expert would possess. Intuition thus differs from an instinct in that it represents a learned behavior that is gained from studying past environments (Hogarth, 2010). Research has supported this claim in finding that experts are able to more efficiently pick up cues from the environment and use these cues to make quick, accurate decisions (Chassy & Gobet, 2011; Gobet & Simon, 1998, 2000; Simon & Chase, 1973). The strong gut feelings sport fans, players, and coaches get while watching a game may be another manifestation of expert intuition. Players, coaches and even fans who have spent many years studying their sport may have gained enough experience to become "experts." This expertise allows insight into the specifics of the sport environment, including noticing players who are hot or have momentum, and this information intuitively leads to strong gut feelings about outcome.

The purpose of this study was to test the notion that the ability to notice a hot performance is a manifestation of expert decision-making. It was hypothesized that basketball experts would make more accurate performance predictions than a random model and that the participants would better predict the outcomes of a hot performer. A third set of hypotheses included that successful predictions would have a positive correlation with: expertise, confidence, "gut feeling," and trait mindfulness. Although the phenomenon studied (i.e. streaky performance) may be best defined as PM, the hot hand will be used throughout the paper due to the widespread use of this term among population sampled (i.e., basketball players and coaches).

Method

Participants

Participants were basketball experts (N = 23) located in the greater San Francisco bay area. A basketball expert was defined as a current or former player or coach who played or coached at the collegiate level or higher. Participants were required to be over the age of 18 in order to participate. Fourteen college teams and coaching staffs, four camps, one pro-am league, and six former players were contacted via email and phone. Five coaches and 18 players participated (10 women, 13 men, *M* age = 23.16 years, age range: 18-42 years). These participants averaged 4.78 years of experience (*SD* = 5.28) with a range of zero - 19 years. Four participants did not report their age. Table 1 provides further demographic variables for the participants. In addition, participants were asked if they had attended either Syracuse or BYU (i.e., the two schools competing in the video shown), or considered themselves serious fans of either school's basketball team. No participants reported ever being affiliated with either BYU or Syracuse. Two participants reported being serious of fans of either BYU or Syracuse, however this did not seem to affect their responses as their number of correct predictions was within a standard deviation of the other participants' predictions. Three 50-dollar gift cards were raffled away to those who participated as an incentive for participation.

Table 1

Demographic Information

Demographic characteristics	*n*
Gender	
Female	10
Male	13
Ethnicity	
American Indian or Alaska Native	1
Asian or Asian American	1
Black or African American	10
Hispanic or Latino	1
Non-Hispanic White	9
Multiracial	1
Current Experience	
NCAA D-1 player	9
NAIA	8
Junior college coach	1
High school coach	1
D-II Coach	2
NAIA Coach	1
Former Experience	
Junior college player	2
NAIA Player	1
NCAA D-I player	1
NCAA D-II Player	1
NCAA D-III Player	1
Former College Player	1
International Professional	1

Instruments

Pretest data. A single background questionnaire was used to collect pre-test information on a number of variables, including demographic information, expertise, participants' confidence in predicting shots, and trait mindfulness.

Expertise. Participant expertise was measured by the number of combined years of experience either playing or coaching competitively since the age of 18. The age of 18 was used as a cut off to exclude high school basketball experience due to the fact that many high school teams do not break down film of games, and thus are not necessarily getting the same amount of basketball experience.

Shot prediction confidence. Participants were asked to rank their level of confidence in predicting whether a player makes or misses a shot while watching a taped basketball game on a scale from one ("not confident at all") to 10 ("extremely confident") as part of the background questionnaire.

Mindfulness. Participants completed the trait version of the Mindful Attention Awareness Scale to assess their trait level of mindfulness (MAAS; Brown & Ryan, 2003). The MAAS consists of 15 statements that present a different daily experience that assesses to what degree a participant is focused in the moment (e.g., "I find it difficult to stay focused on what's happening in the present"). Participants respond to how frequently they experience each of these experiences in their daily lives from one ("almost always") to six ("almost never"). The scale is scored by averaging each participant's score; a higher score reflects a higher level of dispositional or trait mindfulness. The MAAS has been found to have high internal consistency with a student population ($\alpha = .82$), general population ($\alpha = .87$), and also possesses high test-retest reliability (Brown & Ryan, 2003).

