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A critical discourse analysis of legitimacy, stakeholder voices, and calls to action in Saudi environmental associations

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ABSTRACT

This study aimed to identify the Challenges facing athletics coaches in applying artificial intelligence techniques, the researchers used the descriptive method in his survey method due to its suitability and the nature of the study, the study sample consisted of (364) athletics coaches from the directorates of education of the Jordanian Ministry of Education, and to address the analytical aspects of the subject of the study, the researchers turned to collecting raw data by building a questionnaire for the Challenges facing athletics coaches in the application of artificial intelligence techniques, which consists of (28) paragraphs distributed over three axes (the cognitive axis (8) paragraphs, the technical axis: (10) paragraphs, and the organisational axis (10) paragraphs. The researchers used the following statistical methods (arithmetic mean, standard deviation, Cronbach's alpha coefficient to measure internal consistency, and Pearson correlation coefficient. As for the technical Challenges, "the two institutions do not have the necessary technical infrastructure to use artificial intelligence technologies when training for athletics", while the organizational Challenges were "there are not enough financial resources for the use of artificial intelligence systems", and the study recommended many recommendations, the most important of which are: equipping the various institutions concerned with athletics with a modern infrastructure for the use of artificial intelligence systems.

KEYWORDS: artificial intelligence, athletics coaching, barriers, constraints, practical

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1. Introduction

Contemporary sports have gone beyond the concept of physical competition to become a vital field where human performance intersects with accelerated digital and technological transformation, as it now forms a space where human skills interact with advanced technologies, imposing a fundamental shift in preparation, training and competition, and establishing an integrated system that integrates biological capabilities with digital technologies to achieve maximum sporting excellence.

Coaches in general, and athletics coaches in particular, in addition to setting goals, need to formulate detailed and individual training plans that consist of exercises that the player has to do during training, taking into account the player's current performance, the time period, and the target performance that should be achieved, and this represents a great burden on athletics coaches, as athletics players cannot reach a high level of athletic performance without proper training planning. To reach a high level, a coach needs to use artificial intelligence as an effective tool to develop individual training plans for athletes, especially during the period of physical preparation, when athletes improve their physical and skill development, such as strength and endurance.

By analyzing large amounts of data generated during training and competition, AI systems identify patterns and provide insights that may be difficult for humans to detect, as AI systems can analyze performance and identify strengths and weaknesses, in addition to what algorithms based on wearable sensors allow for real-time monitoring of players, heart and effort indicators, enabling AI systems to identify performance patterns, detect glitches and suggest instant load or technology adjustments During the training session. (Bodemer, 2023, & Cossich et al., 2023, & Chidambaram, 2022, & Sperlich et al., 2023, & Wbaid et al.,2025)

However, the logic behind these techniques is often ambiguous, which leads to difficulties in applying and gaining the trust of coaches in general and athletics coaches in particular, hence the difficulties appear, as indicated (Mahmoud, 2023), that the lack of planning and policies, the weakness of resources and institutional structure, the lack of organized training, in addition to the lack of allocated budgets indicated by (Ahmed et al., 2025) is considered one of the organizational and administrative difficulties for the use of artificial intelligence technologies. Understanding system outputs (Al Sawani, 2024), managing cognitive load (Abed, 2025), and formulating commands (Merie et al., 2025) are among the cognitive difficulties in using artificial intelligence technologies. Regarding the technical difficulties of using artificial intelligence, which are concentrated in: data quality and sensors (Sperlich et al., 2023 & Zhou et al., 2025 & Musat et al., 2024 & Dudek et al., 2025), the need for a robust computing infrastructure (Pakeer, 2025), the high cost (Dudek et al., 2025 & Pakeer et al., 2025 & Cossich et al., 2023), and the high requirements for cybersecurity and privacy (Zhou et al., 2025 & Musat et al., 2024 & Dudek et al., 2025), which limit the mainstreaming of AI in sports training, especially at the non-professional levels.

Although there are many studies on the challenges of using AI in sports, few address the difficulties that athletics coaches face when working with AI technologies. Therefore, this study seeks to identify the difficulties that athletics coaches face in applying artificial intelligence technologies, to provide officials with facts to help them address these difficulties, and to present the conditions of athletics coaches to officials. We can identify legislation that helps coaches address the challenges they face when using artificial intelligence technologies.

