



The Role Of Artificial Intelligence In Understanding And Managing Competitive Pressures Among Football Players

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Abstract:

Artificial intelligence is an advanced tool used in the field of sports to analyze performance and manage the competitive pressures experienced by players by analyzing big data. This helps understand and alleviate these pressures which contribute to improving physical and mental balance for players.

Keywords: Artificial Intelligence - Competitive Pressure.

Introduction:

Football is one of the most adored and popular sports in the world, where players face multiple challenges and pressures due to the intense competition on the field. These pressures not only affect physical performance, but also extend to include psychological aspects that play a pivotal role in achieving sporting success. In light of the rapid technological developments, artificial intelligence has emerged as an effective tool that contributes to analyzing and understanding complex problems in multiple fields, including the field of sports. Artificial intelligence has superior capabilities to analyze big data, monitor performance patterns, and provide innovative solutions to manage the psychological and physical aspects of players. In the context of football, these technologies can play a major role in understanding the nature of the psychological pressures that players face during competitions and in developing effective strategies to deal with them, which enhances their performance and reduces the impact of these pressures on their general health.

This study aims to explore the role that artificial intelligence can play in understanding the management of competitive stress among football players by analyzing the theoretical and applied aspects that highlight how this advanced technology can be used to enhance player well-being and achieve outstanding athletic performance, which opens new horizons for improving training and sports management practices.

In order to know the role of artificial intelligence in understanding and managing competitive pressures among football players, this study attempted to answer the following questions.

-How can AI measure and analyze physical and psychological indicators associated with competitive stress in football players?

-What AI techniques can be used to identify patterns of psychological stress and predict their impact on player performance?

-Do artificial intelligence systems have a role in managing competitive pressures and enhancing players' psychological resilience?

Importance of the study:

Studying the role of artificial intelligence in understanding and managing competitive pressures among football players is of great importance, as most teams that provide high performance and achieve good results rely on advanced means to detect these deficiencies, which has led to improving athletic performance that has helped manage competitive pressures effectively by enhancing players' focus and making better decisions during matches, which has a positive impact on their individual and collective performance and enhancing the players' psychological health, as psychological pressures are considered one of the most prominent challenges affecting players' health. Using artificial intelligence to understand these pressures provides innovative tools to support players psychologically, which improves the quality of their professional and personal lives, and reduces injuries associated with psychological pressure, which can lead to physical stress and increase the likelihood of injuries. Through artificial intelligence analysis of data related to stress and pressure, these risks can be reduced and artificial intelligence helps coaches understand the impact of pressures on their players by analyzing performance data and psychological state, which allows the development of customized training plans for each player and the use of advanced technology in developing sports team management strategies, which enhances the position of football as a sport that keeps pace with technological development. This study provides the opportunity to develop advanced sports research based on artificial intelligence, which contributes to the development of sports sciences in general and football in particular.

Study objectives:

1- Analyzing the nature of competitive pressures to identify the types of psychological and physical pressures that football players face during competitions and studying the impact of these pressures on the athletic performance and general health of the players.

2- Exploring the potential of artificial intelligence in understanding how to use artificial intelligence techniques such as machine learning, analysis and prediction in studying psychological stress and identifying appropriate technological tools and models to analyze and evaluate the impact of stress.

3- Designing effective stress management strategies based on artificial intelligence to reduce the effects of psychological stress and improve athletic performance, and studying scientific examples of artificial intelligence applications in similar sports environments.

4- Supporting coaches and administrators to use data extracted from artificial intelligence to customize training and administrative plans directed at each player, enhancing the teams' ability to face psychological and competitive challenges.

5- Enriching scientific knowledge in the field of the relationship between modern technology and sports.

Highlighting the importance of integrating technology and sports psychology to improve player well-being

6- Developing future solutions that can be used to handle the pressures of competition in other sports.

Terms used in the study:

Artificial intelligence:

Artificial intelligence is a branch of computer science that aims to design systems and programs capable of simulating human intelligence and performing tasks that require thinking, learning, and decision-making. Artificial intelligence relies on creating algorithms and mathematical models that help learn from data, analyze it, extract patterns and make predictions to take accurate action.