Prediction data. Prediction data was gathered by having participants circle yes (i.e., made) or no (i.e., miss) for 28 jump shots taken during the first half of game from the first round of 2004 National Collegiate Athletic Association (NCAA) basketball championship tournament. The first half of a game between Brigham Young University (BYU) and Syracuse University (SU) was chosen due to availability, date of the game, and high number of jump shots taken. It was assumed that participants would not remember the outcome of the shots taken during the first half as this was not a championship. In addition, this half was chosen due to the performance Syracuse's Gerry McNamara. McNamara made all six of his three-point attempts in the first half and ended the half with 27 points. It is reasonable to assume that this performance would be considered "hot" by many basketball players and coaches. McNamara's shots were used to examine if participants would notice a "hot" performance.

Consent was gained to use the video for research purposes from the NCAA through the company Thought Equity Motion. "T3Media (formerly Thought Equity Motion) offers cloud-based storage, access and licensing for enterprise-scale video libraries." (T3Media, 2012). T3Media provided footage in standard definition and with their company watermark in the middle of the screen. A pilot study confirmed that the low quality and watermark did not hinder the ability of participants to see and understand what was happening in the game.

The stock footage was edited to show just actual game footage. All free throws and dead time were removed. The goal of editing was to show participants just the game footage from which to make their predictions. Finally, the video was edited to introduce a still frame showing each jump shot prior to release. For the purpose of this study a jump shot was defined as any shot where the player squared up to the basket and jumped prior to releasing the ball. Hook shots and "floaters" were not used because these shots are taken from close range of the basket and have a higher percentage of success. Each still frame was displayed for four seconds to allow time for prediction before the video resumed playing. A pilot study was run and four seconds was determined to be an appropriate amount of time. Each still frame was inserted seamlessly into the footage so that after the four second pause the video would resume and participants were given immediate feedback as to whether they had gotten their prediction right. The video ran for 22 minutes and 51 seconds.

Control data. Control data was calculated using a random model. A standard six-sided die was used to create random outcomes; an even roll represented a make and an odd role was a miss. A die was physically rolled 644 times to equal the number of predictions by participants (i.e., 28 shots * 23 participants), outcomes were recorded into a spreadsheet before being converted into makes (Y) and misses (N).

Post-test data collection.

Post-confidence & gut feeling. The participant's post-confidence ratings were collected using the same confidence scale used to measure pre-confidence. Participants were also asked to rate to what degree they made predictions trusting their gut instinct on a scale from one ("not at all") to 10 ("completely").

Prediction factors. Participants were asked to circle all factors that impacted their predictions. The following factors were listed in addition to three blank spaces for participants to list other factors: defense, open look, player is hot or feeling it, good shooter, team had the momentum, player was cold, or instinct/gut feeling.

Hot hand opinion. Finally participants were asked to answer an open ended question in which participants were asked to explain what impact, if any, being hot or having a hot hand has on a player's performance during a basketball game.

Procedure

Participants who voluntarily consented to participate were met on their campus, office, or team room to complete data collection. The study was completed either one-on-one, or in a small group consisting of two to nine participants. After completing the consent form, participants were given a folder containing questionnaires and response forms. They were asked to begin by filling out all the pretest information.

After all participants completed the pretest forms, instructions for the video and shot prediction portion of the study were given. The participants were given instructions in writing and verbally about the video and how to predict the outcome of the shots (i.e., circle yes or no on the form when the video pauses). Participants were told they would have four seconds to predict and that they should trust their gut feeling when predicting and try not to worry if they thought a player should or should not make the shot. If they were unable to predict prior to the video resuming they were told to not make a prediction and that the blank would not be counted against their overall score. It was explained that not all shots would pause (i.e., layups) and that they should only predict shots that paused. Finally, participants were told to stay focused on the game and not try to score their results. If they wanted their score they could receive it at the end of the study. At this point the group or individual was asked if they had any questions. If participants had no questions, the video was shown either on laptop or on a projection screen. Participants circled yes (make) or no (miss) for each shot that paused on the form provided. After completing their predictions, participants were asked to complete the final questionnaire.

