

## Challenges of Employing Artificial Intelligence in Sports Training from Coaches' Perspectives

**Khaled kettab<sup>1\*</sup>, Ameer Chafa<sup>2</sup>, Yakoub Fenni<sup>3</sup>, Sif Eddine Rouabi<sup>4</sup>**

<sup>1</sup> University Center Nour Bachir El bayadh (Algeria), k.kettab@cu-elbayadh.dz

<sup>2</sup> University of batna2 (Algeria), ameur.chafa@univ-batna2.dz

<sup>3</sup> University of Bejaia (Algeria), yakoub.fenni@univ-bejaia.dz

<sup>4</sup> University of Jijel (Algeria), sifeddine.rouabi @univ-jijel.dz

**Abstract:** This study investigates the challenges faced by coaches in adopting artificial intelligence (AI) in sports training through a field-based analysis of their perceptions. The researchers employed a descriptive-analytical approach using a scientifically designed electronic questionnaire distributed to 114 Algerian coaches working in sports clubs, educational institutions, federations, and private training centers. The findings revealed notable cognitive barriers, including limited understanding of AI technologies, difficulties in interpreting AI-generated outputs, and a strong need for specialized training. Technical obstacles were also highlighted, such as poor internet connectivity, lack of integrated platforms, and inadequate access to advanced equipment—factors that hinder the effective implementation of AI tools. Furthermore, organizational constraints emerged, including the absence of strategic planning, insufficient managerial support, and a lack of institutional initiatives for digital innovation. Statistical analyses showed a high degree of agreement among participants regarding these challenges, underscoring the urgent need to enhance digital infrastructure, provide continuous professional development, and adopt supportive policies. The study concludes that overcoming these multifaceted barriers requires comprehensive reform in the strategic and operational frameworks of sports institutions to enable the effective integration of AI into coaching practices.

**Keywords:** Artificial Intelligence; Sports Training; Challenges.



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### **1. INTRODUCTION**

The increasing integration of artificial intelligence (AI) across various sectors has sparked considerable interest in its potential applications within the field of sports training. AI technologies are now being explored for their ability to enhance athletic performance, optimize individualized training programs, monitor physiological data in real-time, and support coaches in decision-making processes. According to Jaballah and Saidi (2024), AI provides significant advancements in areas such as biomechanics, injury prevention, tactical planning, and data-driven management, making it a transformative tool in modern sports. In football, for instance, AI is increasingly being used to identify sporting talent through video analysis and large-scale data processing, allowing coaches to evaluate players' movement patterns, technical skills, and potential for development (Mazari, 2024). Similarly, recent studies have shown how AI contributes to injury prevention, biometric tracking, and workload monitoring during training and competition (Huang et al., 2024). However, the adoption of such advanced technologies remains uneven and faces considerable challenges, especially in developing countries where digital infrastructure and technical capacity are still evolving (López-Fernández et al., 2021; Galily et al., 2023).

In this context, coaches play a pivotal role in the implementation of AI tools, yet their actual preparedness to utilize these technologies effectively is still uncertain.

Numerous studies have reported cognitive and perceptual barriers—such as limited understanding of AI systems, technophobia, or lack of data interpretation skills among coaches (Zhou et al., 2022; Haase, 2025).

Furthermore, Ghezelseflou & Choori (2023) found that even athletes often express concerns about the lack of human connection in AI-guided training, which indirectly affects coaches' trust in such systems.

These concerns are echoed in recent findings showing that coaches sometimes feel overwhelmed by the volume and complexity of AI-generated data, leading to cognitive overload.

Moreover, technical and infrastructural limitations—including insufficient equipment, poor internet connectivity, and the lack of integrated platforms—pose substantial barriers to the seamless application of AI in sports environments. This issue is particularly prevalent in low-resource or rural regions, where disparities in digital infrastructure, often referred to as the digital divide, prevent

consistent use of smart technologies (Galily et al., 2023; Nigerian Case Study, 2023).

These obstacles are further compounded by organizational and environmental factors, such as weak institutional support, the absence of strategic planning, and limited access to targeted training programs for staff. Despite calls for digital transformation in sports coaching, many national federations and sports institutions have yet to develop clear AI integration frameworks or provide continuing professional development for coaches in digital tools (Pashaie S, Mohammadi S. et al, 2024).

