Research Article

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Enhancing Safety and Quality in College Sports Management Through Big Data and Artificial Intelligence (AI)

Weiwei Jiang [ID] [1,2*], Mohamad Nizam Bin Nazarudin [ID] [3], Nur Shakila Mazalan [ID] [4]

[1] Ph.D candidate, Centre of Community Well-being & Education, Universiti Kebangsaan Malaysia (UKM), Bangi, Malaysia
[2] Instructor, School of General Studies, Zhangzhou Institute of Technology, Zhangzhou, Fujian, China
[3] Doctor, Professor, Centre of Community Well-being & Education, Universiti Kebangsaan Malaysia (UKM), Bangi, Malaysia
[4] Doctor, Centre of Community Well-being & Education, Universiti Kebangsaan Malaysia (UKM), Bangi, Malaysia
* **Corresponding Author:** p134229@siswa.ukm.edu.my

ARTICLE INFO	ABSTRACT
	The purpose of this study is to explore how artificial intelligence (AI) and big data can be used to solve the twin issues of athlete safety and sports event quality in a college sports environment. Furthermore, this study attempts to fill the literature vacuum regarding the application and effectiveness of artificial intelligence and big data in improving safety and quality in collegiate sports administration by investigating possible synergies between these elements and the implementation of developed technologies. This qualitative study used a sampling method to conduct in-depth interviews with 18 sports administrators and commentators. Using coding and classification methods, the data were evaluated thematically with a focus on artificial intelligence and big data applications. Research has found that artificial intelligence and big data play a key role in proactively reducing injuries, optimizing athlete performance and enabling data-driven decision-making. It also identifies barriers and opportunities for integrating these technologies, revealing their dynamic potential. This study provides new perspectives on the relationship between safety and quality and the application of artificial intelligence and big data in collegiate sports management. It also highlights the ways in which these technologies have transformative potential in sport. The findings have important implications for educational programs and policy development aimed at managing responsible technology integration and preparing future professionals in the field of sport management. **Keywords:** Artificial Intelligence, Quality, Safety, Sports Management, Big Data Integration, Data Analytics.

INTRODUCTION

Technology has transformed sports administration, from player performance evaluation to fan engagement. Sports organisations now have access to inconceivable insights and capabilities thanks to big data and AI (Halappa, 2023; Liu, Tan, & Pawar, 2022; Rigoni et al., 2023). Big data analytics, and artificial intelligence (AI) are reshaping the landscape of daily life (Hu & Xu, 2023). Performance analysis Trainers and sports scientists use data analytics to identify detailed patterns in players' motions, physiological reactions, and tactical decisions. This knowledge enables for customized training, recovery, and tactical changes during battles. Sensor-equipped wearables can quickly track athletes and provide feedback to enhance performance and avoid injury (Fialho, Manhães, & Teixeira, 2019). Data-driven digital platforms have changed fan interaction and marketing outside of

sports. Data analytics may help sports teams customize content, predict fan preferences, and improve fan experience. Social media sentiment analysis and predictive modeling improve fan-club interactions through targeted marketing and engaging fan experiences (Feng & Tan, 2020). Sports administration decision-making requires AI. Large datasets help machine learning algorithms evaluate player performance, recruiting, and game strategy. Predictive analytics simplify scheduling, resource allocation, and budgeting and increase competitiveness (Fury, Oh, & Berkson, 2022). Business productivity is improved by AI-powered chatbots and virtual assistants that handle mundane tasks like ticket sales and customer service. Customizing experiences and improving communication with natural language processing and machine intelligence may boost fan loyalty for sports firms (Paschos, 2021).

Data and AI talent finding and recruiting have boosted sports administration's spectator engagement, training, and athlete well-being. In recent years, the educational environment has seen a significant transformation, spurred by the unrelenting march of technological developments, notably in the realms of big data analytics and artificial intelligence (AI) (Sun & Song, 2023, p. 1). Machine learning algorithms and data analytics can identify prospective student-athletes based on injury histories, performance indicators, and development potential. Data-driven decision-making optimizes recruiting and team configurations for long-term success (Li, Karthik, & Rajalakshmi, 2022). Large-scale data and AI have enabled personalized coaching to fit each athlete's needs. Coaches can tailor training and recovery to physiological signs, biomechanical data, and performance assessments to increase performance and reduce injury risk. This individualized approach boosts physical performance and fosters a loving, supportive environment that promotes long-term success and well-being (Edson et al., 2023). In addition to boosting on-field performance, sports administration uses AI and data analytics to allocate resources and make strategic choices. Predictive analytics may help colleges estimate attendance, manage ticket prices, and enhance the fan experience through targeted marketing and promotion (S. Wang, 2023). Data analysis helps academic institutions promote brand exposure, community participation, and revenue. This will help them succeed in collegiate athletics' competitive environment.

Several studies on college sports safety and quality have shed light on the field's challenges and prospects (Foye-Fuller, Derouin, & Buck, 2022). Research on injuries, performance, and fan participation has mostly been done in sports administration (Bogue, Idriss, Sturkey, & Derouin, 2021). Researchers have also examined athletes' mental health and fitness to better understand athlete safety. Sports performance has been studied in terms of distinct coaching philosophies, meal plans, and training regimens (J. A. Braaten, Banovetz, M. C. Braaten, Kennedy, & LaPrade, 2023). Although previous studies have provided insights into distinctive components of protection and quality in college sports activities, there is still a substantive lack of records in the current literature. It is well worth mentioning that previous research have often centered on these components one by one, without thoroughly inspecting how safety and quality interact with each other (Fialho et al., 2019). The capacity synergies between safety measures and athlete overall performance, as well as the positive effect of satisfactory upgrades on safety, have now not been thoroughly investigated (Foye-Fuller et al., 2022). In addition, the ever-evolving role of AI and Big Data in tackling those challenges is a relatively unexplored area within the realm of university sports activities management (Gong & Wang, 2021; Leister et al., 2019).