(Zaid Abdul Hadi) believes that artificial intelligence is one of the computer sciences that includes expert systems (Zaid Abdul Hadi, 2000, p. 19).

(Arnous, 2007) sees artificial intelligence as one of the parts of computer science that is concerned with intelligent computer systems that are related to intelligence, decision-making, and solving problems facing athletes (Arnous Bashir, 2007, p. 9).

Operational definition of artificial intelligence:

Artificial intelligence is a field of computer science that focuses on developing systems and machines that can quickly analyze data and perform tasks that require human-like thinking and decisions. This includes tasks such as learning from data, analyzing patterns, and solving problems.

Competitive pressures:

“It is the feeling resulting from the loss of balance between requirements and capabilities, and is accompanied by several situations of failure, where confronting the demands and capabilities becomes an influence in creating pressures” (Shawqiya Ibrahim, 1992, p. 44).

The pressures of competition are an integral part of the players' lives due to the popular and competitive nature of this sport. Players are exposed to increasing pressure to achieve positive results, whether at the club or national team level, which may lead to them feeling stressed and anxious about achieving the wishes and high expectations of the fans and even internal competition between team members to reserve a place in the starting lineup, which affects the focus in decision-making and overall performance on the field. Therefore, managing these pressures effectively is an essential element to improve the players' performance and ensure their continued high levels, which highlights the need for modern strategies and technologies such as artificial intelligence to understand and deal with these pressures.

Operational definition of competing pressures:

It is a set of behaviors that appear in the player's condition through the actions he performs and the performance he provides that is unusual, and this indicates instability resulting from physical, mental and psychological stress.

Using Artificial Intelligence to Measure and Analyze Competitive Pressures:

1- Collecting data related to players:

-Sensors and biometrics: Devices such as smart watches and sensor bands are used to monitor vital signs such as heart rate, stress levels and brain activity.

-Video analysis, in which artificial intelligence techniques rely on analyzing video clips to determine facial expressions, body language, and player movements during matches.

2- Analyzing physiological and psychological data by using machine learning techniques to analyze physiological data such as changes in heart rate or breathing that reflect stress levels.

- Identifying psychological patterns through players' responses in interviews or training sessions using natural language processing.

3- Predicting stress levels by using predictive models that artificial intelligence can predict psychological stress levels based on players' previous performance and behavior during matches.

-This helps in early detection of cases of excessive stress and taking appropriate measures to alleviate them.

4- Applying virtual reality techniques in which virtual reality is used to simulate high-pressure situations such as penalty kicks or decisive matches, which helps players improve their response in similar situations in the future.

5- Providing instant feedback because artificial intelligence is able to provide immediate reports on players' performance and the level of pressure they are exposed to during competitions, which allows coaches to intervene immediately and take appropriate measures.

7- Integration with mental health platforms that use artificial intelligence to provide psychological support through mental health applications such as calming sessions or guided breathing exercises based on an analysis of the player's condition.

Artificial intelligence techniques that can be used to identify patterns of psychological stress and predict its impact.

Features of artificial intelligence:

Artificial intelligence is characterized by a set of characteristics, including (Al-Najjar, 2010, pp. 169-170):

- The ability to think and perceive - The ability of systems to improve their performance over time by learning patterns and data

- Use past data to predict future outcomes - Provide effective solutions based on multivariate analysis

- Good handling of difficult and ambiguous situations and cases in the absence of information

Types of artificial intelligence:

1- Narrow AI: Specialized in performing a specific task such as translation or image recognition. "It is a type of AI that is associated with developing systems and programs designed to perform a specific task well but often do not have a real understanding. These systems excel in areas such as data analysis, natural language, and computer vision, however they are often limited to a specific scope" (Mohammed Aqouni, 2023, p. 8)

2- General artificial intelligence: capable of performing multiple tasks similar to the human mind. "It is a type of artificial intelligence that aims to create artificial intelligence systems that resemble human abilities in understanding and thinking. This means that they can deal with a variety of tasks and situations in a manner similar to humans" (Muhammad Aqouni, 2023, p. 8)

3-Super artificial intelligence: It surpasses human intelligence and is still theoretical.

