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Cognitive Biases in Sports: Examining Their Influence on Athletic Decision-Making

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Abstract

Traditional economic theory has long relied on the notion of rationality, which assumes that individuals will always make decisions leading to the optimal level of benefit or utility for themselves. However, behavioural economics, a subfield of economics, proposes that decision-making is not always rational, as emotions and cognitive biases influence it. In line with this, the dual processing system highlights how decisions may be made via one of two systems: the first characterised by relatively fast and nonconscious decision-making and the latter by slower and more conscious thinking. This research paper extends the literature on behavioural economics into the realm of sports, as it is a context where time is of the essence, and decisions need to be made on the spot. Primary research was conducted among a group of amateur athletes. The findings suggest that cognitive biases, including availability heuristic, anchoring bias, sunk cost fallacy, and framing bias, among others, influence the decisions made by athletes. The paper also proposes methods to overcome these biases.

Keywords: Behavioral economics, Decision making, Cognitive Biases, Sports

Introduction

Passing the ball is a fundamental aspect of basketball, but on January 6th, 2013, Kobe Bryant did not pass the ball. One must wonder why this decision was made.

Decision-making is the process of identifying multiple courses of action and carefully selecting an appropriate action in a given situation (Sheldon, Burns, and Brush, 2020). Traditional economics assumes that individuals are rational people who make decisions by maximising utility based on all available information. This model presumes that people weigh the costs and benefits of each option logically and choose the one with the highest expected outcome. However, Behavioral Economics challenges this view by incorporating psychological insights into economic theories. In their paper, Prospect Theory: An Analysis of Decision under Risk, Kahnemann and Tversky (1979) lay the foundation for behavioural economics by suggesting that psychological phenomena, such as cognitive biases and emotional influences, affect decision-making and must be incorporated into economic and financial models.

The approach taken to decision-making is based on several factors, and time, with regard to biases, will be a key factor that is examined in this paper. Cognitive biases become more pronounced when decisions need to be made quickly, as is often the case in sports. Under extreme time constraints, athletes might rely more heavily on intuitive judgments rather than deliberate reasoning, heightening the effect of cognitive biases (Miller, 1960; Payne et al., 1993). Understanding the behaviour of athletes is crucial, not only for comprehending past incidents but also for improving future decision-making in sports. This brings us to the central research question of this study: "**To what extent do cognitive biases affect the decision-mak-**

ing of athletes?"

By investigating this question, this research paper aims to explore myriad biases that affect the behaviour and decision-making of athletes, using both primary and secondary data, providing valuable insights for coaches, players, and sports psychologists.

Literature Review

For years, rationality has been studied as the root of each decision. In 1776, Adam Smith studied this concept, and in the process, he developed a new theory – the rational actor/choice theory. The rational actor theory, a cornerstone of traditional economics, puts forth the idea that individuals carefully choose the best possible option when presented with a multitude of choices, consistently minimising losses (Ganti, 2024). This theory holds the assumption that individuals will have perfect knowledge and the necessary ability to process the information. So, it conjectures that decision-making is a fully systematic and calculative process where each action is carefully examined (Becker, 1976).

As Adam Smith had shown, minimising losses was something that individuals considered very important and concepts that spoke about minimising losses (loss aversion) were later popularised in a new field of study - behavioural economics. The psychology of human decisions and economic behaviour had been studied prior in works such as John Maynard Keynes' (1936) "The General Theory", which introduced the concept of animal spirits driving economic decisions, and George Katona's (1977) "Psychological Analysis of Economic Behavior", which focused on the psychology of consumer behaviour and their expectations. However, Richard Thaler, Daniel Kahnemann and Amos Tversky are known to be the founding fathers of this new form of economics and the ones who introduced behavioural economics in the broader space (Svorenčík et al., 2022). Behavioural economics combines elements of economics and psychology to understand how and why people behave and make decisions the way they do in the real world, sometimes in an irrational manner (Witynski, 2021). Whilst the introduction of this field was not easy, with many in the economist community questioning its legitimacy (Gilad, Kaish and Loeb, 1984), today, behavioural economics provides vital knowledge and theories used by economists worldwide to understand the reasoning behind decisions that appear peculiar in light of rationality.