This study is important for two reasons: its theoretical (scientific) importance and its practical importance. The study's significance lies in the variables it addresses, particularly the concept of artificial intelligence, which is an important variable for competitive sports coaches in general and athletics coaches in particular. The situations of a wide range of trainers are studied, as there is a lack of research in this category. It has developed a special questionnaire on the Challenges faced by athletics coaches when using artificial intelligence technologies. It opens new horizons for researchers to explore sports training and artificial intelligence, as well as various topics in individual and team sports. It sheds light on how sports officials can improve the infrastructure and working conditions of athletics coaches by leveraging artificial intelligence. The importance of the problem addressed in the study stems from knowledge of the cognitive, technical, and organisational Challenges that athletics coaches face when applying artificial intelligence technologies. Consequently, the results of the study will contribute to the development of better policies to improve the conditions of the study sample and provide practical solutions, such as strengthening institutional support for athletics.

The problem the study addresses is that the researchers are specialists in athletics, are interested in

artificial intelligence, and follow its developments. Through their review of some previous scientific studies and research, and through their discussions with colleagues and athletics coaches, and through their struggles in organisational and technical matters in the application of artificial intelligence in athletics training, they noticed that athletics coaches face great cognitive, technical, and organisational Challenges in the application of artificial intelligence techniques in sports training. The problem is compounded by the scarcity of studies that address the practical difficulties coaches face in applying artificial intelligence techniques, thereby reducing the expected positive impact of these technologies on the development of sports performance. Johnson & Lee (2019) confirmed that sports clubs face significant technical challenges in adopting artificial intelligence technologies, as their implementation requires advanced infrastructure. In addition, the club's staff's lack of technical expertise makes it difficult for them to properly understand and implement these technologies, which is reflected in the coaches' performance and achievements.

This is consistent with a study (Brown et al., 2022) that found difficulties in data collection and analysis. A study (Clark & White, 2021) found difficulties related to data privacy and security. The Harris (2020) study noted difficulties related to the cost of AI applications. The study (Albedaiwe,2023) found that some coaches and administrators may see AI applications as a threat to their jobs or traditional ways of working.

Based on the above, the researchers concluded that there is an urgent need to clarify the Challenges that athletics coaches face in applying artificial intelligence techniques. Hence, the questions of the study:

- What are the cognitive Challenges facing athletics coaches in applying artificial intelligence technologies?
- What are the technical Challenges facing athletics coaches in applying artificial intelligence technologies?
- What are the organisational Challenges facing athletics coaches in applying artificial intelligence technologies?

2. Literature Review

Artificial intelligence (AI) has shown significant potential in athletics coaching, but its use remains very limited due to technical, practical, and situational issues. It is not always that coaches possess digital skills and training to effectively use AI-powered tools like performance analytics and automated feedback systems (Al-Salman and Haider, 2024a, 2024b; Abu-Rayyash and Haider, 2024; Farghal and Haider, 2024; Haider et al., 2024a, 2024b, Also, according to previous researchers, user readiness, perceptions, and attitudes are critical determinants of successful AI technologies integration in the workplace (Al-Salman and Haider, 2021; Al-Salman, Haider, and Saed, 2022; Haider and Al-Salman, 2022; Haider, Hussein, and Saed, 2022; Saed et Moreover, the issues of institutional and contextual barriers remain in the way of successful AI application in sporting environments. Limited resources, insufficient planning, and lack of awareness of AI applications contribute to these challenges (Al-Dhuhli, Alkindi, & Al-Taani, 2022; Fraihat, 2024; Ja'afreh, 2023; Meqdad, Al-Bayyari, & Al-Taher, 2023). Moreover, psychological and behavioural considerations, including the unwillingness to change technology and fear of over-reliance on AI, also make the integration among coaches more complex (Ahmed, Al-Qatami, and Al-kilani, 2023; Al-Qahwaji, Atiyat, and Al-Moghrabi, 2023; Al-Taieb et al., 20). These results underline the importance of the structured support systems, training, and definite implementation frameworks (Aburahme, 2021; Ammari & Al-Ahmad, 2023).