Data analysis

A two-tailed independent samples t-test was run to test the difference between the participant and control conditions' ability to predict the outcome of shots. A Chi-square test was run to determine if a significant difference existed in the number of correct predictions for each of McNamara's shots between the participants and control condition. Correlations were run between the participants' number of correct predictions and expertise, pre-confidence, post- confidence, MAAS, and gut feeling scores. All significance levels were set at $p < .05$.

Participants' responses to the open-ended item regarding participants' perceptions, if any, of the effects of a "hot" player were analyzed using content analysis of the responses. Two of the researchers developed codes independently based on the participants' responses and then met to come to an agreement on the coding structure. Once the codes were created, the two researchers then coded the responses using this structure and again compared results. Any disagreements were discussed, and frequency counts were used to identify how prevalent the codes were.

Results

Predictions

Participant predictions were compared to predictions made following a random model of prediction. A t-test was run to compare the number of correct predictions of participants (M = 14.48, SD = 3.06) and the control condition (M = 13.48, SD = 2.19), the results showed no significant difference between the two groups $t(44) = 1.275$, $p = .083$. A t-test comparing the number of correct predictions for males ($N = 13$, M = 15.15, SD = 3.05) and females (N = 10, M = 13.60, SD = 2.99) was also not significant, $t(21) = 1.221$, $p = .886$.

The five coaches averaged 17.4 (SD = 2.30) correct predictions with a range of correct predictions of 15-20. The 18 players averaged 13.67 (SD = 2.77) correct predictions with a range of correct predictions of nine to 19. Due to the large difference in group size, these two groups' scores were not directly compared.

A t-test comparing the number of correct predictions for McNamara's six shots by the participant (M = 3.348, SD = 1.335) and control condition (M= 3.044, SD = 1.364) groups was shown to be not significant, $t(44) = .765$, $p = .512$. However, results of the chi-square analysis showed that there were significantly more correct predictions by the participants when compared with the control condition for McNamara's fifth and sixth shots of the half $\chi^2(1, N = 46) = 9.583$, $p = .002$ (Figure 1).

Correlations

Participants' expertise was found to have a strong positive correlation with the number of correct predictions [$r(21) = .612$, $p = .002$] and participants' post predictions confidence ratings were also positively correlated with the number of correct predictions [$r(21) =. 552$, $p = .006$]. Pre-confidence [$r(21) = .059$, $p = .793$], trait mindfulness as measured by the MAAS [$r(21) = .242$, $p = .265$], and gut feeling [$r(21) = -.070$, $p = .749$] were not significantly correlated with correct predictions.

Participants' post-confidence rating was significantly correlated with correct prediction of McNamara's six shots [$r(21) = .666$, $p = .001$]. Expertise [$r(21) = .321$, $p = .136$], pre-confidence rating [$r(20) = .078$, $p = .730$], MAAS [$r(21) = .214$, $p = .326$], and gut feeling [$r(21) = .075$, $p = .735$] were not significantly correlated with participants' ability to predict McNamara's shots.