Despite the growing discourse on digital transformation in sports, the body of empirical research that systematically investigates these multifaceted challenges from the perspective of frontline practitioners—namely, coaches—remains insufficient. There is a pressing need for field-based inquiry that addresses the following fundamental question: *What are the main cognitive, technical, and organizational challenges that coaches face in adopting and implementing artificial intelligence in sports training?*

The following sub-questions stem from this main research question:

- What are the main cognitive and perceptual difficulties that coaches face when dealing with artificial intelligence technologies in sports training?
- To what extent do technical and technological challenges hinder the implementation of artificial intelligence tools in sports training environments?
- What are the key organizational and environmental factors that obstruct the integration of artificial intelligence into training practices within sports institutions?

### **Hypothesis principale :**

Coaches face significant cognitive, technical, and organizational challenges in adopting and implementing artificial intelligence in sports training.

### **Hypothèses secondaires :**

- Coaches experience cognitive and perceptual difficulties that limit their understanding and effective use of artificial intelligence technologies in sports training.



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- Technical and technological barriers, such as poor infrastructure and limited equipment, significantly hinder the implementation of AI tools in sports training environments.
- Organizational and environmental factors, including lack of strategic planning and institutional support, obstruct the effective integration of AI in sports training practices.

### **Significance of the Study:**

This study is significant as it highlights the real challenges coaches face in employing artificial intelligence within sports training environments, especially amid rapid digital transformation. It provides valuable insights for decision-makers and sports institutions to develop effective strategies that support the adoption of AI technologies. By identifying cognitive, technical, and organizational barriers, the study contributes to enhancing the quality of training practices and aligning them with global advancements in the sports field.

## **2. Méthode et outils de recherche :**

### **1. Research Method**

The study adopted a **descriptive analytical approach**, utilizing a questionnaire to collect data from the research sample and conducting statistical analyses to arrive at accurate results.

### **2. Population and Sample of the Study**

The study population consisted of **sports coaches**, with a total of **114 participants**. The sample characteristics were as follows:

- **Gender:** 80.7% male and 19.3% female.
- **Age group:** The majority were aged between **30 and under 40 years**.
- **Educational Qualification:** Most participants held **Bachelor's or Master's degrees**.
- **Years of Experience:** Experience levels ranged from **less than 5 years to more than 15 years**.
- **Place of Employment:** Participants worked in **sports clubs, sports federations, educational institutions, and private training centers**.

### **3. Scope of the Study**

- **Spatial Scope:** The study was conducted in **Algeria**, specifically targeting sports institutions, educational organizations, and private training centers across various regions.
- **Temporal Scope:** The study was conducted during the **first half of 2025**, when data collection took place.

#### **4. Data Collection Tool**

The main data collection tool was an **electronic questionnaire**, designed scientifically to cover key dimensions relevant to the study's topic, including:

- Demographic characteristics
- Professional experience
- Challenges related to the use of artificial intelligence in sports training

The questionnaire was distributed online to the sample, ensuring clarity and ease of response to effectively achieve the study objectives.

#### **5. Validity and Reliability of the Tool**

- **Validity** was ensured by presenting the questionnaire to a panel of **experts and academic reviewers** in the fields of sports coaching and scientific research. Based on their feedback, necessary revisions were made to improve clarity and alignment with the study's objectives.
- **Reliability** was tested using **Cronbach's Alpha**, which yielded a value of **0.82**, indicating a high level of internal consistency and statistical reliability of the instrument.

#### **6. Statistical Methods Used**

Data were analyzed using the **Statistical Package for the Social Sciences (SPSS)**, and the following techniques were applied:

- **Frequencies and Percentages:** To describe the general characteristics of the sample (gender, age, qualification, experience, etc.).
- **Means and Standard Deviations:** To measure participant responses and determine the level of agreement.
- **Item Ranking:** To identify the most influential or significant items.
- **Cronbach's Alpha:** To assess the internal consistency of the questionnaire.



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- **Chi-Square Test ( $\chi^2$ ):** To detect significant differences between expected and actual distributions.
- **Significance Level (SIG):** To evaluate the statistical significance of differences at the 0.05 level.