Therefore, the aim of this study is to conduct a comprehensive examination of the fusion of Artificial Intelligence (AI) and Big Data within the area of college sports management, with dual recognition. This study aims to discover how these advanced technologies can be carried out to enhance quality and safety in the collegiate sports landscape. This consists of a radical evaluation of their use in preventing injuries, improving athletes' overall performance, and increasing the overall satisfaction of sporting occasions. Furthermore, by concentrating on the usage of big data and AI in college sports administration and investigating the relationship between safety and quality, this study seeks to fill a significant gap in the literature. This study aims to achieve the following research objectives which are given in **Table 1**.

Table 1. Research Questions and Objectives

Research Questions	Objectives
1. How are big data and AI currently being used in college sports management to enhance safety and quality?	1. To assess the current use and adoption of big data and AI in college sports management for safety and quality enhancement.
2. What are the key challenges and opportunities associated with the integration of big data and AI in college sports management for safety and quality improvement?	2. To identify the challenges and opportunities associated with integrating big data and AI into the sports management context.

Research Questions	Objectives
3. What is the impact of big data and AI on decision-making, risk assessment, and injury prevention in college sports management?	3. To examine the impact of big data and AI on decision-making processes, risk assessment, and injury prevention.
4. How do college sports administrators and stakeholders perceive the effectiveness of AI and big data applications in promoting safety and quality in sports management?	4. To investigate the perceptions of college sports administrators and stakeholders regarding the effectiveness of AI and big data applications in promoting safety and quality.

This groundbreaking AI-Big Data integration to increase safety and quality in collegiate sports administration is crucial. This study sets a precedent for proactive treatments to safeguard student-athletes and improve sporting events by addressing player and spectator well-being and enjoyment. These technologies have far-reaching effects beyond games and tournaments. Advanced analytics and AI-driven solutions will help schools foster creativity and excellence in their sporting programs. These technologies may also influence sports governance policy by establishing safety and fairness requirements. Last but not least, AI and Big Data have revolutionized collegiate sports administration. With this technology, institutions can make athletes, spectators, and stakeholders safer and more engaged, ushering in a new era of sports administration development and potential.

LITERATURE REVIEW

Role of Big Data in Sports Management

Big Data in sports management involves collecting, storing, processing, and analyzing massive sports datasets. Financial data, supporter involvement statistics, health and fitness tests, and athlete performance indicators are included (Feng & Tan, 2020; S. Wang, 2023; Xie, 2022). Sports administration needs Big Data to get practical insights, expedite operations, improve athlete performance and spectator engagement, and aid decision-making (X. Wang, 2020). Big Data may help sports organizations enhance management and gain a competitive edge. Big Data enables sports organizations to do in-depth analysis of performance measurements, injury data, and other variables influencing outcomes. Sports managers and coaches can make better judgments with the information provided by this thorough examination (Yin & Wang, 2019). Predictive analytics can predict game outcomes, athlete injuries, and spectator behavior using historical and real-time data. Proactive action and strategic planning are made possible by this competence (S. Wang, 2023). Individual athlete data can be utilized to adapt training programs, dietary plans, and recuperation tactics, allowing athletes to maximize their potential while lowering the risk of injury. Personalized fan experiences, fan choice prediction, and content delivery can all be achieved by utilizing big data, which will ultimately boost fan engagement and generate income (Yin & Wang, 2019). Furthermore, Big Data is critical in the analysis of athlete performance. During training and tournaments, sensors, cameras, and wearable devices collect data, measuring aspects like speed, distance travelled, heart rate, and more. In order to make real-time modifications to training plans and tactics, trainers and sports scientists use this data (Xie, 2022). Soccer players' GPS trackers might reveal their position and movement habits. Sports organizations may use Big Data to track and assess athlete performance and health. Analyzing past injuries and possible risks helps doctors prevent injuries (Mamo, Su, & Andrew, 2022). National Football League's "The Electronic Medical Record" system stores and analyzes player health data, enhancing safety and lowering injuries (Mataruna-Dos-Santos, Faccia, Helú, & Khan, 2020).

Application of AI in Sports Management

The introduction of artificial intelligence (AI) technology in sports administration has disrupted numerous areas and led to new methods. AI, including machine learning, computer vision, and predictive analytics, has transformed sports decision-making (Keiper, Fried, Lupinek, & Nordstrom, 2023). Its data analysis, automation, predictive modeling, and customization features have improved sports management procedures, providing timely insights and strategic advances. AI is often used in sports administration to analyse athlete performance (Himeur et al., 2023). AI can analyze video data using computer vision and machine learning algorithms to follow player movements, generate key performance metrics, and provide real-time insights. Coaches may use AI to improve player placement, in-game strategy, and team performance. AI helps avoid injuries, says Xia (2023). AI systems may predict injury risks and alter training regimens using historical health and biomechanical data. Wearables using AI can track athletes' health. These devices can warn athletes of injury risks and treat them quickly,

extending their careers. Personalization using AI increases player safety, performance, and audience engagement. Sports clubs have the ability to customize fan experiences and enhance loyalty using AI-driven chatbots, recommendation systems, and predictive analytics. This personalized strategy increases revenue, fan pleasure, and audience size. AI impacts talent acquisition and assessment (Fialho et al., 2019). AI can search massive player data and performance metrics databases for applications and inform recruitment teams. Data helps sports firms choose personnel who satisfy strategic goals and performance standards. Sports administration uses AI for talent acquisition, audience engagement, injury prevention, and performance monitoring. AI can improve sports management and spectator, athlete, and stakeholder experiences.