This study aims to build on a body of previous research on the Challenges That athletics coaches face in applying artificial intelligence technologies, identify research gaps, and highlight the scientific contribution of the current study.

Bodemer (2023) conducted a study aimed at improving sports training using artificial intelligence, employing an experimental method. Training programs were made using artificial intelligence applications. The most important results were: The use of AI-powered tools led to significant progress in sports, the integration of artificial intelligence in sports training led to the improvement of individual performance, there is a natural tendency for highly experienced coaches to prefer their own decisions over artificial intelligence recommendations, including challenges related to data quality The lack of sufficient financial resources causes an obstacle to the use of artificial intelligence in sports training, and the lack of investment affects the development of coaches' skills.

Sperlich et al (2023) conducted a study to analyse the strengths, weaknesses, and threats associated with the application of artificial intelligence in sports training and performance improvement. The most important

findings were: the most important threats: over-reliance on technology, lack of sharing of human expertise, risks related to data privacy, and data integrity violations and manipulation.

Albedaiwe (2023) also aimed to provide an integrated vision of how to integrate artificial intelligence in sports clubs by developing technical infrastructure, training staff, and enhancing collaboration with specialised companies, while highlighting the expected benefits and challenges facing the implementation of these technologies, by collecting player data via wearable sensors and advanced cameras. Identify players' strengths and weaknesses and make data-driven decisions. The most important findings were that clubs face challenges in adopting these technologies, including high costs, a lack of technical expertise, and data privacy concerns.

WU (2024), which aimed to evaluate the impact of real-time monitoring of wearable AI devices in the rehabilitation of athletic athletes, stated, A group of athletes was selected and provided with a wearable AI device capable of real-time monitoring of their physiological parameters, athletic postures, and joint movements, and an individual rehabilitation model was created from the data collected by these sensors. Advanced intelligence algorithms were used to analyse the data. The most important result was that wearables with artificial intelligence are essential and have a significant impact on real-time monitoring in athlete rehabilitation.

Mateus et al (2024) conducted a study that aimed to analyze the presence of artificial intelligence in elite sports training and the integration of technologies in school sports, a systematic review of the recent literature in scientific databases was conducted in addition to a detailed analysis of the practical applications of artificial intelligence in elite sports training, and the most important results were: Artificial intelligence systems reflected positively on sports performance, although its application is limited in school sports due to high costs, insufficient infrastructure, and lack of a plan A strategy to this end.

Aljemely (2024) also conducted a study to identify the challenges trainers face during teacher training on the use of artificial intelligence. The best practices that can be used to enable teachers to use artificial intelligence, a systematic review of 10 studies was used that focused on the importance of artificial intelligence and teachers' use of artificial intelligence, the challenges faced by teachers and trainers, and the best practices that trainers can adopt, and the most important results were: Teachers lack the incentive to use AI, which is the biggest challenge for trainers. Therefore, training programs should be stimulating and personalised, and highlight the importance of AI. Moreover, training courses should be available on the latest AI technologies to give teachers hands-on experience, as good training reduces hesitation and boosts trainers' confidence.

Souaifi et al (2025) focused on AI methods and their effectiveness in improving performance, as the methodological literature and studies published in (2015-2024) were reviewed, data on AI technologies and biomechanical parameters were collected. The most important findings were: the implementation of AI systems led to a 23% reduction in recurrence rates; however, significant challenges remained, including data standardisation and a lack of infrastructure, which affected the quality of training.

Zhou et al (2025) aimed to uncover the applications, challenges, and future trends of AI in sports, in biomechanics, performance improvement, sports medicine, and health monitoring. The most important findings were: limited understanding was one of the most significant challenges in using AI systems, alongside data privacy and cybersecurity.

In addition to the study (Haase, 2025), which aimed to learn about how coaches use AI, effectiveness, and future potential, on a sample of 205 professional coaches in sports, the most important findings were: Positive attitudes promote the use of AI in sports training and that concerns about replacing humans with AI do not significantly affect the usage, as AI is the enhancer and not the alternative, which emphasizes the need for training to know AI systems.

Kim et al (2025) conducted a study summarising the ethical implications associated with the use of AI in sports, as nine databases were searched in 397 studies, and 25 studies were classified into four main ethical concerns, whose most important findings were: fairness and bias, transparency and explainability, privacy and data ethics, and accountability in the application of AI in sports. Emphasising the challenges related to explainability and trust in AI-led decisions, the most important issues were 22 studies in Data privacy.