"Professor of integrative biology and computer science in a 2016 article that it is possibleArend Hitze explained

Artificial intelligence is classified into four types: reactive machines, limited memory, theory of mind, and self-awareness (Imad Saleh Ahmed Al-Azab, 2021, p. 8).

Artificial intelligence applications:

Artificial intelligence encompasses a wide range of applications such as robotics, machine translation, big data analysis, natural language processing, and sports performance improvement. In short, artificial intelligence is a field that contributes to transforming data into intelligent decisions that help improve efficiency across a variety of sectors. Scientists have so far been able to develop prototypes in the field of artificial intelligence, including robots and computers for a character capable of interacting with humans through dialogues

and executing voice commands, with the possibility of improving and developing them continuously.

The importance of artificial intelligence:

Improving efficiency and productivity in various fields "Artificial intelligence contributes to the automation of many routine tasks, which leads to increased efficiency in operations and reduces errors" (Mohammed Aqouni, 2024, p. 2). Saving time and costs through automation and intelligent analysis, providing innovative solutions to complex challenges in daily life and encouraging the development of services that meet human needs

Interest in artificial intelligence applications is increasing day after day, and the truth is that academic interest has turned into commercial interest in the applications of this science (Zain Abdel Hadi, 2000, p. 26)

The development of artificial intelligence in sports:

Cognitive computing and artificial intelligence "The terms artificial intelligence and cognitive computing are sometimes used interchangeably, but in general, the word artificial intelligence is used to refer to machines that replace human intelligence and the word cognitive computing is used to refer to products and services that simulate human thought processes" (Emad Saleh Ahmed Al-Azab, 2021, p. 8).

Artificial intelligence has witnessed development in the sports field, as it has become a major tool for analyzing performance, improving strategies, and supporting technical and administrative decisions, thanks to technical developments. Artificial intelligence can handle huge amounts of sports data and transform it into actionable insights to improve sports performance at all levels.

Stages of development of artificial intelligence in sports:

1- Initial beginnings (simple analysis): In the early stages, artificial intelligence was used to analyze basic data such as match results and individual statistics, and it relied on traditional software to process data manually.

-2- Using modern technological tools: With the development of imaging technologies and sensors, it has become possible to collect detailed data such as - player speed - distances covered during the match - ball movement and passing accuracy.

3- Artificial intelligence based on machine learning: Sports have witnessed a major boom with the introduction of machine learning and deep learning technologies, as artificial intelligence has been able to - recognize patterns and the performance of players and teams - predict match outcomes based on historical statistics - provide instant analyses during matches.

4- Employing virtual reality and augmented reality: Artificial intelligence has evolved to include the use of virtual reality and augmented reality technologies, which has helped in simulating match scenarios to train players in environments similar to reality - improving players' skills in specific situations such as executing penalty kicks.

5- Big Data Analysis: With the emergence of big data, it has become possible to analyze the performance of players and teams over long periods - evaluate the performance of opponents and develop effective competitive strategies - improve training programs using data-based analysis

6- Injury prediction and health management: Artificial intelligence is now able to predict injuries by monitoring vital signs and physical and psychological stress, which reduces the likelihood of injuries and increases the period of continuity of players on the fields.

Modern applications of artificial intelligence in sports

1-Real-time performance analysis: Track player and ball movements using AI-powered cameras, and analyze matches using AI software to analyze the performance of their team and the opponent's team

-Provide instant reports to coaches to improve performance during matches.

2-Design customized training plans: Analyze player data to create a customized training plan according to strengths and weaknesses.

3- Team management and playing strategies: Providing tactical recommendations based on analysis of team and opponent performance.

4- Improving the fans' experience: Using artificial intelligence to provide live statistics and immediate analysis during matches.

-Personalize content for viewers according to their interests.

5- Psychological analysis and psychological management: Studying the psychological state of players through facial and voice analysis techniques, which contributes to managing the pressures of competition.

The importance of the development of artificial intelligence in sports:

-Improving the level of athletic performance: by providing accurate and targeted analyses.

-Enhancing player health: using injury prediction and stress management techniques.

-Develop effective strategies: based on accurate data analysis.