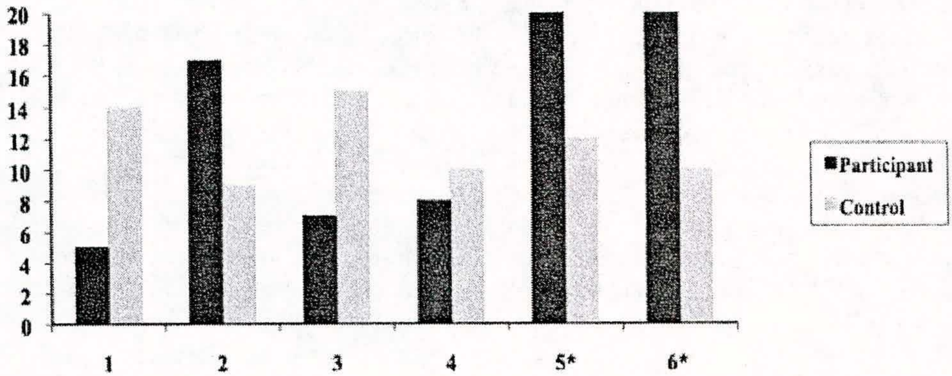

Figure 1. Number of correct predictions, out of 23, for McNamara's six jump shots between participant (basketball experts) and control condition (random model).
Note. Series marked with * possess a significant difference between the two groups.

Table 2

Qualitative responses and categories

Categories	Level One	Level Two
Player (n = 36)	Increase confidence (n = 17)	Take more difficult shots (n = 1) Decrease in conscious thought (n = 1)
	Increase performance (n = 9) Decrease conscious thought (n = 4) No change in performance (n = 1) Increase number of shots (n = 1) Poor shot selection (n = 1) Relax (n =1) Confident (n = 1) Impacts performance (n = 1)	
Same Team (n = 9)	Offensive adjustment (n = 5)	Increase hot player ball touches (n = 5)
	Increase confidence (n = 2) Increase performance (n = 1) Creates opportunities (n = 1)	
Opposing Team (n = 1)	Defensive adjustment (n = 1)	Increase impact with start player (n = 1)
Game (n = 5)	Changes game play (n = 1) Confidence is important (n = 1)	

Note. Data are reported as the number of the times the code or category appeared in the participants' responses.

Qualitative data

Responses to the prompt "what impact, if any, does the hot hand have on a player's performance during a game?" were separated into 56 meaningful units (MUs). These MUs were assigned to four categories that could be affected by a hot performance: *player* (refers to a hot player), *same team* (refers to the hot player's team), *opposing team* (refers to team opposing the hot player), and *game* (refers to the game, without specific focus on either team or the player). The MUs were then assigned a second and third level code to further describe the subject of the MU. There were 36 MUs assigned to the *player* category, nine to the *same team* category, one to *opposing team*, and five were assigned to the *game* category (four MUs were judged to not be relevant and were discarded). Table 2 provides a breakdown of all the codes.

Discussion

The current study's purpose was to compare basketball experts' decision-making ability to a random model, explore the impact the hot hand has on their decision making, and explore if various participant characteristics were related to their ability to accurately predict the performance. Basketball experts were not found to predict shots significantly better than the control condition, which randomly created predictions. However, a significant difference was seen between basketball experts' predictions and the control condition when looking at the six shots taken by the hot shooter; specifically the experts were able notice that the player had gotten "hot" and predicted the fifth and sixth shot more accurately. This finding supports the notion that the experts' predictions were influenced by the hot hand belief. Qualitative results further suggested the strong influence the hot hand belief has on in-game decision making. Finally, a significant correlation was found between the participants' level of expertise and the number of correct predictions.

The hot hand or PM is defined as the belief that a series of successful outcomes increases a player's chance of being successful in the future (Gilovich et al., 1985). One of the main findings of the current study was that of the participants' ability to better predict the final two shots in a hot sequence when compared with the control condition. A possible explanation for this finding is that the participants were able to pick up on the performer's hot hand and used this perception to guide their decision making on his final two shots of the half. Research by Burke, Burke, and Joyner (1999), Markman and Guenther (2007), and Smisson et al. (2007) have found that the three-point shot is a common catalyst for momentum. McNamara made all six of his shots in the clip and all six were three-point attempts. This may have led participants to perceive McNamara as being hot (i.e., possessing momentum), which then led to the participants outperforming the random model on his fifth and sixth shots. This finding further supports prior research that has shown that players and coaches believe in the positive effects of momentum (Burke, 1995; Demian, 2011; Jones & Harwood, 2008; Markman & Guenther, 2007; Miller & Weinberg, 1991). Though there are conflicting results in the literature, "streaky," or "hot" performances have been statistically observed (Bocskocsky, et al., 2014; Livingston, 2012; Savage, 2013; Sun, 2004). These results combined with the results from the present study suggest that the basketball experts may have picked up on more than a pattern in outcomes when predicting McNamara's shots. The basketball experts in the current study may have identified a hot performance, concluded it would continue, and used this insight to predict the final two shots more accurately than the control condition.