Pakeer (2025) also conducted a study that aimed to integrate sports training systems into artificial intelligence, through video analysis and internet sensor data to provide a comprehensive assessment of movement and personal training reactions across different training environments, as the most important results were: Contribute to athlete development programs as artificial intelligence systems continue to develop, future

innovations in AI-powered sports training, especially in the field of personal training, lack of equipment limits the ability of coaches and players to benefit from intelligence systems Synthetic.

In the same way, Serli et al (2025) conducted a study aimed at identifying the challenges students face in using artificial intelligence to learn and translate academic texts, using a descriptive curriculum with a sample of 26 students in the Department of English Language Teaching at the University of Santo Augustinos. The most important result was that some believe artificial intelligence is useful. Others express doubts about its accuracy and the need for specialised training, as poor technological understanding and a lack of digital culture affect individuals' ability to adopt and use artificial intelligence effectively.

3. Study Methodology

The researchers used the descriptive survey method, which suited the nature and purposes of the study.

3.1 Study Population

The study sample comprised 364 athletics coaches from multiple directorates within the Ministry of Education, and Table 1 shows this:

Table 1: Demographic characteristics of the study sample members (n = 364)

Variable	Category	Number (frequency)	Percentage
Workplace	Central Directorates	136	37.4
	North Directorates	127	34.9
	Southern Directorates	101	27.7
Blind qualification	Bachelor	156	42.9
	Diploma in Education	128	35.2
	Postgraduate studies	80	22.0
Gender	Male	204	56.0
	Female	160	44.0
Total		364	100

Table (1) shows the distribution of the study sample members according to the workplace variable, as there are (136) coaches in athletics working in the central directorates of the Jordanian Ministry of Education (37.4%), and as for the scientific qualification, the largest percentage of them is a bachelor's degree in physical education with a frequency of (156) coaches in athletics (42.9%), and about gender, more than half of the study sample members were males with a frequency of (204) coaches in athletics (56%).

3.2 Study Tool

In order to achieve the objectives of the study, a questionnaire was built by the researchers to collect the required information, as it consists of two parts: the first part: it deals with the demographic data of the study sample members, and the second part: it consists of (28) paragraphs distributed over three axes (the cognitive axis (8 paragraphs), the technical axis (10 paragraphs), and the organizational axis (10 paragraphs).

The researchers used the five-point Likert scale to answer the questionnaire items, where the categories of the five-point graded scale were identified as shown in the table, as follows:

Table 2: Defining the categories of the Likert Five-Fold Scale

I agree very much	I highly agree	Moderate OK	I agree to a small degree	I agree to a very small degree
5.00-4.21	4.20-3.41	3.40-2.61	2.60-1.81	1.81-1.00

3.3 Content Authenticity

We confirmed the authenticity of the study tool by presenting it to (10) referees from the faculties of physical education in Jordanian universities with experience and specialisation in the subject of the study.

3.4 Validity

After confirming the study tool's content was accurate, it was applied to a sample of 30 athletics coaches from the study community. The Pearson correlation coefficient was calculated to assess the questionnaire's internal consistency. Table 3 illustrates this.

Table 3: Pearson's correlation coefficient for the paragraphs (**Challenge** faced by athletics coaches in the application of artificial intelligence techniques) with the total score of each axis.

Organisational Challenge		technical Challenge		Cognitive Challenge	
Paragraph Number	Correlation coefficient	Paragraph Number	Correlation coefficient	Paragraph Number	Correlation coefficient
1	0.742**	1	0.654**	1	0.703**
2	0.722**	2	0.696**	2	0.595**
3	0.643**	3	0.651**	3	0.779**
4	0.593**	4	0.631**	4	0.743**
5	0.605**	5	0.775**	5	0.696**
6	0.545**	6	0.588**	6	0.652**
7	0.629**	7	0.626**	7	0.678**
8	0.698**	8	0.582**	8	0.533**
9	0.752**	9	0.662**	-	-
10	0.681**	10	0.616**	-	-
	0.863**		0.862**		0.898**

** Statistically significant at the significance level ($\alpha \geq 0.01$).

Table (3) shows that all the correlation coefficients of the paragraphs with the total score of the axis to which they belong function at the significance level (0.01), indicating high and sufficient reliability indicators that can be trusted in the application of the current Study tool.