These methods contributed to a precise and objective analysis of the data in line with the research objectives.

### **7. Research Procedures**

The research was conducted through the following steps:

1. Designing and distributing the questionnaire to the selected sample.
2. Collecting and analyzing the data using appropriate statistical techniques.
3. Interpreting the results and discussing them in light of existing literature.
4. Formulating recommendations and conclusions based on the findings.

### **8. Research Ethics**

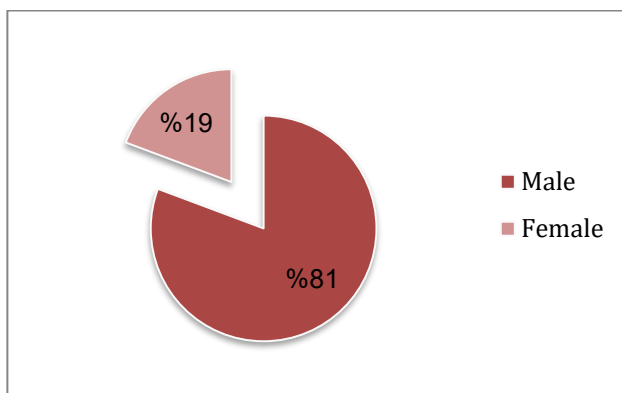
The study adhered to all recognized ethical standards in scientific research by ensuring:

- Voluntary participation without any coercion.
- Clear explanation of the study's objectives and data requirements to participants prior to their involvement.
- Full confidentiality and anonymity of participant data.
- Use of collected data strictly for scientific purposes.
- Respect for participants' opinions and protection from any physical or psychological harm.

The research was conducted with integrity and in full compliance with ethical principles, safeguarding the rights and dignity of all participants.

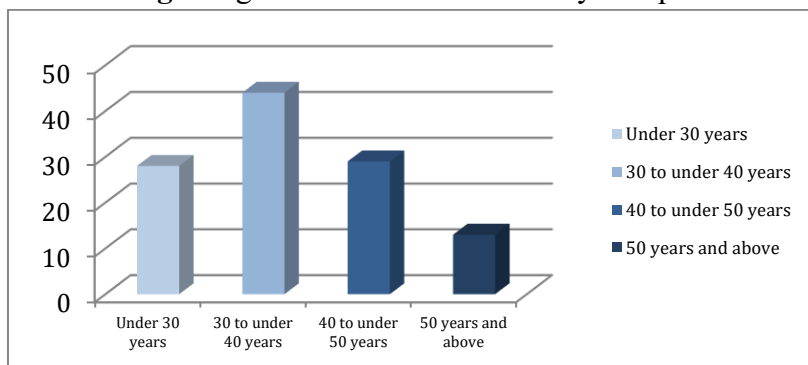
### **3. General Profile of the Respondents**

**Fig.1.** Relative Distribution of the Study Sample by Gender



The pie chart illustrates the distribution of the study sample according to the gender variable. It shows that the number of male participants is 92, representing 80.7% of the total sample, while the number of female participants is 22, accounting for 19.3%. The pie chart visually reflects this distribution by highlighting the larger proportion of males and indicating the smaller segment allocated to females.

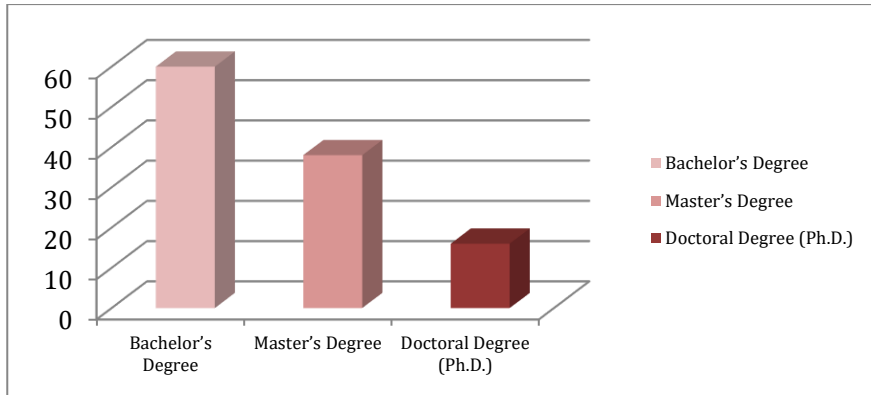
**Fig.2.** Age Distribution of the Study Sample