Previous Research on Big Data and AI in Sports Management

Big Data and AI may enhance college sports administration, player performance, and student-athlete safety, according to studies. Mataruna-Dos-Santos et al. (2020) found that wearable devices and AI algorithms with injury data prevented collegiate athletes from injuring themselves. AI-powered injury prevention protects college athletes and maintains programs. Tan (2023) examined how Big Data and AI may boost collegiate sports strategy and performance. AI can assist college coaches improve sports team performance, practice, and decision-making. Tan (2023) discovered these technologies boost collegiate sports management and results. Himeur et al. (2023) improved collegiate athletics sales and attendance with AI and big data. AI-driven customization, chatbots, and recommendation systems may increase fan loyalty and happiness, research finds. Examples show how colleges using AI to serve supporters has improved sports administration profitability and quality. Xie (2022) examined college sports management AI and Big Data ethics. Their analysis demonstrated these issues must be addressed by utilizing AI and Big Data to improve collegiate athletics safety and excellence. This technology can assist sports organisations resolve ethical difficulties and comply with regulations while operating ethically and fairly. Many studies suggest that Big Data and AI effect collegiate sports administration, including money, injury prevention, and performance. New tech can help universities win sports.

Gaps in the Existing Literature

Big data and AI in collegiate sports administration have been more understood, but their application and acceptability have not. Frevel, Beiderbeck, and Schmidt (2022) emphasize that this study often focuses on specific technologies or apps and lacks a comprehensive understanding of how these tools improve collegiate sports quality and safety. Despite the challenges of integrating vast volumes of data and AI into sports administration, Tan (2023) stresses the need for more study, especially in college athletics. Current research often ignores serious technological difficulties companies confront and merely evaluates potentialities and restrictions. This study addresses big data and AI's challenges and possibilities in collegiate sports management. AI and big data can impact sports management decision-making and risk assessment, although research is scarce (Lowry, Haarbauer-Krupa, Breiding, & Simon, 2021; Van Iersel, 2023). To address this vacuum, this study will explore these components, assess their practical implications, and assess the usefulness of artificial intelligence and big data in these crucial sectors. Neither college sports administrators nor other stakeholders' perspectives on AI and big data apps' efficacy have been fully examined. This study addresses the merits and cons of AI and big data in collegiate sports administration from several perspectives. The project aims to enhance college sports and decision-making. A comprehensive strategy will be used.

METHODOLOGY

Research Design

This qualitative study examined how AI and big data improve college sports management, notably safety and quality. Qualitative research enabled a comprehensive study of AI and big data in sports administration. It provides a platform for gathering rich, context-specific data to deepen topic understanding. Due to the dynamic nature of AI and large data in collegiate athletics, this study technique was excellent for revealing subtleties, challenges, and potential that quantitative methods may miss.

Selection of Participants

Participants in this study included 18 sports directors and analysts with key obligations in collegiate sports activities management. These people have been chosen by using a purposeful sampling method, which covered choosing participants on the idea in their backgrounds, positions, and reviews on the subject of university sports administration, with an emphasis on synthetic intelligence and massive facts. Specific guidelines had been followed for developing the inclusion and exclusion criteria for participant selection. Those who have relevant expert know-how managing university sports activities the usage of synthetic intelligence and large records were

blanketed in the inclusion standards. In order to guarantee a range of viewpoints, it was also critical to pursue variety within the individuals' institutional affiliations, which included quite a number of schools and universities. Participants have been additionally asked to show a willingness to take part in interviews or recognition institution discussions, demonstrating their openness to proportion their thoughts and experiences. Exclusion criteria, alternatively, have been designed to guarantee that the observation did no longer include those who did no longer want to participate or who had no earlier knowledge or direct engagement in college sports activities management. Participants had been formally invited to take part in the study, with thorough records about the objectives of the study. The purpose of this thorough player selection technique turned into to gather a consultant and sundry institution of sports directors and analysts in order that the study targets may be thoroughly tested. The demographic profile of selected members is given in **Table 2**.