Daniel Kahneman, who won a Nobel prize in 2022 for his work on behavioural economics, studied the 'dual-system model' (Pilat and Krastev, 2020) extensively. Dual-system theory describes two modes of decision-making. System 1 is fast, automatic and emotional; it relies heavily on heuristics and past experiences. This system is used more frequently because it requires less cognitive effort, which allows for quick judgments and responses in everyday situations. In contrast, System 2 is the slow, deliberate, and more rational way of thinking, requiring more analytic and logical processing of information (Pettinger, 2024). Understanding these systems explains why people often make quick, irrational decisions. Kahnemann discussed this model in his book "Thinking, Fast and Slow" (Kahneman, 2011).

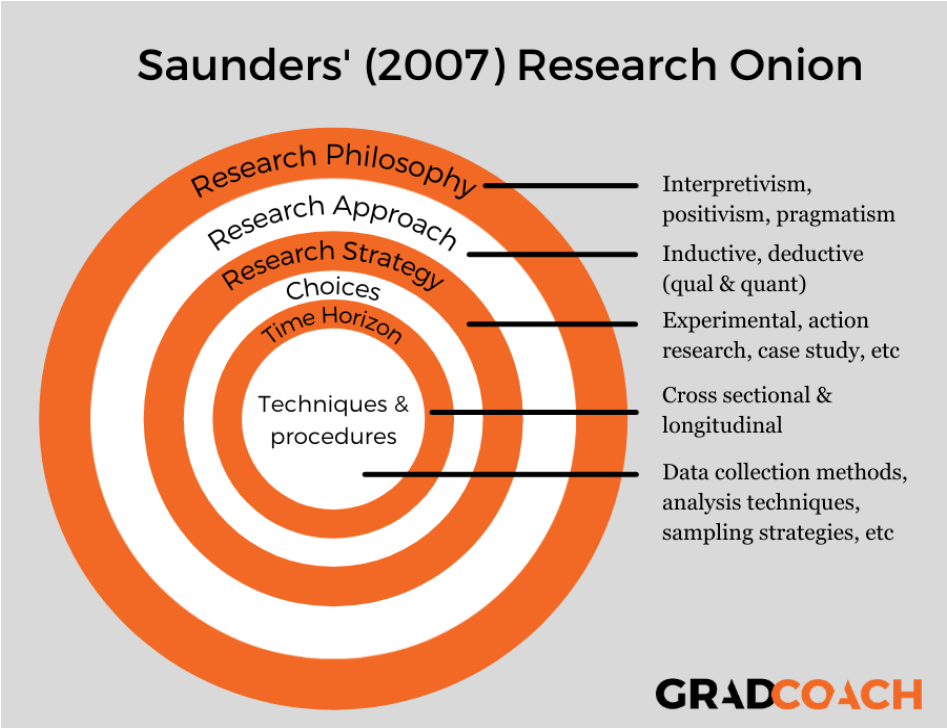
System 1 focuses on heuristics and biases, which are our daily way of thinking, but what are heuristics and biases? When we read articles that support our beliefs and skip ones that don't, or learn a little about a topic and then assume we know all there is to know about it, we are actively using a cognitive bias - a deviation from the rationale and logic applied in day-to-day life. Cognitive biases are present in every human being and are the reason for irrational decisions. In line with this, prospect theory, developed by Kahneman and Tversky in 1979, explores decision-making under risk, challenging the traditional rational actor theory, which assumes individuals always maximise utility. The theory highlights loss aversion, where losses are felt more strongly in comparison to gains, leading to cognitive biases such as the

endowment effect and status quo bias (Kahneman & Tversky, 1979). These biases make individuals overvalue their possessions and resist change, showing irrational behaviour in decision-making. Richard Thaler's work on behavioural economics further supports prospect theory by examining how real-life decisions often deviate from rational models due to these biases (Thaler, 1980).

When evaluating decision-making, time is a significant influencing factor. For instance, in sports, athletes are required to make almost split-second decisions that can decide the ultimate outcome of the game. As mentioned before, biases exist in everyone, including athletes. However, since athletes experience the pressure of time during play, it is more likely for biases to impact their decision-making and for the System 2 model of thinking to be almost non-existent, as every decision they take must be impulsive (Roberts, Teoh and Hutcherson, 2021). This reliance on quick, instinctive responses from system 1 amplifies the effects of cognitive biases, as athletes may default to familiar patterns of thought and action under pressure, which is studied in the succeeding part of this paper.