3.5 Stability of the tool

To verify the stability of the study tool, a sample of 30 athletics coaches from the study population was applied. Table 4 shows this:

Table 4: Stability coefficients for the study axes (n=30)

Number	Axis	Number of paragraphs	Stability Coefficient
1	cognitive	8	0.809
2	Technical	10	0.837
3	Organizational	10	0.868
	Overall stability	28	0.915

Table 4 shows that the stability coefficients of the study axes have high internal consistency (0.915), with values ranging from 0.809 to 0.868, indicating high stability and reliability for the application of the current study tool.

3.6 Procedures for the implementation of the study

The study tool was distributed to a sample of (364) athletics coaches from various directorates of education in Jordan, where the necessary instructions were attached to the tool, explaining the purpose and importance of the study, and answering any inquiry that could be raised in order to reach credible data by the respondents, as the researchers distributed the tool through the (Google Drive) program to the sample from 21/12/2025 – 16/1/2026

After the questionnaires were distributed and collected, the researchers entered the data into the Statistical Package for the Social Sciences (SPSS).

3.7 Statistical Treatments

To achieve the objectives of the study and answer its questions, the collected data were analysed using several appropriate statistical methods in the Statistical Package for the Social Sciences (SPSS), including frequencies and percentages. Arithmetic averages and standard deviations. Cronbach's Alpha coefficient for measuring internal consistency. Pearson correlation coefficient.

4. Findings

4.1 Presentation and discussion of the results

In light of the study's objectives and questions, the researchers collected the necessary statistical data by administering a questionnaire on the difficulties that athletics coaches face in applying artificial intelligence techniques. The following presents the results and discusses the study's questions.

To answer the first question, which states: "What are the cognitive and cognitive Challenges facing athletics coaches in the application of artificial intelligence techniques?" Table (5) shows this:

Table 5: Mathematical Averages and Standard Deviations of Cognitive Challenges Facing Athletics Coaches in the Application of Artificial Intelligence Techniques (N=364)

Paragraph Number	Paragraph	Arithmetic Average	Standard deviation	.
1	I find it difficult to link AI to athletic training fields	4.17	0.83	4
2	I do not have the skills to craft precise commands for AI tools	4.44	0.75	1
3	I find it easy to determine how long it takes to rely on AI versus my own experience	3.71	1.03	7
4	I need specialised training to use AI tools	4.24	0.87	2
5	I lack the right environment to improve my knowledge of artificial intelligence used in athletics training	3.76	0.85	6
6	I have sufficient knowledge of AI technologies contributing to athletic training	3.15	1.08	8
7	The amount of data provided by the AI system exceeds my ability to analyse.	4.17	0.83	3
8	I find it difficult to keep up with the developments in artificial intelligence	4.03	0.78	5
	Overall, Axis Grade	3.96	0.68	

Table (5) shows that the arithmetic averages of cognitive Challenges facing athletics coaches in the application of artificial intelligence techniques ranged between (3.15-4.44), and paragraph (2) was "I do not have the necessary skills to formulate precise commands for AI tools. " In the first place, with an average of (4.44), followed by paragraph (4), which is "I need specialised training to use artificial intelligence tools." With an average of (4.24), paragraph (3) came, which is "I find it easy to determine the time needed to rely on artificial intelligence as opposed to relying on my personal experience." "In the penultimate rank with an arithmetic average of (3.71), paragraph (6), which is "I have sufficient knowledge of artificial intelligence techniques to contribute to athletics training", came in the last rank with an average arithmetic value of (3.15), and the arithmetic average of the total degree of cognitive Challenges facing athletics coaches in the application of artificial intelligence techniques reached (3.96).