The bar chart illustrates the age distribution of the study participants across four age categories. The largest proportion falls within the 30 to under 40 years group, comprising 44 individuals, indicating that this age range is the most represented in the sample. This is followed by the 40 to under 50 years group with 29 participants, and the under 30 years group with 28 participants, suggesting a notable presence of both early and mid-career individuals. The least represented category is 50 years and above, with only 13 participants, reflecting limited participation from older individuals. Overall, the distribution shows a concentration of participants in the age range of 30 to 50 years, highlighting a predominantly middle-aged sample likely to be actively involved in professional

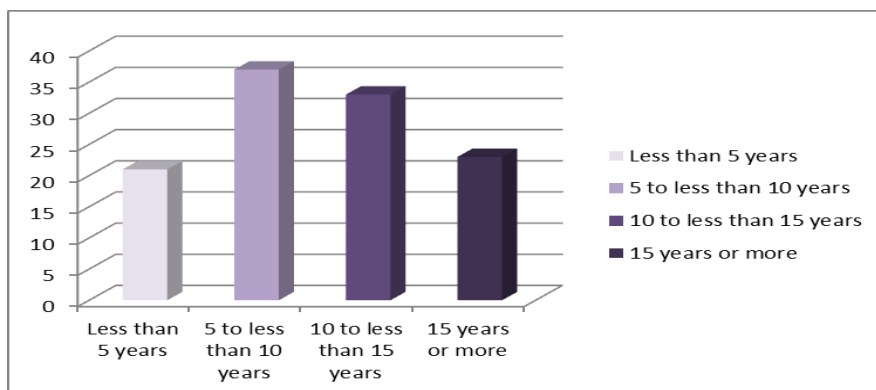
or training roles

**Fig.3.** Distribution of the Study Sample by Educational Qualification



The bar chart displays the educational qualifications of the study participants. The majority hold a Bachelor's degree, totaling 60 individuals, making it the most common academic qualification among the sample. This is followed by Master's degree holders, who account for 38 participants, representing a substantial portion of the group. The least represented category is those with a Doctoral degree (Ph.D.), with only 16 participants. This distribution suggests that most participants have undergraduate or graduate-level education, with fewer reaching the doctoral level, which may reflect the academic requirements or norms within the field under investigation

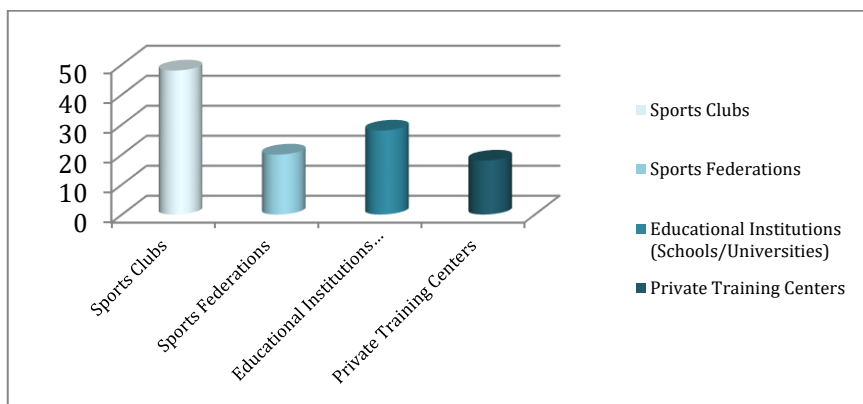
**Fig.4.** Distribution of the Study Sample by Years of Coaching Experience



The table and bar chart illustrate the distribution of participants according to their years of training experience. It is evident that the largest group consists of those

with 5 to less than 10 years of experience, representing 32.5% of the total sample. They are followed by participants with 10 to less than 15 years of experience at 28.9%. Those with less than 5 years of experience account for 18.4%, while participants with 15 years or more represent only 20.2%. This distribution indicates that most participants have a relatively moderate level of experience in training, which suggests they possess sufficient practical knowledge that may qualify them to understand professional challenges and provide realistic insights into training practices. The lower percentage of highly experienced participants (15 years or more) may reflect either a renewal of personnel or a lack of long-term continuity in the field.