Previous research has shown that experts are accurate in making quick snap predictions or judgments (Ambady & Rosenthal, 1993; Dijksterhuis, Bos, Van der Leij, and Van Baaren, 2009; Ekman & O'Sullivan, 1999; Reyna & Lloyd, 2006; Wilson & Schooler, 1991). This study did not find this to be true as the "experts" were unable to predict basketball shots more successfully than a random model. Dijksterhuis et al. (2009), Mikels, Maglio, Reed, and Kaplowitz (2011), and Wilson and Schooler (1991) have found that conscious thought impedes accurate decision-making when the decision is complex. For instance, Dijksterhuis et al. found that soccer experts who thought unconsciously successfully predicted more games correctly than experts who predicted immediately or after conscious deliberation. Through experience, experts have gained the necessary skills to intuitively detect the important components of a situation, which enables them to accurately predict, and conscious thought inhibits this intuitive process. Predicting basketball shots represents a complex decision, with many variables impacting each prediction. One possible reason for the experts in the present study not predicting accurately is that participants had four seconds to circle their prediction, which may have allowed them time to consciously decide and this may have led to less accurate predictions. In addition, many of the participants were relatively inexperienced and may have not acquired the knowledge and experience necessary to make accurate predictions. In support of this notion, a significant correlation was seen between level of expertise and the number of correct predictions. Gobet and Simon (2000) studied how master chess players are able to make accurate snap predictions after briefly glimpsing a chessboard, an ability novice players are unable to replicate. The importance of expertise in predicting has been replicated in other studies (Dijksterhuis et al., 2009; Ekman & O'Sullivan, 1999; Kahneman & Klein, 2009; Simon & Chase, 1973). These snap predictions represent the true skill of the experts to be able to recognize the important characteristics of a situation and use this to predict what will happen. The importance of experience is supported in the common belief that veteran leadership from both coaches and players is an important aspect of team success. Veterans have, through their increased experience, learned more about their particular environment and will subsequently be better able to make more accurate snap decisions in each moment. Similarly, it is important for coaches to take steps to prepare their teams and players for future situations so that less experienced players will be able to learn the dynamics of the environment that will lead to better decisions and better performance by the team. This supports the use of film sessions and discussion as a tool to accelerate learning by sharing knowledge between coaches and players. In addition, coaches should construct practices in a way that players will experience game-like situations as much as possible, so that the experience they gain in practice can be translated to the game.

Another tool that could be utilized to increase individuals' decision making is imagery. Imagery has long been used as a way to prepare athletes for situations that are hard to recreate in practice. Helping players identify the critical cues in game can be aided by the systematic practicing of imagery. Sport psychology professionals can work with coaches to craft an effective script that contains the appropriate cues and experiences for each player. For example, a rookie point guard can use imagery to prepare to face a press defense. Using imagery in addition to studying film of the opposing team and practicing against press in practice will give the player additional experience, which may lead the player to feel more confident and make better decisions when they face the press defense.