Research Methodology

To ensure a thorough methodology for this study, the research onion by Saunders et al. (2007) will be used as it encourages the researchers to make different decisions with regard to developing the appropriate methodology by working from the outside of the onion to inwards. A sample image of the research onion is below:



Research Philosophy

The first layer of the research onion is the research philosophy, which refers to the set of beliefs the research is built upon. The three main research philosophies are positivism, interpretivism and pragmatism. Research philosophies will vary based on the goals of the study and the manner that would be deemed best to achieve these goals. This study will adopt an interpretivist philosophy as it focuses on understanding the subjective meanings and experiences of the athletes.

Research Approach

The second layer of the research onion considers the research approach, which refers to the broader method that will be used in the study. The two approaches that are recognised at this stage are inductive and deductive. This paper will employ an inductive approach, which involves collecting data and then developing theories or themes based on the data analysis. Furthermore, an inductive approach aligns well with interpretivism.

Research Strategy

This layer of the research onion details how research can be conducted based on the study's aims. This study uses a grounded method to conduct research effectively. The strategy of grounded theory is deemed an appropriate choice for this paper as it aids in developing theories based on data collected from participants, which aligns with the aim of this paper, i.e., to understand biases in decision-making through primary data.

Research Choice

The fourth layer of the onion deals with the research choice: how many data types are being used in the research. Out of mono, mixed, or multi-method, while the survey will pursue a mixed-method approach whereby both qualitative and quantitative findings are gathered, all responses will ultimately be converted to qualitative findings to perform further analysis.

Time Horizon

The fifth layer of the onion deals with the time horizon. The time horizon describes how many points in time the data collection is done. The two options available are cross-sectional and longitudinal, wherein the former relates to data collected at a certain point in time, whereas the latter is concerned with data collection over multiple points in time. This study will use the cross-sectional method since participants are giving their results to a survey at a particular time rather than at multiple points in time.

Techniques and Procedure

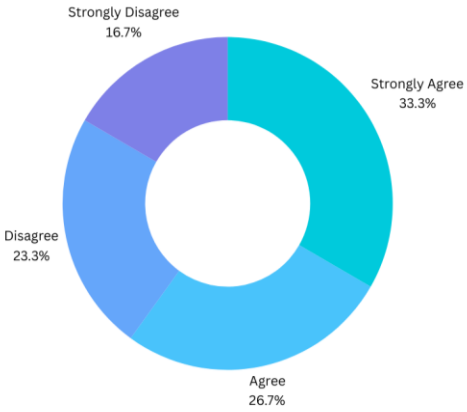
The sixth and final layer of the onion relates to the techniques and procedures used in this study. This study intends to collect primary research to gauge the influence of biases on the decision-making of athletes by creating and sharing a questionnaire with 30 amateur sporting personnel. Further elaborating on this, to ensure that no bias is present, the athletes will be associated with a range of sports, including Basketball, Cricket, Football, Tennis and Golf. Moreover, in the context of this study, ‘amateur’ is defined as athletes who participate in sports primarily for enjoyment, health, and passion rather than for financial gain or professional status.

The survey's design will include both open-ended and close-ended questions to obtain a comprehensive and multifaceted view of the responses. Furthermore, the method chosen to analyze the qualitative data is thematic analysis. Thematic analysis is a popular analytical framework choice in psychology given its ability to identify patterns within data collected from multiple participants, which is essential for this study.

Data Coding

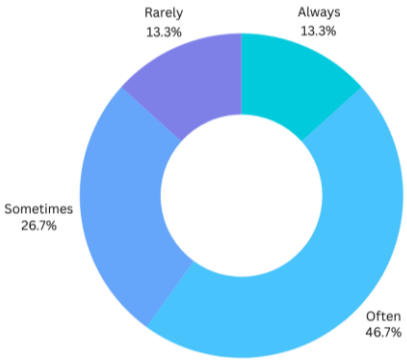
Code 1 - Greater Tendency for More Conservative Play While Leading in a Gamee (Derived from the following question: On a scale of 1 to 10, how much do you agree with the following statement: "I

often play more conservatively when my team is leading by a small margin")



Possible responses	Number of the participants
Strongly Agree	10
Agree	8
Disagree	7
Strongly Disagree	5

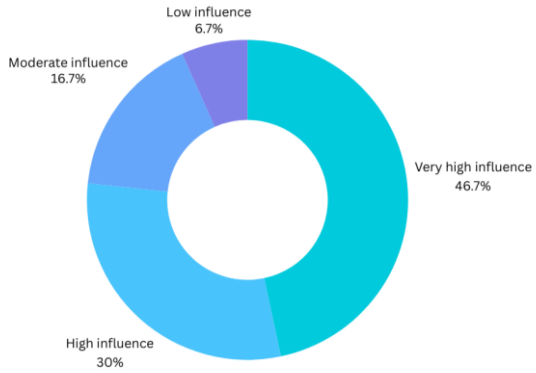
Code 2 - High Reliance on Past Performance for Decisions (Derived from the following question: How often do you rely on your past performance to make decisions during a game?)