-Improve viewing pleasure: thanks to instant analysis and interactive reports

The future of artificial intelligence in sports:

With the continuous developments in artificial intelligence, it is expected to become an integral part of all aspects of sports, from training players to providing unique experiences for fans. Artificial intelligence will contribute to providing innovative solutions that revolutionize the way sports are practiced and managed.

Artificial Intelligence Tools and Techniques in Sports

Artificial intelligence plays a vital role in sports through a set of tools and technologies that contribute to improving sports performance, managing teams, and enhancing the viewing experience. These tools rely on big data analysis, machine learning, and smart technologies.

1- Sports performance analysis techniques:

Biometric data analysis: "Biometric data such as heart rate, temperature, and blood oxygen levels are used to determine the best training strategies" (Mohammed Aqouni, 2024, p. 31)

-Motion tracking systems: Advanced cameras and artificial intelligence technologies are used to accurately track the movements of players and the ball during matches, such as systems such as:

Catapult –satasports

-Video analysis: AI-based programs to analyze match footage and extract data on passes, speed, and shooting accuracy, for example.

Coach's Eye – hudl

2- Training management tools:

-Smart Training Apps: Provides customized training plans based on player performance such as strengths and weaknesses analysis.

Polar Team Pro – Xampion

- Virtual reality training: used to provide virtual environments that simulate real situations in matches, for example: Rezzil

Which helps players improve their skills in a safe environment.

3-Injury and physical health prediction tools:

-Wearable sensors: Smart devices that monitor vital signs such as heart rate, stress levels, and muscle fatigue.
Whoop – Fitbit

-Injury prediction systems:

Predicting injuries: “Artificial intelligence can analyze historical injury data and identify factors that contribute to their occurrence, leading to taking preventive measures” (Muhammad Aqouni, 2024, p. 32), and analyze player data to determine injury risks and take preventive measures such as systems
Zone 7

4- Applications of artificial intelligence in strategies and tactics:

Opponent Analysis: Software that analyzes the performance of competing teams to develop effective game plans Example
Instat scout – Sportscode
-Tactical Planning: Tools that help coaches test game strategies using intelligent simulations.

5- Techniques to improve audience experience:

-Technologies and automated analysis: Artificial intelligence is used to provide statistics and analytical comments during matches, for example the system
To analyze sports data IBM Watson
-Personalization for audiences: Apps that rely on viewer preferences to deliver personalized content such as replays of specific clips or in-depth analytics.

6-Team management and group performance tools:

-Group dynamics analysis systems: AI-based programs to organize training times in line with performance levels.

7- Sports Business and Management Techniques:

Audience Data Analysis: Used to analyze attendance and sales data to develop effective marketing strategies Example
Microsoft Azure Sports Analytics
-Ticketing and Marketing Management: AI-Powered Tools to Deliver Personalized Offers to Fans

8- Artificial Intelligence Applications for Psychological Well-Being:

Psychological analysis: Tools that use voice, text and body language analysis to understand the psychological state of players Example of psychological health analysis applications such as Mindstrong
-Providing meditation and relaxation programs: Applications that provide sessions designed to reduce anxiety and increase focus.

9-Electronic sports game techniques:

- Analyze players' performance in eSports to improve skills and develop game strategies.
-Developing smart robots to compete with players during training.

Performance prediction and recovery systems:

The concept of performance and recovery prediction systems: These are tools that rely on artificial intelligence and machine learning to analyze biometric and sports data with the aim of: 1- Predicting players' performance based on effort and fitness levels

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2- Monitoring the recovery process from injuries and ensuring that players return to their best condition.

3-Design customized training and recovery programs.

How prediction systems work:

1- Data collection: Players' data is collected using wearable sensors – measuring heart rate – monitoring muscle movement – monitoring sleep and stress level

2- Data analysis: - The systems use machine learning algorithms to analyze data and compare it with previous information - patterns affecting performance or recovery are identified.

3- Providing recommendations: - Proposing training plans tailored to each player based on his current condition - Determining the necessary rest periods to avoid fatigue and injuries.