The qualitative responses from the present study support previous research showing that players and coaches decisions are influenced by the hot hand (Bocskocsky et al., 2014; Gilovich et al., 1985; Mace, Lalli, Shea, & Nevin, 1992). The responses showed that the influence of the hot hand extends beyond individual players to impact both teams on the court. Teams with the hot shooter want to get them the ball, while the opposing team wants to prevent the hot shooter from touching the ball. Additionally, when looking at an individual player's hot performance the responses showed that one critical benefit of the hot hand was an increase in confidence. This reinforces previous findings that found a relationship between confidence, PM, and a perceived increase in performance (Gernigon, Briki, & Eykens, 2010; Miller & Weinverg, 1991). This is further supported by Bandura's (1982) assertion that self-efficacy is strongly influenced by performance accomplishments. One explanation for the perceived benefit of past performance is that players feel a sense of increased confidence based on their prior success, and this confidence impacts future performance. Additionally, participant confidence was likely influenced by immediately seeing the outcome of their predictions. This is supported with the correlation that was found between the number of correct predictions and participants' post-confidence rating. Future studies are needed to explore whether prediction confidence impacts prediction accuracy. For instance, a future study could measure the impact confidence has on prediction accuracy by manipulating participant confidence by providing false outcomes to their predictions. Finally, responses in the current study also revealed that the hot hand led to a perceived increase in performance and a decrease in conscious thought, which helped the hot shooter shoot more freely.

The present findings, coupled with the previous research, indicate that the hot hand is perceived as real by many players and coaches and these "experts" may possess the ability to recognize this phenomenon. Though the statistical existence of hot hand remains unclear (Albright, 1993; Bocskocsky et al., 2014; Gayton, et al., 1993; Gilovich et al., 1985; Koehler & Conley, 2003; Livingston, 2012; Richardson et al., 1988; Savage, 2013; Sun, 2004; Vergin, 2000), what is clear is that players and coaches believe in the positive impact that being hot has on individual and team performance (Bocskocsky, et al., 2014; Demian, 2011; Gilovich, et al., 1985; Jones & Harwood, 2008; Miller & Weinberg, 1991; Perreault, et al., 1998; Richardson, et al., 1988). As such, it is important that individuals working with coaches and players are aware of these beliefs. Trying to argue against the hot hand runs the risk of alienating coaches, players and teams. The hot hand or PM, regardless of the labeling as a "fallacy" by many statisticians and researchers, influences game decisions from both players (e.g., shooting more) and coaches (e.g., adjusting offense and defense).

This study is not without limitations. While steps were taken to ensure participants did not recall outcomes of specific shots it is possible that some of the participants did remember portions of the half-shown. The video used was shot in standard definition with a watermark in the center of the video. Though results from a pilot study showed that the video quality was sufficient at certain points the game may have been difficult to follow due to the watermark and video quality. Additionally, the study sample was inexperienced as many of the participants were in their first or second year of college. The study would be further strengthened by adding a third group of participants with no basketball experience, which would help to understand if basketball experts are able to see subtle cues in basketball that lead to more accurate predictions. Additionally, larger sample sizes would yield more confidence in the findings.

The study may have not accurately measured whether participants made decisions based on their gut feeling because they had four seconds to predict each shot outcome and during this time one could have thought consciously about shot outcome. Shortening the length of time the shot was shown combined with having participants provide their predictions verbally and thereby decreasing the time needed for judgments could provide a truer test of a gut feeling.

Future Directions

Through both quantitative and qualitative research the hot hand, PM, and human decision-making are all becoming better understood, but there is still much to explore. Basketball provides an excellent environment to study intuitive decision making and can be used in future studies to further examine the hot hand (Hogarth, 2010; Kahneman &

Klein, 2009). A potential future study could compare a sample of basketball experts (with experience beyond college), a sample of novice participants, and a random models ability to predict shot outcome based only on seeing the player receive the ball, rise and release. By taking out outcome, participants will be forced to predict based only on pre-shot cues in the player's form. If experts are able to outperform other groups it will provide proof that experts are able to detect subtle cues and this detection allows them to not only pick up on the hot hand but also use it to accurately predict shot outcome. In addition, measures that can be employed which decrease the time participants have to make their prediction should be explored as this will more closely mirror intuitions that coaches, players, and fans feel during games and will limit any conscious analysis participants may engage in. Gaining insight into the role past performance has on future performance has broad implications beyond just sport performance. If PM leads to detectable improvements in performance it will substantiate the long held belief that the mind and body work together to achieve top performance, not just in sports, but in all aspects of human performance.

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