Possible responses	Number of the participants
Always	4
Often	14
Sometimes	8
Rarely	4

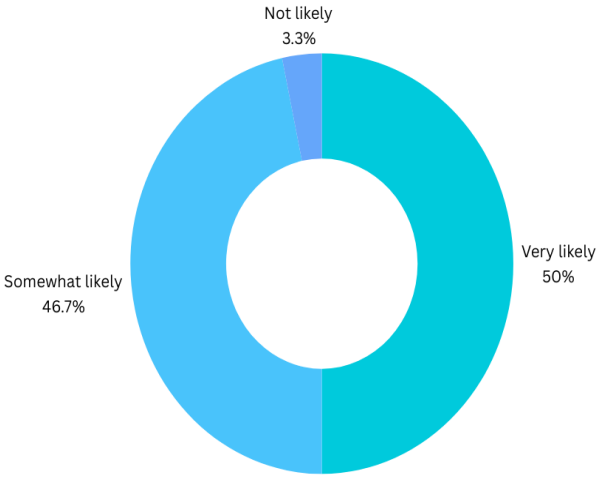
Never	0

Code 3 - Significant Influence of Early Performance on Later Decisions (Derived from the following question: On a scale of 1 to 10, how much does your performance in the first part of the game influence your decisions in the latter part?)



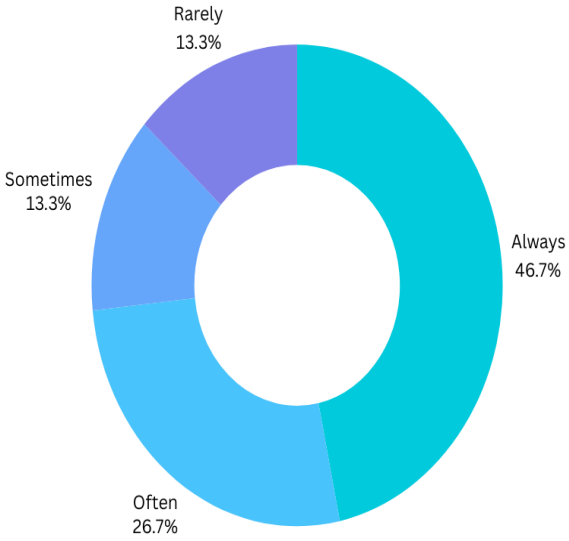
Possible responses	Number of the participants
Very high Influence	14
High influence	9
Moderate Influence	5
Low Influence	2

Code 4 - High Likelihood of Repeating a Successful Play in Different Gaming Circumstances (Derived from the following question: How likely are you to try a play that recently worked well, even if the circumstances differ?)



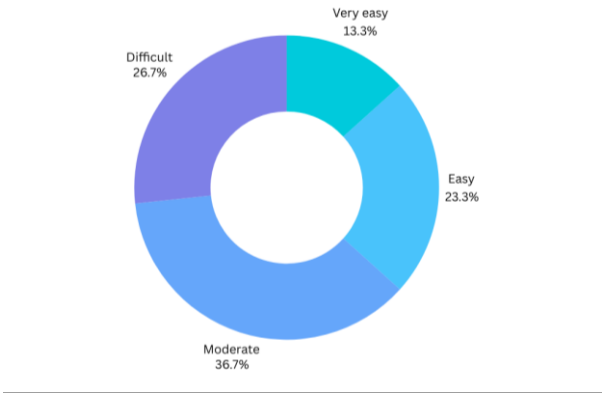
Possible responses	Number of the participants
Very Likely	15
Somewhat likely	14
Not Likely	1

Code 5 - High Tendency for Game Situation Descriptions to Impact Decision-Making (Derived from the following question: How often does the way a game situation is described to you (e.g., "must-win") affect your decision-making?)