Table 2. Demographic Profile of Respondents

| Participant ID	Age	Gender	Educational Background	Years of Experience	Current Role
1	28	Male	Bachelor in Sports Science	6	Sports Administrator
2	32	Female	Master in Sports Management	9	Data Analyst
3	25	Male	Bachelor in Physical Education	4	Athletic Trainer
4	30	Male	Master in Business Administration	8	Head Coach
5	27	Female	Bachelor in Marketing	5	Sports Marketing Specialist
6	35	Male	Bachelor in Sports Management	12	Compliance Officer
7	29	Male	Bachelor in Computer Science	7	Data Scientist
8	31	Female	Master in Sports Psychology	9	Sports Psychologist
9	26	Male	Bachelor in Exercise Science	5	Strength and Conditioning Coach
10	33	Male	Master in Education	11	Athletic Director
11	28	Female	Bachelor in Sports Medicine	6	Team Physician
12	34	Male	Bachelor in Kinesiology	9	Performance Analyst
13	27	Female	Bachelor in Communications	4	Public Relations Coordinator
14	30	Male	Master in Sports Analytics	7	Data Analyst
15	29	Male	Bachelor in Sports Management	6	Sports Administrator
16	35	Female	Master in Public Health	8	Sports Health Coordinator
17	32	Male	Master in Sports Administration	9	Athletic Director
18	26	Female	Bachelor in Business	5	Operations Manager

Data Collection Method

The data for the study was collected through interviews with sports administrators and experts. The selection of interviewees was based on the understanding of the priceless insights that people actively engaged in collegiate sports activities management can additionally offer approximately the usage of artificial intelligence (AI) and big data to enhance quality and safety. These interviews provided a right away road for acquiring firsthand studies, perceptions, and field challenges. Semi-structured interviews were accomplished with sports activities administrators and specialists. This strategy combined open-ended questions with certain subjects, ensuing in a flexible but rigorous data collection.

Data Analysis Technique

The study used a comprehensive data analysis approach to extract and make experience of the insights gleaned from interviews. The center of the analytical technique was thematic analysis, with a focus on big data and artificial intelligence-associated subjects. Thematic evaluation scientifically identifies and explores qualitative data's recurrent styles, themes, and narratives. Coding and classifying were crucial to theme analysis. Coding

allowed the systematic analysis and organizing of unstructured and incoherent interview material. Analyzing the figures revealed emerging themes and trends in AI and big data in collegiate sports administration (**Figure 1**).
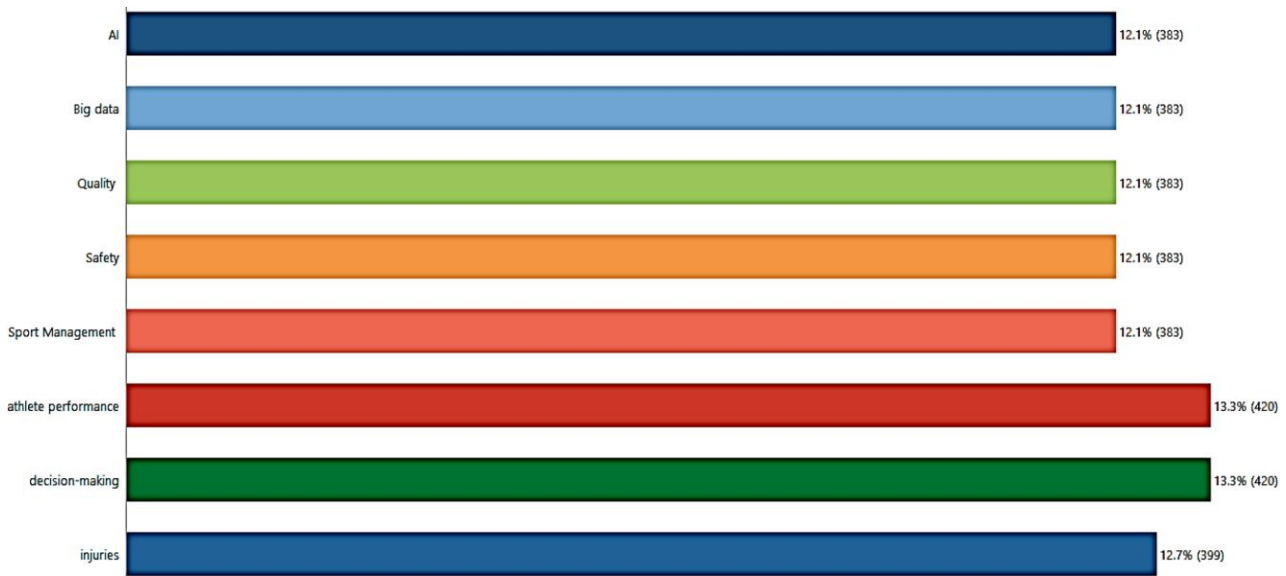
Figure 1. Overview of Code Selection and Generation

Initial Coding

The initial interview coding technique codes responses for analysis (**Table 3**). A key category is "Current Use of AI and Big Data (CU-ABD)" in college sports administration. This code lets academics record their applications and breakthroughs, providing a full technical landscape. College sports AI and big data integration are complicated, hence this code is needed. The code "Challenges in Integration (CI)" highlights sports management system AI and big data integration issues. These include data integration issues, training demands, and technology installation problems. Researchers can better understand the limits needed to effectively incorporate artificial intelligence and large-scale data technology into college athletics management by recording these issues. The code Opportunities and Advantages (OA) illustrates how AI and large records assist sports activities administration. These remarks address those technologies' blessings. Improved decision-making, performance, and fan engagement. Strategic enhancements and sports activities control processes might also result from college athletics pupils' new development and innovation opportunities.