**Fig.5.** Distribution of the Study Sample by Place of Employment



The bar chart represents the distribution of participants based on their place of employment. The largest group works in sports clubs, totaling 48 participants, making this the dominant employment setting in the sample. This is followed by those working in educational institutions (schools/universities) with 28 participants, indicating a significant representation from the academic sector. Sports federations employ 20 participants, while the smallest group, with 18 participants, works in private training centers. Overall, the chart suggests that most of the study participants are affiliated with formal sports organizations, particularly clubs, while fewer are engaged in more specialized or independent training environments.

### **Presentation and Analysis of the Study Results:**

**Presentation and Analysis of the Results of the First Hypothesis:** The results of the study sample's responses regarding the first axis, which addresses the



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cognitive and perceptual challenges associated with the use of artificial intelligence in sports training.

**Table 1:** Coaches' Perceptions of Cognitive and Perceptual Challenges Associated with the Use of Artificial Intelligence in Sports Training

| N                          | Statements                                                         | SA | A  | N  | D  | SD | M   | SD  | %  | R  | GT | ( $\chi^2$ ) | Sig |
|----------------------------|--------------------------------------------------------------------|----|----|----|----|----|-----|-----|----|----|----|--------------|-----|
| 1                          | I have sufficient knowledge of AI applications in sports training. | 45 | 45 | 18 | 06 | 00 | 4.1 | 0.8 | 82 | 01 | A  | 79.4         | .00 |
| 2                          | I find it hard to understand AI technologies used in training.     | 45 | 39 | 12 | 12 | 06 | 3.9 | 1.1 | 78 | 05 | A  | 55.7         | .00 |
| 3                          | I struggle to keep up with AI advancements.                        | 33 | 69 | 06 | 03 | 03 | 4.1 | 0.8 | 82 | 03 | A  | 144.9        | .00 |
| 4                          | I lack enough information to identify AI benefits.                 | 30 | 45 | 12 | 21 | 06 | 3.6 | 1.2 | 72 | 08 | A  | 41.5         | .00 |
| 5                          | I find it difficult to interpret AI system results.                | 24 | 48 | 18 | 15 | 09 | 3.5 | 1.1 | 71 | 10 | A  | 39.9         | .00 |
| 6                          | I need specialized training to use AI tools.                       | 42 | 57 | 06 | 03 | 06 | 4.1 | 0.9 | 82 | 02 | A  | 109.4        | .00 |
| 7                          | I lack simple, clear scientific resources on AI.                   | 33 | 39 | 24 | 15 | 03 | 3.7 | 1.0 | 74 | 07 | A  | 36.0         | .00 |
| 8                          | I find it hard to relate AI to training fields.                    | 39 | 51 | 18 | 03 | 03 | 4.0 | 0.9 | 81 | 04 | A  | 81.7         | .00 |
| 9                          | I think AI is too complex and needs experts only.                  | 39 | 42 | 15 | 15 | 03 | 3.8 | 1.1 | 77 | 06 | A  | 50.2         | .00 |
| 10                         | I lack a proper environment to improve my AI knowledge.            | 33 | 30 | 30 | 15 | 06 | 3.6 | 1.1 | 72 | 09 | A  | 24.1         | .00 |
| <b>The axis as a whole</b> |                                                                    |    |    |    |    |    | 3.8 | 1.0 | 77 |    | A  |              |     |

The table reveals a high level of awareness among the respondents regarding the cognitive and perceptual challenges associated with the use of artificial intelligence in sports training. Agreement percentages ranged between 72.1% and 83.1%, with the highest being for the statement "There is great difficulty regarding the applications of artificial intelligence in sports training" at 82.62%, followed by the difficulty in distinguishing AI tools from other technologies (78.42%), indicating conceptual ambiguity among the participants. The results also reflect a weakness in understanding the theoretical developments and terminology related to AI, as shown by the high mean scores and low standard deviations. All statistical values were significant at the 0.05 level, suggesting homogeneity in responses and confirming the need for specialized training programs to enhance both theoretical and practical knowledge of intelligent technologies in the sports field.