Functions of performance prediction and recovery systems:

1- Predicting sports performance: - Analyzing factors affecting performance such as nutrition, sleep, and level of physical activity - Predicting the expected level of performance during training or matches

2- Monitoring physical and psychological stress: - Monitoring stress levels to ensure that players are not exposed to excessive pressure that affects their performance - Submitting periodic reports that clarify the psychological and physical condition of players

3-Predicting injuries: - Monitoring muscle movements and vital signs to predict the risk of injuries before they occur - Identifying times of danger associated with fatigue or overexertion

4- Recovery and injury management: - Providing recovery plans based on player data including rehabilitation exercises, nutrition programs and improving sleep quality.

Techniques used in performance prediction and recovery systems:

1- Wearable devices that measure vital signs such as heart rate, breathing, and physical stress.

2- Data analysis programs: They rely on artificial intelligence techniques to analyze data and extract recommendations. -SAP ports One – Catapult Performance

3- Medical imaging and advanced techniques: Using magnetic resonance imaging or ultrasound to monitor muscle injuries – visual analysis techniques to assess the movement status of players

4- Artificial intelligence applications: Using machine learning algorithms to analyze data and predict injuries - designing customized plans based on discovered patterns in performance

Benefits of performance prediction and recovery systems:

-Improving athletic performance - Reducing injuries - Enhancing player continuity - Saving time and costs

The role of artificial intelligence systems in managing competitive pressures and enhancing their psychological resilience

Definition of competitive pressures:

Competitive pressures refer to the psychological and physical challenges that athletes face as a result of their participation in sports competitions. These pressures appear as a result of expectations of high performance, the desire to win, and challenges related to competitors, the presence of the public and the media. These pressures affect the psychological and physical state and athletic performance of players in ways that may be positive or negative. "It is a human phenomenon that refers to the psychological state or feeling of tension and anxiety that requires the person to re-adapt to the environment" (Osama Kamal Rateb, 2004, p. 133).

Factors causing competitive pressure:

External pressures: - Expectations of the public and coaches - Requirements to win matches - Media influence - The public

Internal pressures: The athlete's desire to outperform himself and his competitors, represented by performance and results – anxiety about failure or making mistakes, represented by fear and tension – pressure resulting from insufficient preparation

Forms of impact of competitive pressures:

Positive: - Enhance focus and motivation to achieve optimal performance - Improve self-discipline and psychological readiness

Negative: Increased anxiety and tension lead to poor performance due to distraction or psychological stress.

“The player's feeling that he has completed all aspects of preparation puts him in a good psychological state and ready to compete, and then he is exposed to an inappropriate level of psychological stress” (Ahmed Amin Fawzy, 2003, p. 215)

Competitive pressures in the context of football:

In football, competitive pressures are an integral part of the game due to: - the collective nature of the competition and the reliance on collective performance - the intensity of competition in major tournaments - the great influence of the public and media on the psychological state of the players

Competitive pressures affect players' decisions on the pitch, such as passing accuracy and handling at crucial moments. Understanding and managing these pressures is essential to improving performance and success in football.

The impact of competitive pressure on players:

The pressures of competition are one of the main factors that affect athletic performance, as they can have positive or negative effects on players. These effects vary based on the athlete's ability to deal with the psychological and physical challenges imposed by competitions.

1- The positive effects of competitive pressures:

When the pressures of competition are managed well, they lead to: 1. Enhanced concentration. The challenge helps the athlete to increase attention to critical situations during play and improve decision-making in difficult situations.

2- Stimulating high performance enhances the athlete's motivation to achieve victory or provide a better level and performance and creates a strong desire to excel over the competitor.

3- Increasing self-confidence enables the athlete to face challenges successfully, enhances his sense of confidence in his abilities, and increases his ability to adapt to pressures in future competitions.

4- Developing mental skills makes the athlete improve psychological adaptation skills, anxiety management, and enhance the ability to deal with difficult situations and positive thinking.

Negative effects of competitive pressures:

We should take into account that the character of sports competitions, if they are carried out within the limits of educational foundations and rules that emphasize the necessity of adhering to the rules of sports honor, fair play, acceptance of judgments, modesty, and lack of arrogance, then they become one of the driving forces that push individuals to practice sports activities and motivate them to reach high levels (Muhammad Hassan Alawi, 1998, p. 35). When pressures exceed the athlete's ability to endure, they lead to

1- Deterioration of athletic performance and lack of concentration due to anxiety and excessive tension, in addition to committing repeated errors in technical and tactical decisions.