Table 3. Initial Coding and Its Description

Code	Description
CU-ABD	Current use of AI and big data in college sports management
CI	Challenges in the integration of AI and big data into sports management processes
OA	Opportunities and advantages of AI and big data in sports management

Axial Coding

Creating larger categories with axial coding permits for greater information evaluation (**Table 4**). Technology incorporates Technology Implementation (TI) includes preliminary codes CU-ABD, CI, and OA. This segment discusses the complicated courting between cutting-edge AI and large statistics applications, which includes integration challenges and rewards. Academics might also learn how AI and large facts are altering sports activities administration by way of researching generation in collegiate sports activities control. A code-linked class is Data-Driven Decision-Making (DDD). This phase investigates how AI and massive records impact sports administration decisions. This inquiry indicates how these technologies have modified processes via enterprise specialists' firsthand bills. Studies of records-pushed selection-making screen sports management's development. The position of AI and large facts in collegiate sports approach and achievement is highlighted. These classes can help researchers understand era adoption, decision-making, and university sports activities management.

Table 4. Axial Coding and Its Description

| Axial Category	Description
Technology Implementation (TI)	The interplay between the current use of AI and big data, the challenges in integration, and the opportunities in sports management
Data-Driven Decision-Making (DDD)	The impact of AI and big data on decision-making processes and its influence on perceptions and experiences

Final Coding

Axial categories are combined into a data analysis framework to discover themes in the final coding. DDD and TI are called "AI and Big Data Integration (ABDI)". AI and big data impact sports management success and decision-making. In risk assessment, injury prevention, safety, and quality, college sports administration emphasizes technology's game-changing powers. Many in ABDI debate how AI and big data may improve collegiate athletics for fans under the "Safety and Quality Enhancement (SQE)" trend (**Figure 2**, **Figure 3**). Studying these topics may help academics grasp the complicated implications of AI and big data on collegiate athletics as shown in **Table 5**.

Table 5. Final Coding and Its Description

Final Theme	Description
AI and Big Data Integration (ABDI)	Integrating artificial intelligence and large amounts of data presents both potential and challenges for sports administrators.
Safety and Quality Enhancement (SQE)	The main theme, which emphasizes how AI and big data may improve safety and quality, has subthemes on accident prevention, risk assessment, and how people perceive safety and quality.

Code System	decision-making	athlete performance	injuries	Sport Management	Quality	Safety	Big data	AI
decision-making		840	819	803	803	803	803	803
athlete performance	840		819	803	803	803	803	803
injuries	819	819		782	782	782	782	782
Sport Management	803	803	782		766	766	766	766
Quality	803	803	782	766		766	766	766
Safety	803	803	782	766	766		766	766
Big data	803	803	782	766	766	766		766
AI	803	803	782	766	766	766	766	

Figure 2. Code Relation Matrix
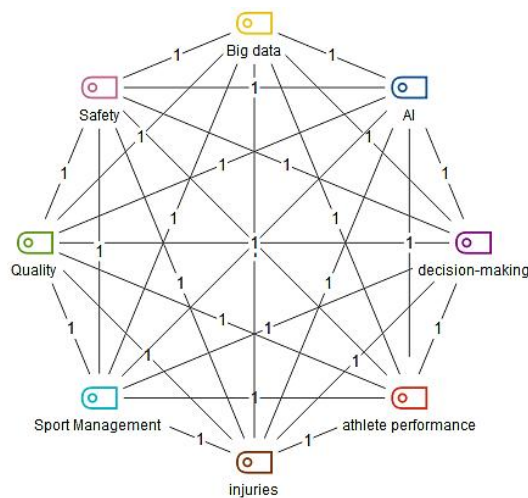
Figure 3. Co-occurrence of Codes

FINDINGS

Interactions with sports administrators and analysts revealed a diverse spectrum of AI and big data applications in collegiate sports management. There was widespread agreement that artificial intelligence (AI) and big data technologies are making substantial advances in the area, radically altering many facets of sports administration. These findings provide a thorough snapshot of the influence of these technologies on college sports management safety and quality enhancement.

Key Themes and Findings Related to AI

Talking to college sports administrators and experts revealed numerous key findings concerning AI's safety and quality benefits. Injury prevention using AI was important. Participants stressed the importance of AI-driven devices in tracking athletes' movements and physiological data, detecting weariness and overuse, and preventing injuries. AI-powered monitoring technologies let administrators evaluate athletes' health and performance. AI is needed for data-driven college sports administration. Participants stated that data-driven AI informed coaching and game strategy. AI enhances strategy by analyzing opponents' play, boosting decision-making and performance. Another major area was sports AI. AI assisted sports management in assessing players' strengths and weaknesses and constructing customised training and skill programmes to improve performance. Real-time AI monitoring changed skill development and performance, participants reported. AI integration offers several benefits, however, participants noted implementation problems. Protecting athlete data and privacy was vital. AI education was another issue. The initial financial investment slowed AI adoption, emphasizing the need for strategic planning and resource allocation. The interviews provided stakeholder viewpoints on AI in collegiate sports administration. Some stakeholders initially rejected AI-driven solutions, but they eventually benefited. Sports managers must convince volatile stakeholders of AI-driven solutions' benefits. AI helps college sports administrators prevent injuries, make data-driven decisions, and improve performance. Data protection and training are necessary for strategic AI deployment. Changes in stakeholders' perceptions and acceptance of AI in college sports management to improve safety and quality deepen the story. These findings illustrate AI's collegiate athletics transformation potential.