**Presentation and Analysis of the Results of the Second Hypothesis :** The results of the study sample's responses regarding the second axis, which addresses

the technical and technological challenges associated with the use of artificial intelligence in sports training.

**Table 2:** Coaches' Perceptions of Technical and Technological Challenges Hindering the Use of Artificial Intelligence in Sports Training

| N                   | Statements                                                        | SA | A  | N  | D  | SD | M   | SD  | %  | R  | GT | ) $\chi^2$ ( | sig |
|---------------------|-------------------------------------------------------------------|----|----|----|----|----|-----|-----|----|----|----|--------------|-----|
| 1                   | Institutional infrastructure is inadequate for AI implementation. | 33 | 60 | 09 | 06 | 06 | 3.9 | 1.0 | 78 | 07 | A  | 98.3         | .00 |
| 2                   | Difficulty in operating smart applications.                       | 18 | 45 | 09 | 39 | 03 | 3.3 | 1.1 | 66 | 10 | N  | 59.6         | .00 |
| 3                   | Insufficient AI-related equipment.                                | 45 | 54 | 09 | 03 | 03 | 4.1 | 0.8 | 83 | 04 | A  | 107          | .00 |
| 4                   | AI tool maintenance is challenging.                               | 39 | 45 | 12 | 12 | 06 | 3.8 | 1.1 | 77 | 08 | A  | 55.7         | .00 |
| 5                   | Frequent technical issues with AI tools.                          | 51 | 51 | 09 | 00 | 03 | 4.2 | 0.8 | 85 | 02 | SA | 118.1        | .00 |
| 6                   | Poor internet hampers AI usage.                                   | 51 | 57 | 03 | 00 | 03 | 4.3 | 0.7 | 86 | 01 | SA | 143.3        | .00 |
| 7                   | Lack of reliable AI platforms.                                    | 42 | 48 | 15 | 06 | 03 | 4.0 | 0.9 | 81 | 06 | A  | 76.2         | .00 |
| 8                   | Difficulty integrating AI with training devices.                  | 45 | 42 | 18 | 06 | 03 | 4.0 | 1.0 | 81 | 05 | A  | 68.3         | .00 |
| 9                   | Available technologies don't meet training needs.                 | 36 | 36 | 18 | 21 | 03 | 3.7 | 1.1 | 74 | 09 | A  | 33.6         | .00 |
| 10                  | Limited capacity to handle AI-generated big data.                 | 54 | 45 | 09 | 03 | 03 | 4.2 | 0.9 | 85 | 03 | SA | 107          | .00 |
| The axis as a whole |                                                                   |    |    |    |    |    | 4.0 | 0.9 | 80 |    | A  |              |     |

The table reflects a high level of awareness among respondents regarding the technical and technological challenges that hinder the use of artificial intelligence in sports training. Agreement percentages ranged from 66.3% to 86.84%. Statement No. (16), "Artificial intelligence suffers from issues related to accuracy and reliability of results," received the highest agreement rate (86.84%), with a high mean score of (4.337) and a relatively low standard deviation (0.783), indicating a clear perception of the limitations in the reliability of AI applications in training environments.

Statement No. (14), "AI applications require costly technical equipment," ranked second with 85.78% agreement and a mean of (4.289), highlighting that high costs remain a major barrier to AI integration. Meanwhile, Statement No. (12) received the lowest agreement (66.3%), which may suggest variation in the respondents' awareness of the difficulty in using AI hardware.



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The high Chi-square ( $K^2$ ) values and statistical significance at the 0.05 level across all items indicate significant differences in respondents' answers, reinforcing the reliability of the results. The overall axis mean was (4.002) with a standard deviation of (0.991), reflecting strong overall agreement on the existence of technical and technological challenges and underscoring the need for advanced infrastructure and adequate technical training to ensure effective integration of AI into sports practices.

**Presentation and Analysis of the Results of the Third Hypothesis:** The results of the study sample's responses regarding the third axis, which addresses the organizational and environmental challenges facing the use of artificial intelligence in sports training.