It is clear from Table 5 that paragraph (2), "I do not have the necessary skills to formulate precise commands for AI tools," ranked first, with an average of 4.44. The researchers attribute this to the fact that the field of formulating commands for artificial intelligence is considered modern and did not provide the athletics coach with sufficient opportunity to develop and apply this skill; moreover, his previous experience focused on the theoretical and practical aspects and did not address the technological and technical aspects. He did not

yet have the opportunity to combine his mathematical knowledge with the skills of using artificial intelligence technologies. This is consistent with the results of the Riche et al. (2025) study, which showed that improving command formulation skills is key to enhancing human-artificial intelligence collaboration and achieving the best results in various applied fields.

Paragraph (4) reads: "I need specialised training to use AI tools. The researchers attribute this to the fact that the work reality of coaches in general and athletic coaches in particular is based on direct human interaction. Hence, the athletics coach has various training programs and plans that can be flexibly adjusted based on the situation. However, when dealing with artificial intelligence techniques, he requires very specific commands and specialised training to be programmed and to formulate knowledge that enables him to respond correctly to the system. This result is consistent with the study of (Gmeiner et al., 2023), whose results showed that the use of AI tools requires new skills that are different from traditional skills, such as understanding and dealing with the system's outputs correctly, which makes specialized training necessary to overcome these difficulties; Training programs must therefore be stimulating and customized to meet the needs of users and provide a first-hand hands-on experience with technology, in addition to the fact that good training can reduce hesitation and enhance athletics coaches' confidence in the use of AI technologies, which explains the importance of specialized training expressed by athletics coaches (Aljemele, 2024). In addition, limited technical understanding and digital literacy hinder individuals' ability to adopt and use AI tools effectively, underscoring the need for specialist training (Serli et al., 2025). In educational contexts, teachers face additional stress when using these tools, and they need ongoing training support to overcome these challenges and make the most of AI in education (Alwaqdani, 2024).

Paragraph (3) reads, "I find it easy to determine the time required to rely on AI as opposed to relying on my personal experience. The researchers attribute the fundamental reason for the paragraph's result to the dispersion in the way athletics coaches use artificial intelligence and rely on their training experience. This state is a natural result of a lack of knowledge of artificial intelligence techniques and of the human soul's preference for the human over the machine. This is consistent with studies by Sperlich (2023) and Grivas et al. (2025), which showed that many trainers have difficulty assessing when AI recommendations are more accurate or relevant than their own judgment, especially in the absence of a deep understanding of how systems work or their limitations.

A study (Bodemer et al., 2023) showed that trainers with extensive training experience tend to favour their own decisions and underestimate automated system recommendations.

Paragraph (6) "I have sufficient knowledge of AI techniques to contribute to athletics training" came in last place with an average of (3.15). This result is in line with the researchers' expectations that reflect that few users feel that they have advanced or specialised knowledge in this field, indicating that this aspect is not a common challenge or a high priority compared to other issues, such as a lack of skills in formulating orders or the need for specialised training. This finding is consistent with a study by (Bodemer et al. 2023 and Sperlich et al. 2023), whose results showed that there are challenges such as generalizability, the need to integrate human experience with technology, privacy and ethics concerns, as well as the resistance of some athletes and coaches to adopt the new technology fully. The results indicate that in-depth technical knowledge is not widely available among athletes and coaches, making adequate understanding in this field rare. Having sufficient knowledge is therefore considered less common and ranks last compared to the more pressing need to develop and train skills for using and maintaining tools.

To answer the second question, which states: "What are the technical Challenges facing athletics coaches in the application of AI technologies?" Table (6) shows this:

Table 6: Mathematical Averages and Standard Deviations of Technical Challenges Facing Athletics Coaches in the Application of Artificial Intelligence Techniques (n=364)

Paragraph Number	Paragraph	Arithmetic Average	Standard deviation	Ranking
1	The frequency of technical malfunctions limits my use of AI applications in daily athletic training	3.55	0.95	6
2	The organisation does not have the technical infrastructure to use AI technologies during athletic training	4.00	0.86	1
3	I find it difficult to deal with modern technologies	3.93	0.89	3
4	I have enough ability to handle AI-generated data	3.19	1.05	10
5	My institution does not have enough equipment for athletics training related to AI applications	3.98	0.87	2
6	AI apps are easy to run during training.	3.29	1.00	7
7	The internet's limitations hinder my use of AI in athletics training.	3.74	0.90	4
8	The available AI apps do not meet my needs for athletic training.	3.20	1.01	9
9	I am concerned about the technical aspects of protecting player data when using AI systems.	3.63	0.89	5
10	I find it difficult to integrate AI applications with athletic training	3.26	1.04	8
	Overall, Axis Grade	3.58	.75	