Key Themes and Findings Related to Big Data

Sports administrators and analysts interviewed on how big data enhances college sports administration safety and quality showed several key findings. Big data-driven athlete performance analysis was a focus. Big data monitors and evaluates athlete performance characteristics from several sources to construct performance-enhancing training regimens. Big data helps forecast and avoid injuries. It lets participants identify injury patterns and risk factors, enabling tailored training and rest regimes. Large dataset analysis guided this proactive injury prevention technique. Data-driven decision-making in collegiate sports management requires huge data. Performance data informed coach, trainer, and game strategy decisions in real-time. Big data integration provides benefits, but panelists noted implementation problems. Athlete data privacy and accuracy require advanced analytics, data security, and data quality. Staff data analytics training was a major issue. For players and coaches, stakeholder buy-in differed. Some stakeholders were suspicious of big data in sports management, but the practical benefits and safety and performance increases won them over. This dynamic stakeholder engagement shows evolving college sports management perspectives regarding big data integration. Big data is crucial in college sports administration for athlete performance monitoring, injury prevention, and data-driven decision-making. Data quality, security, and expertise must be addressed to reap big data integration benefits. The multiple stakeholder interactions underscore the importance of articulating big data-driven solutions' benefits. Big data improves college sports management safety and quality.

Synergy between AI and Big Data: Enhancing Safety and Quality - Respondents' Perspectives

The informative conversations with sports administrators and experts showed how AI and Big Data increase college sports management safety and quality. The field benefits from these two disruptive technologies, as respondents have shown. Quote-heavy views illustrate AI and Big Data's journey: College sports management improves player safety using data. It anticipates and decreases injury risks using AI and Big Data. Big Data collects massive sports and health data. Training loads, physiological data, injury histories, and performance markers are supplied. AI systems search this vast data collection for damage-risk patterns, trends, and anomalies. Early diagnosis of fatigue, overuse, and biomechanical inefficiencies helps athletes avoid injury. Training load changes, technique or equipment upgrades, and customized recovery regimens are possible. AI-powered predictive analytics can anticipate injuries using previous data for proactive treatment. Athletic safety is proactive with data-driven injury prevention. Colleges use AI and Big Data to reduce injury risk and improve athlete health. This preventative measure helps collegiate athletes avoid career-ending injuries and perform better. AI and Big

Data help college sports administration coach players correctly. AI-driven analytics may assist sports professionals modify massive databases for athlete training and therapy. Big Data performance indicators include movement patterns, physiological markers, biomechanical aspects, and historical trends. Data analysis by AI systems shows tiny relationships that may affect sports performance. Sportspeople can enhance performance by adapting training to strengths, weaknesses, and improvement areas. Programs may target skills, biomechanical inefficiencies, or data-driven improvements. AI-driven performance monitoring provides real-time feedback and modifications to tailor training to athletes. Colleges may increase sports performance and decrease injury and fatigue with AI and Big Data. This precision-driven strategy uses data-driven strategies for each athlete instead of one-size-fits-all. AI and Big Data inform collegiate sports administration decisions. This idea uses AI to turn big data into vital insights. Big Data analyzes athletes, opponents, games, and trends. AI searches for patterns, correlations, and trends that might otherwise be missed. Real-time data may help coaches and sports management better plans, training, and choices. AI-driven data on athlete performance, opponent plans, and game dynamics can help universities modify strategy. Repeating data processing and decision-making boosts performance. AI-driven predictive analytics helps coaches and sports management see difficulties and possibilities. AI and Big Data can keep universities ahead in sports by making data-driven judgments. This strategy encourages strategic agility and adaptation via empirical data, excellence and continual development. AI and Big Data in collegiate sports administration present challenges and opportunities, transforming the field. The vast volumes of sensitive athlete data gathered raise privacy and security issues. Workers need substantial data analytics and AI algorithm training for insights. Many organizations need budgeting and strategic planning for AI and Big Data. These difficulties can enhance college sports management. Security may boost AI and Big Data confidence by encrypting and preserving privacy. These technologies may help trainers innovate and improve sports management. Overcoming financial hurdles may democratize AI and Big Data solutions, levelling the playing field for all organizations. Institutions may use AI and Big Data to enhance sports management safety, quality, and performance by seeing these challenges as possibilities for growth (**Figure 4**).
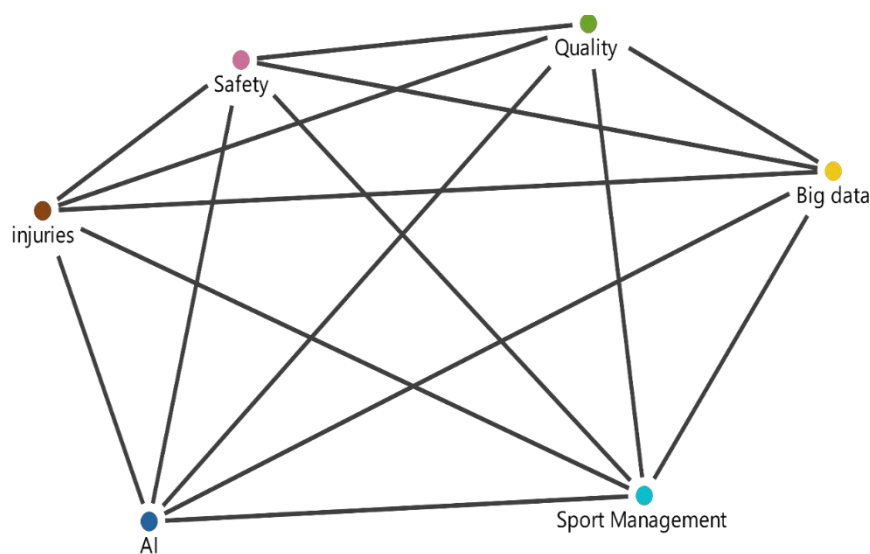