2- Psychological and physical exhaustion resulting from expectations of high performance or the desire to achieve victory and feeling tired and exhausted quickly during the match.

3- Anxiety and fear of failure. The player feels extreme pressure due to fear of not satisfying the coach and the audience, and low self-confidence due to excessive thinking about possible mistakes.

4- Health effects: Increased risk of infection due to physical stress and the appearance of psychological symptoms such as sleep disorders, loss of appetite or depression.

5- Deterioration of relationships within the team: Pressure may lead to tension in relationships between players or between the player and the coach, and a lack of communication between team members due to anxiety and tension.

The relationship between artificial intelligence and competitive pressures:

1-The role of artificial intelligence in understanding competitive pressures:

- Psychological and physical data analysis: Using sensors and technologies to measure vital signs such as heart rate, blood oxygen level, and stress levels, and analyzing psychological data through digital questionnaires to determine levels of anxiety and stress.

- Detecting patterns that affect performance: Through machine learning algorithms, it is possible to detect factors that lead to increased competitive pressures, such as facing strong teams and decisive matches under public pressure.

- Predicting psychological risks: Anticipating increased levels of anxiety or stress before matches, allowing early interventions such as relaxation sessions or mental training.

2- The role of artificial intelligence in managing competitive pressures:

-Creating customized training plans: by designing training programs that take into account the physical and psychological condition of each player and adjusting the intensity of training based on stress and physical fitness data.

-Improving mental readiness: Developing AI-powered mental training applications that help players improve focus, reduce stress, and use meditation and deep breathing techniques.

- Performance management during matches: providing immediate recommendations to coaches about substitutions or changing tactics based on real-time fatigue or performance indicators.

3- The impact of artificial intelligence on reducing competitive pressures: -Improving coaches' decisions: Providing accurate data that helps coaches make decisions regarding formation, substitutions and game plans, as well as reducing pressure on players by assigning roles that suit their abilities.

-Enhancing players' psychological well-being: Providing tools to measure psychological and physical progress, giving players a sense of control over their performance and providing positive feedback based on immediate data analysis.

- Increased self-confidence: Reduce stress by improving physical and mental readiness using data-driven plans and enhancing players' sense of readiness to compete, which reduces performance pressures.

Suggestions:

-Providing training programs for coaches on how to use artificial intelligence to understand and manage competitive pressures.

-Integrating technology with sports psychology studies to develop comprehensive systems for managing the stress of competition.

-A practical study using artificial intelligence tools to analyze player data during training and matches to assess stress levels.

-Comparing the effectiveness of AI techniques with traditional methods in understanding and managing competitive pressures.

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- Creating an application based on artificial intelligence to help players and coaches monitor and analyze stress and fatigue levels.
- Study how to exploit big data related to player performance and apply it to managing competitive pressures
- Exploring AI techniques to prepare players psychologically for intense competitive situations.
- Evaluating the role of virtual reality and artificial intelligence in preparing players psychologically for intense competitive situations
- Developing an integrated system that collects and analyzes players' psychological and physical performance data using artificial intelligence.
- Developing AI-based programs to relieve stress through relaxation techniques and guided meditation.

Conclusion:

The role of artificial intelligence in understanding and managing competitive pressures among football players is an increasingly important topic in our current era, as artificial intelligence technologies provide innovative solutions in the field of sports by analyzing player behavior, assessing stress levels, and providing customized strategies. Artificial intelligence can be a powerful tool to support athletic performance and the psychological well-being of players. Despite the great potential of these technologies, their use in managing psychological pressures requires caution and care to ensure privacy. It should also complement traditional approaches to treating psychological pressures, not replace them. There are also ethical and technical challenges that require further research and development to ensure that players benefit from them in a safe and effective manner. The future holds many opportunities to develop advanced artificial intelligence tools in this field, which contributes to enhancing the competitive ability of players while maintaining their psychological health. Therefore, integrating artificial intelligence into the world of sports can represent a major step towards improving athletic performance and dealing with pressures in a more effective manner.

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