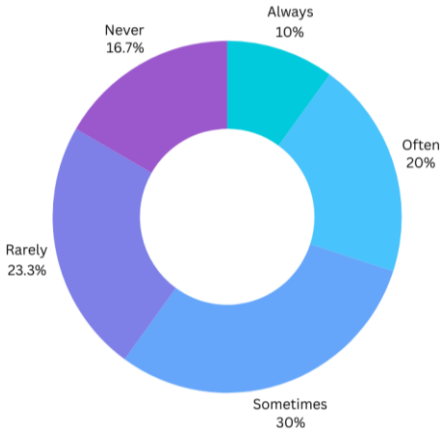
Possible responses	Number of the participants
Always	14
Often	8
Sometimes	4
Rarely	4
Never	0

Code 6 - Difficulty in Switching Strategies During a Game (Derived from the following question: On a scale of 1 to 10, how difficult is it for you to switch strategies or positions during a game?)



Possible responses	Number of the participants
Very easy	4
Easy	7
Moderate	11
Difficult	8

Code 7 - High Likelihood of Persisting with a Failing Strategy Due to Effort Invested (Derived from the following question: How often do you continue with a failing strategy because of the effort already invested?)



Possible responses	Number of the participants
Always	3
Often	6

Sometimes	9
Rarely	7
Never	5

Data Analysis - Themes

Theme	Code	Justification
Theme 1: Tendency to Play Conservatively While Leading	Code 1	60% of participants agreed or strongly agreed with the statement, "I often play more conservatively when my team is leading by a small margin."
Theme 2: Effect of Past and Early Performance on Decision-Making	Code 2 and Code 3	A large majority of the participants, 60%, agreed that they almost always or often rely on their past performances to make decisions during the game. Furthermore, more than 75% of the respondents stated that their performance in the first half of a game has a very high or high influence on the manner in which they play the remainder of the game.
Theme 3: Repeating Successful Plays Across Games	Code 4	29/30 participants in the survey tend to repeat plays that have caused them prior success, out of which 15 almost always repeat a successful play
Theme 4: Impact of Game Situations on Decision-Making	Code 5	46% of participants stated that the game situation always has an effect on their decision making, and all participants stated that on at least one occasion, they have made a decision based on the game situation
Theme 5: Difficulty in Switching Strategies	Code 6	When asked about the difficulty level of switching strategies

		during a game, over 25% of the sports personnel stated they find it difficult, whilst over 35% found it moderately difficult
Theme 6: Persisting with Failing Strategies Due to Time and Effort Invested	Code 7	The survey results evidence that around 60% of the participants may sometimes, often, or always persist with a failing strategy due to the effort and time they have already invested.

Discussion

As mentioned in the literature review, the theory of loss aversion presents evidence to support the idea that people experience a more significant emotional impact from losses than from gains of equivalent value (Kahneman and Tversky, 1979). Theme 1 suggests that the players often play more conservatively when their team is leading by a small margin; the high number of strong agreements with the theme indicates the presence of the loss aversion bias since the players are likely to be more focused on avoiding a loss rather than maximising potential winnings. This cautious approach can ultimately impact their overall performance and decision-making strategies, highlighting the profound influence of psychological factors on sports behaviour. Understanding the implications of loss aversion can benefit sporting teams by underscoring the need to manage players' risk perceptions and emotional responses during critical game situations, and understanding this bias can significantly improve decision-making and performance.

Theme 2 indicated the presence of anchoring bias among athletes. Anchoring bias occurs when individuals rely too heavily on pre-existing information or the first piece of information they encounter when making decisions. For athletes, decision-making during games and matches can be significantly influenced by past performances. This often results in the repetition of specific techniques or styles of play. For example, one participant noted, “Sometimes, when I scored from a certain area during a previous game, I am tempted to shoot from a similar position in the next game.” This reliance on past performance can extend within the same game, where techniques executed and results achieved during the first half influence decision-making in the second half (Vipond, 2024). Theme 3 reveals another bias related to recent information: the availability heuristic. This cognitive bias involves making decisions based on examples, information, or recent experiences that are readily available (Gleason, 2021). In this study, athletes tended to repeat successful plays, even when circumstances differed. This behaviour illustrates the influence of the availability heuristic, where the success of a play is more likely to be repeated if it is the most recent or vivid example available to the athlete. To overcome the impact of these biases on athletes' decision-making, coaches can encourage players to base decisions on a broad range of experiences and evidence rather than recent highlights or lowlights - helping develop a more balanced and informed approach to game strategy. Moreover, training that includes varied drills and situations can also prevent players from becoming overly reliant on specific past experiences.