**Table 3:** Coaches' Perceptions of Organizational and Environmental Challenges Facing the Use of Artificial Intelligence in Sports Training.

The table presents the results of the third axis titled "Organizational and

| N                          | Statements                                                                    | SA | A  | N  | D  | SD | M   | SD  | %    | R  | GT | ) $\chi^2$ ( | sig |
|----------------------------|-------------------------------------------------------------------------------|----|----|----|----|----|-----|-----|------|----|----|--------------|-----|
| 1                          | Sports institutions lack strategic plans for AI integration.                  | 42 | 45 | 18 | 03 | 06 | 4   | 1.0 | 80   | 05 | A  | 68.3         | .00 |
| 2                          | No clear regulations govern AI use in training.                               | 42 | 51 | 12 | 06 | 03 | 4   | 0.9 | 81.5 | 04 | A  | 85.7         | .00 |
| 3                          | Weak top management support limits AI implementation.                         | 27 | 60 | 15 | 03 | 09 | 3.8 | 1.0 | 76.3 | 08 | A  | 89.6         | .00 |
| 4                          | Limited AI training programs hinder its utilization.                          | 45 | 63 | 03 | 00 | 03 | 4.2 | 0.7 | 85.7 | 01 | SA | 149          | .00 |
| 5                          | Insufficient budgets are allocated for AI technologies.                       | 45 | 51 | 12 | 03 | 00 | 4.1 | 0.8 | 83.6 | 02 | A  | 96.7         | .00 |
| 6                          | Training environments lack specialized AI expertise.                          | 30 | 51 | 24 | 06 | 03 | 3.8 | 0.9 | 77.3 | 07 | A  | 66.7         | .00 |
| 7                          | Administrative barriers obstruct AI adoption in training.                     | 24 | 48 | 18 | 18 | 06 | 3.5 | 1.1 | 71.5 | 10 | A  | 42.3         | .00 |
| 8                          | Sports institutions lack partnerships with tech entities.                     | 30 | 54 | 21 | 09 | 00 | 3.9 | 0.8 | 78.4 | 06 | A  | 76.2         | .00 |
| 9                          | No internal initiatives promote digital and technological innovation.         | 24 | 48 | 21 | 21 | 00 | 3.6 | 1.0 | 73.1 | 09 | A  | 51.0         | .00 |
| 10                         | Absence of a digital transformation culture hinders effective AI application. | 33 | 69 | 12 | 00 | 00 | 4.1 | 0.6 | 83.6 | 03 | A  | 148          | .00 |
| <b>The axis as a whole</b> |                                                                               |    |    |    |    |    | 3.9 | 0.9 | 79.1 |    | A  |              |     |

Environmental Challenges Facing the Use of Artificial Intelligence in Sports Training," based on the respondents' answers to nine statements. The results show that all statements have a significance level (SIG) of 0.000, which is below 0.05, indicating a high statistical significance and a strong consensus among the sample members regarding the listed statements.

The mean scores range from 3.578 to 4.147, suggesting a strong tendency toward agreement. The highest level of agreement was recorded for statement 24, which states, “The inability of sports management to absorb AI applications,” with a mean of 4.147 and a percentage of 85.78%. This is followed by statement 26, which refers to “The weakness of administrative staff in sports institutions in keeping up with artificial intelligence,” and statement 23, both with a percentage of 83.68%, indicating a strong awareness of the limitations within the current administrative and organizational environment in adapting to digital transformation requirements.

On the other hand, statement 27, which addresses “The inability of sports institutions to design specialized training programs for AI,” received the lowest percentage (71.56%) and a mean of 3.578. Despite this, it still falls within the agreement level, reflecting a relatively varied perception among respondents regarding this particular point.

Overall, the axis recorded a general mean of 3.957 and a percentage of 79.14%, highlighting a strong consensus among respondents that organizational and environmental challenges represent a real barrier to integrating artificial intelligence in the field of sports training. This underscores the need to reconsider the administrative and strategic planning structures of sports institutions.