Figure 4. Code Relation Model Drive Through Analysis

DISCUSSION

AI and Big Data have improved collegiate athletics management quality and safety. Expert and sports official disputes showed integration's widespread impact. This talk shows AI and big data's numerous quality and safety benefits to this firm. Big Data mines performance and health data from many sources to provide insights. However, AI uses this massive data set to identify trends and hazards. This partnership allows proactive injury prevention, boosting athlete safety and sports management. Sports organisations may use Big Data and AI to develop preventative and therapeutic tactics to improve athlete health. Artificial intelligence and big data boost athlete performance precision, another key to sports administration success. Big Data collects performance data from medical records, training files, and wearable devices. Artificial intelligence analyzes this massive data and provides insights that help create customized training programs for each athlete (Nahavandi, Alizadehsani,

Khosravi, & Acharya, 2022; X. Wang, 2020). Increasing athlete performance with this precision increases individual training routines and collegiate sports competition and training. Trainers may assist athletes reach their full potential and improve performance by using data to improve training regimens. This research uses AI and Big Data to advance collegiate athletics management (Weller et al., 2024). Injury prevention is a common theme in this study and others. Prior research has underlined the relevance of AI and big data in athlete data monitoring, risk factor detection, and prevention. AI and Big Data have been shown to improve collegiate athletic safety management, and this study supports its use in this discipline (Pandurangan et al., 2024). The importance of precision in athlete performance development, a key part of sports quality management, matches earlier findings. Sports organizations may improve performance evaluation and training with artificial intelligence and large-scale data analysis, ensuring athletes attain their full potential and lowering accident risk. The aforementioned emphasis on accuracy and progress aligns with the overarching goal of improving college sports instruction and competition, demonstrating the transformative potential of AI and Big Data. The use of Big Data and AI to tailor training programs to individual athletes has been recognized as a transformational feature of sports management (Bar-Eli, Lidor, Lath, & Schorer, 2023; Zhang, Zhu, & Zhao, 2021). The convergence emphasizes the relevance of big data and AI in improving collegiate athletics training and competitiveness. The study examines evidence-based decision-making beyond injury prevention and performance improvement. Previous studies have shown that AI and big data help sports administration and coaches make strategic decisions using real-time data. These technologies can help sports organisations understand athlete performance metrics and enhance training and competition (Miller, Pierce, Johnson, & Stokowsk, 2023; Tan, 2023). The research also highlights how AI and Big Data improve education and sports administration. The current field debate matches this. Sports administrators and teachers may easily access and evaluate massive datasets to improve performance. Sports administration systems now make data-driven decisions thanks to AI and Big Data. Big Data-AI integration has limitations (Mamo et al., 2022; Xia, 2023). Staff training and data security and privacy issues limit rollout. Effective security and privacy legislation are crucial for sports groups and players. Staff must undergo extensive training to exploit AI and Big Data technologies due to their complexity. The paper takes a fresh approach by seeing these difficulties as collegiate sports administration development possibilities. Data privacy and security may boost stakeholder and athlete trust in sports organisations, allowing data-driven innovation. Training people to use AI and Big Data successfully may improve industrial innovation. This method highlights how AI and Big Data are revolutionizing sports management. It stresses overcoming obstacles and seizing growth chances, delivering a new viewpoint. By proactively and strategically addressing these issues, athletic organizations may enhance collegiate sports administration.

CONCLUSION

Big Data and AI have transformed collegiate athletics administration, boosting quality and safety. This qualitative research studied AI and Big Data in collegiate athletics. Significant study findings enhance comprehension and add new perspectives to the discourse. The study reveals that AI and big data are necessary for injury prevention, athlete performance, and data-driven decision-making. These innovative tools help schools and institutions detect and mitigate risks, making athlete training safer. Personalized AI-guided training has minimized injury and boosted peak performance. The study underlines the need for data-driven decision-making to enable sports administrators and coaches to make real-time strategic decisions. These decisions improve training, competition, and sports education for all participants. This study's unique viewpoint on AI-Big−Data integration problems is significant. The research sees these difficulties as development and improvement possibilities. Data security and staff training may encourage sports administration to adopt new technologies responsibly. This approach matches industry talks on collegiate athletics' AI and Big Data flexibility. The paper emphasizes ongoing improvement and instruction to address AI and Big Data difficulties. Monitoring and oversight are needed to ensure these technologies are used appropriately and efficiently to benefit sports organizations and individuals.

IMPLICATIONS

Practical Implications for College Sports Management

College athletes perform better, fans communicate, and ethical concerns are resolved by AI and Big Data. AI-powered injury prevention is crucial for athlete safety. To identify injury risks and create personalised training

and leisure programmes, colleges may utilize AI algorithms to analyse athlete data, including health and performance measurements. Proactively reducing injury risk enhances athlete health and performance over time. Big Data analytics aids coaches' real-time judgments. AI-driven performance analysis systems may assist coaches in evaluating player performance, identifying strengths and weaknesses, and altering training. This tailored training method improves college sports team performance and player skills. AI and Big Data can enhance non-sports audience pleasure. College campuses may tailor fan experiences using data analytics, interactive fan participation, targeted marketing, and personalized content. Individualized fan relations boost sports event attendance and sponsorship. Companies embracing new technology must handle ethical and legal issues related to data privacy, security, and justice. Institutions must prioritize strong rules and processes to collect, manage, and use athlete data. GDPR and HIPAA must be observed. Fairness and openness in AI algorithm implementation are needed to minimize bias and treat athletes equally.