Table (6) shows that the arithmetic averages of the technical Challenges facing athletics coaches in the application of artificial intelligence techniques ranged between (3.19-4.00), and paragraph (2) was "My institutions do not have the necessary technical infrastructure to use artificial intelligence technologies when training for athletics. "In the first place, with an average of (4.00), followed by paragraph (5), which is "My institution does not have enough equipment for athletics training related to artificial intelligence applications" and with an average of (3.98), and paragraph (8), which is "The available artificial intelligence applications do not meet my needs in athletics training. " In the penultimate rank with an arithmetic average of (3.20), paragraph (4) came, which is "sufficient ability to deal with data generated using artificial intelligence." Ranked last with an arithmetic average value of (3.19), and the arithmetic average of the total degree of technological and technical difficulties facing athletics coaches in the application of artificial intelligence techniques reached (3.58).

It is clear from Table 6 that paragraph 2, which is "My institutions do not have the necessary technical infrastructure to use AI technologies in athletics training. The researchers attribute this result to the fact that trainers hear about the enormous potential of AI but lack modern devices, as the problem is not in their training skills or practical experience, but in the environment needed to use AI technologies.

This finding is consistent with a study by Pakeer (2025), which showed that advanced AI-based training systems, such as motion analysis using computer vision and wearable sensors, require advanced infrastructure, including cloud computing and reliable communication networks, to ensure real-time, accurate performance. A study (Souaifi et al., 2025) found that the lack of infrastructure limits organisations' ability to integrate technologies such as deep learning and real-time data analysis, negatively impacting the quality of training and feedback provided to athletes. In addition to the Mănescu study, which showed that the high cost and complex technical requirements make it difficult for small and medium-sized educational and sports institutions to adopt these technologies without investment support and clear policies.

Paragraph (5), which is "My institutions do not have enough equipment for athletics training related to artificial intelligence applications", came in second place with an average of (3.98). Based on this result and the second paragraph, the researchers confirm that the Ministry of Education lacks sufficient equipment for athletics training and the infrastructure for the use of artificial intelligence technologies. This aligns with studies by Wang et al. (2022) and Wu (2024), which found that specialised technical equipment, such as wearable sensors, computer vision systems, and biomechanical measurement devices, is essential for accurate data collection and

analysis using artificial intelligence. A study (Pakeer, 2025) showed that the lack of specialised equipment limits coaches' and athletes' ability to benefit from modern technologies that rely on accurate and effective analysis of motor and physiological data.

Paragraph (8) reads, " The available AI applications do not meet my needs in athletics training. " It ranks penultimate with an average of (3.20), and this confirms what the researchers said, that the Ministry of Education lacks equipment and infrastructure.

Paragraph (4), which is "possess sufficient ability to deal with data generated using artificial intelligence", came in the last rank with an average of (3.19), and this is in line with the researchers' expectations, as trainers possess superficial skills in dealing with artificial intelligence techniques.

To answer the third question, which states: "What are the organisational Challenges faced by athletics coaches in the application of artificial intelligence technologies?" Table (7) shows this:

Table 7: Mathematical Averages and Standard Deviations of Organisational Challenges Facing Athletics Coaches in the Application of Artificial Intelligence Techniques (n=364)

Paragraph Number	Paragraph	Arithmetic Average	Standard deviation	Ranking
1	**Lack of regular AI training programs in my** organisation**.**	3.56	0.81	8
2	**High hardware prices are hindering the effective application of AI.**	4.22	0.80	2
3	**The weakness of the administrative staff** at my sports institutions is their inability to keep **pace with artificial intelligence.**	4.00	0.74	5
4	**My organisation does not have a strategic plan for using AI in athletics training.**	3.05	1.01	10
5	**There are no clear regulations governing the protection of player data when using AI systems**	4.10	0.79	3
6	**The high** subscription prices for artificial intelligence applications prevent their use in athletic **training**	4.00	0.62	4
7	**Lack of internal initiatives that encourage digital innovation**	3.82	0.84	6
8	**Lack of awareness among administrative staff about the importance of artificial intelligence technologies**	3.34	1.02	9
9	**There are not enough financial resources to use AI systems in** athletic **training**	4.34	0.75	1
10	**Lack of partnerships between my sports institutions and technical institutions**	3.63	0.86	7
	Overall, Axis Grade	3.81	0.54	