Framing bias is an individual decision-making misconception caused by a person interpreting the surrounding world according to a decision frame chosen by her or his subjective opinion (Beratšová et al., 2018). Theme 4 strongly suggests that each player asked has fallen into the trap of framing bias at least

once. In the context of sports, a framing bias represents the way a game situation is explained. Athletes in the survey have answered in line with the idea that the manner in which a situation is framed to them will influence their actions. The high frequency of these answers suggests that a player's decisions are significantly influenced by the descriptive context rather than solely by the objective situation. Recognising the prevalence of framing bias in sports allows teams to implement strategies that help reduce its effects. Coaches, for instance, can push for objective analysis and situational awareness, encouraging players to make decisions based on factual assessments rather than subjective interpretations, thereby improving overall team performance and decision-making consistency.

Theme 5, which speaks about the difficulty in switching strategies, highlights the challenge sports personnel face in adapting their approaches during a game, with over 60% finding it at least moderately difficult. This difficulty can be understood through the lens of the endowment effect, a psychological phenomenon where people overvalue what they already possess. In sports, this effect manifests when players or coaches are reluctant to change their current strategies, even if they're not effective, due to their attachment and perceived value of these strategies. This reluctance can hinder performance, as sticking to a familiar yet failing approach can be detrimental. To overcome this bias, coaches can implement and encourage regular strategy reviews during games whereby objective performance metrics can be used to assess the effectiveness of current strategies being played. Moreover, pre-planned contingency strategies can also help ease players' transition to new approaches when required.

One of the most influential studies on the sunk cost fallacy is written by psychologists Hal Arkes and Catherine Blumer (Arkes and Blumer, 1985), "The psychology of sunk cost." It introduces the concept of the sunk cost fallacy and presents evidence to support the idea that people continue to invest in a decision based on prior investments rather than current rationale. Theme 6 suggests that players persist with failing strategies, indicating the presence of the sunk cost fallacy. The many participants who continue with unsuccessful strategies demonstrate their reluctance to abandon an approach they have already invested time and effort into. This continuation to sticking with failing strategies can be detrimental, as it prevents the adoption of potentially more effective alternatives. If coaches recognise this behaviour in their team players, they would be highly advised to encourage a mindset that views abandoning a failing strategy as proactive rather than wasteful.

Conclusion

Decision-making in sports is intricately linked to rationality and the evolving field of behavioural economics, which acknowledges the profound impact of cognitive biases on decision-making. The understanding of decision-making has remained ever-changing since new behavioural economics studies have been published. The works of Kahneman and Tversky laid the foundation for understanding cognitive biases, highlighting how individuals often deviate from rationality due to inherent cognitive warps. Their dual-system theory distinguishes between the fast, intuitive System 1 and the slow, deliberate System 2, which is particularly relevant in sports, where time is a critical factor.

The primary research included surveys sent out to amateur athletes and provided direct insights into how these biases affect athletes in real life. The results support the notion that cognitive biases, such as loss aversion, anchoring and availability biases, framing bias, the endowment effect, and the sunk cost fallacy, affect athletes' decision-making to a great extent. If athletes are able to acknowledge and address these cognitive biases, they, along with their coaches, can develop strategies to mitigate their effects - some of

which have been proposed in the discussion of this research paper. This can lead to improved performance, more rational decision-making, and better outcomes in high-pressure situations.

That being said, it is essential to note that the conclusion obtained in this research is based on participants who may be identified as amateur athletes. Amateurs might be more vulnerable to cognitive biases due to less experience and training in high-pressure situations compared to professional athletes. Future research could benefit from including professional athletes to see if the patterns observed with amateurs are similar to those at higher levels of competition. This could provide more comprehensive insights into how cognitive biases impact decision-making across different levels of experts. Furthermore, while this study highlights the significant impact of cognitive biases on decision-making in sports, it is important to note that other factors, such as physical condition, team dynamics, and external pressures, also play crucial roles. Therefore, a comprehensive approach that considers psychological and non-psychological factors is essential for optimising and understanding athlete performance.

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