Policy Implications

AI and Big Data in collegiate sports management impact ethics, information management, and player well-being. Comprehensive athlete records amassing, garage, and usage guidelines are wished first. Data and athlete privacy must be maintained. Colleges must undertake sports activities to control AI and Big Data guidelines. Maintain statistics confidentiality, accumulate consent, and follow information garage policies. Data breaches or unauthorized admission may endanger athlete information, consequently universities have to prioritize records security. Sports management regulations have to also encompass AI algorithms' moral implications in expertise acquisition, damage prediction, and performance evaluation. Institutions must prioritize algorithmic bias-discount and transparent decision-making. This involves checking out AI structures, supplying athlete assessments, and letting athletes debate algorithmic conclusions. AI-pushed harm prevention applications and athlete-precise health tracking need to be mandated to promote fitness and minimize injury chance. To efficaciously practice AI in sports activities administration, colleges want to educate and teach staff. Legislation needs to inspire regulatory agencies, sports activities businesses, and establishments to collaborate and proportion statistics to implement AI and huge facts governance standards. Industry standards, AI specialist certification, and stakeholder boards are examples. College sports activities government ought to evaluate the societal outcomes of AI and Big Data on instructional success, employment, and sports activities commercialization. Ethics like justice, fairness, and openness should drive policy. This guarantees AI and Big Data benefits are distributed fairly and socially.

Educational Implications

College sports activities administration curriculum need to be reformed to equip students for professions using Big Data and AI. Sports management is always evolving, hence universities must highlight AI and huge information in their curriculum. The application needs to include facts analytics, AI, and sports management. Sports management packages might also train AI and Big Data to assist college students follow those technologies. Experiential mastering and arms-on schooling are important to familiarize students with AI and Big Data technology. Students use their competencies in internships, practicums, and research tasks with organizations, sports groups, and technological corporations. Sports management calls for technical capabilities, vital questioning, problem-solving, and teamwork, which can be learned in practice. Institutions have to prioritize school improvement to make sure AI and Big Data professors can teach. Faculty might also use AI and Big Data breakthroughs in their coaching via cooperative studies, expert improvement, and seminars. Innovation and student studying may result from sports management, laptop technology, and facts science partnerships. Sports control courses the usage of AI and Big Data foster creativity and work skills. By training sports managers how to use AI and massive records, universities enhance sports activities management. Finally, incorporating AI and Big Data into college sports management prepares students for swiftly changing digital surroundings.

Potential Benefits for Athletes and Fans

College sports administration's usage of AI and big data might benefit athletes and fans. Technology has several benefits for athletes. AI-powered injury prevention can make training safer for everyone. These technological advances allow us to anticipate and mitigate dangers. AI-guided tailored training regimens assist college athletes to reach their full potential while reducing injury risk, and to improve all areas of their experience. Advocates benefit greatly from AI and Big Data integration. These technological advances have improved audience involvement and enjoyment by improving sports understanding, player abilities, and game dynamics. Fans should expect strong competition due to real-time data-driven decisions. Ultimately, AI and Big Data assist athletes and spectators. It represents a strong coalition that might improve security and the athletic experience, in line with athletes and their fans' aspirations. This win-win partnership between technology, athletes, and spectators in college athletics will provide safer, more engaged, and more thrilling sports experiences. These technologies can improve player performance, audience engagement, and sports enjoyment as they mature and

are used more in sports management.

LIMITATIONS AND FUTURE DIRECTION

A limitation of the current study is its reliance on the subjective perceptions and firsthand accounts of sports administrators and pundits. Although qualitative research provides valuable insights, future studies should consider incorporating quantitative approaches to complement and enhance these findings. A quantitative analysis might offer a more unbiased evaluation of the impact of AI and Big Data on safety and quality metrics in college sports administration, enabling a more comprehensive understanding of their effectiveness. Moreover, the study's sample size and scope may limit the applicability of the findings. In order to capture a wider spectrum of viewpoints, future research should augment the sample size and incorporate a more diverse array of stakeholders, including players, coaches, and fans. In addition, longitudinal studies might assess the enduring advantages of integrating AI and Big Data into college sports administration, providing valuable information on their long-term sustainability and expandability. A further limitation is the dynamic and ever-evolving nature of technology, which has the potential to render current findings outdated in the future. In order to stay up-to-date with the latest advancements in sports administration, future research should focus on staying current with emerging technologies and trends in AI and Big Data. This may involve examining state-of-the-art AI and Big Data technologies such as predictive analytics, machine learning, and virtual reality, along with their possible consequences for the safety and quality of collegiate athletics. In addition, although the current study primarily examined the utilization of AI and Big Data in college sports administration, future research might explore its application in other domains of sports governance and policy formulation. One such approach is to examine the application of AI and Big Data in the areas of compliance monitoring, talent recruiting, and strategic planning within the context of higher education institutions. Regarding practical implications, potential future developments may involve establishing regulations and optimal methodologies for the secure utilization of AI and Big Data in the management of collegiate sports. This may encompass recommendations for data protection, ethical considerations, and staff training protocols to ensure the successful and ethical implementation of these technologies.

CONFLICT OF INTEREST

All authors disclosed no relevant relationships.

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