Table (7) shows that the arithmetic averages of the organizational Challenges facing athletics coaches in the application of artificial intelligence techniques ranged between (3.05-4.34), and paragraph (9) was "There are not enough financial resources to use artificial intelligence systems in athletics training." in the first place with an arithmetic average of (4.34), followed by paragraph (2), which is "**The high prices of devices hinder the effective application of artificial intelligence.**" With an arithmetic average of (4.22), paragraph (8), which is "the lack of awareness of the administrative staff about the importance of artificial intelligence technologies", came in the penultimate rank with an average of (3.34), and paragraph (4), which is "My institution does not have a strategic plan for the use of artificial intelligence in athletics training", came in the last place with an average value of (3.05), and the arithmetic average of the total degree of organizational and administrative difficulties

facing athletics coaches in the application of artificial intelligence technologies (3.81).

It is clear from Table 7 that paragraph 9, "There are not sufficient financial resources for the use of AI systems in athletics training," ranked first with an average of 4.34. This result was in line with the researchers' expectations because funding is a real, tangible, and undeniable obstacle, given the high costs of software, hardware, and staff training. The researchers attribute this finding to the fact that while AI technologies offer significant benefits in improving performance, personal training, and injury prevention, inadequate funding limits their widespread and effective application. This underscores the need to increase financial resources allocated to AI systems.

This result aligns with the studies by Bodemer et al. (2023) and Canzone et al. (2025), which found that insufficient financial resources are the main barrier to the use of artificial intelligence systems in athletics training. The lack of investment hinders the development of coaches and sports workers' skills in using these technologies efficiently, reducing the opportunities to make optimal use of them. The study (Mănescu, 2025, & Sperlich et al., 2023) showed that AI systems require significant investments in infrastructure, advanced equipment, and specialised software development.

Paragraph (2), which is "There are no clear regulations regulating the protection of players' data when using artificial intelligence systems", came in second place with an average of 4.22, and this is a logical result in the researchers' opinion that the prices of devices are not affordable for coaches. The Ministry of Education does not provide them to all coaches, which causes an obstacle to the use of artificial intelligence technologies. Paragraph (8), which is "Lack of awareness of the administrative staff about the importance of artificial intelligence technologies", came in the penultimate rank with an average of (3.34). The researchers attribute this result to the fact that the administrative staff responsible for the trainers are not sufficiently aware of the importance of artificial intelligence, as this topic is new. They have not been prepared adequately, and this requires conducting training courses to raise managers' awareness and knowledge of artificial intelligence technologies.

Paragraph (4) reads: "My institution does not have a strategic plan for the use of artificial intelligence in athletics training. " It ranked last with an average of (3.05), which is in line with the researchers' expectations, as administrators focus on implementation rather than planning, as artificial intelligence is still new to them. This finding is consistent with studies by Santiago et al. (2025) and Mateus et al. (2024), which showed that the absence of a strategic plan leads to unregulated reliance on technical tools, reducing their effectiveness and limiting the achievement of sustainable results. This finding contrasts with the results of a study (Xu et al., 2025) that focused on strategic plans to address challenges such as data protection and ethical considerations associated with the use of AI in sport.

5. Conclusions and recommendations

Based on the study's results and discussion, the researchers reached the following conclusions.

There are cognitive, technical, and organisational Challenges in applying AI technologies. The most important cognitive Challenges game coaches face when applying AI techniques are: "I do not have the skills to formulate precise commands for AI tools." The most important technical challenges facing game coaches in applying AI technologies are that "my institutions do not have the necessary technical infrastructure to use AI technologies when training athletes." The most important organisational Challenges facing game coaches in applying AI technologies are that "there are not enough financial resources to use AI systems."

Based on the study's findings, the researchers recommend the following: offering courses on the application of artificial intelligence technologies, especially for athletics administrators and coaches. Equip various athletic institutions with modern infrastructure to support the use of AI systems. Increasing the financial resources needed for the use of AI systems

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