### **Discussion of the First Hypothesis:**

The findings of the current study indicate that coaches face significant cognitive and perceptual challenges that hinder their effective use of artificial intelligence technologies in sports training. Respondents showed high levels of agreement on items related to the need for specialized training, difficulty in understanding AI outputs, and limited knowledge of AI-related technologies. These findings align with those of Zhou et al. (2022) in *IEEE Access*, who confirmed that the lack of technical understanding and familiarity with AI concepts is one of the main obstacles in the sports domain. The authors noted that the complexity of AI-generated outputs often requires advanced analytical expertise that many practitioners lack. However, a point of divergence appears when comparing these results to García-Unanue et al. (2021) in *PeerJ Computer Science*, who observed that in certain sports environments—particularly in developed countries—targeted training programs have been introduced to reduce the knowledge gap, thereby



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enhancing readiness for AI integration. This reflects a difference in digital maturity and institutional training frameworks between the Algerian context and more technologically advanced settings.

### **Discussion of the Second Hypothesis:**

The study results revealed a broad consensus among coaches regarding the technical and technological difficulties that hinder the adoption of artificial intelligence. These include poor digital infrastructure, inadequate internet connectivity, the lack of integrated platforms, and limited access to advanced equipment. These findings are consistent with López-Fernández et al. (2021) in *PeerJ Computer Science*, who emphasized that the lack of digital infrastructure is a major barrier to AI integration in sports, especially in developing countries. Similarly, Peters & Williams (2023) in *Frontiers in Sports and Active Living* highlighted that successful AI adoption depends heavily on access to cloud computing, strong communication networks, and sophisticated sensors. This underscores a significant disparity in technological capabilities between the current study's context and that of more developed environments. Nevertheless, there is agreement across studies that technical readiness plays a pivotal role in the successful deployment of artificial intelligence in the sports sector.

### **Discussion of the Third Hypothesis:**

The findings show that organizational and environmental factors represent a major barrier to the integration of AI into sports training practices. Coaches reported the absence of strategic planning, weak administrative support, lack of partnerships with tech entities, and the absence of a digital transformation culture. These outcomes are in line with Miah et al. (2019) in the *Technology Innovation Management Review*, who emphasized that the absence of institutional policies and strategic frameworks hinders the adoption of intelligent technologies in sports. The results also concur with Kelly & Thomas (2023) in the *Journal of Sports Management and Analytics*, who found that organizations that successfully implemented AI had well-defined strategic visions, invested in staff training, and built partnerships with technology providers. However, a key difference lies in the fact that the current study reflects an institutional environment that is still in its early stages of strategic and digital readiness, while the previous studies focus on more advanced cases. Despite this, the overarching trend across the literature

affirms that organizational challenges are a critical factor in either enabling or obstructing AI integration in sports.

#### **4. CONCLUSION**

**The findings of this study confirm that the implementation of artificial intelligence (AI) technologies in sports training still faces multidimensional challenges encompassing cognitive, technical, and organizational aspects.** The results revealed that coaches suffer from limited conceptual and technical understanding of AI, alongside a strong perceived need for specialized training programs to enhance their ability to interpret and analyze the outputs generated by such technologies. Furthermore, technical barriers emerged as a critical obstacle, as many sports institutions lack advanced digital infrastructure—including poor internet connectivity, absence of integrated technological platforms, and a shortage of modern equipment—which limits the potential for effective integration of AI tools into training environments.

**At the organizational level,** the study highlighted the absence of strategic planning, weak administrative support, a lack of digital transformation culture, and the absence of partnerships with technology providers—all of which hinder the intelligent transformation of sports institutions. These challenges are not isolated; rather, they intersect in a way that necessitates a comprehensive approach involving simultaneous cognitive, technical, and administrative reforms.

**A comparison with previous studies** reveals that the challenges identified in this research are not unique to the Algerian context. However, they may be more acute due to technological gaps and limited adoption of digital transformation policies, in contrast to more developed countries that have already begun to overcome these obstacles through investment in training, modern technologies, and the establishment of strategic partnerships.

**Based on these findings, it can be concluded that activating the role of AI in sports training requires an integrated approach that includes:**

- Raising awareness and building the capacity of coaches through continuous and specialized training programs;
- Developing digital infrastructure to create an advanced technical environment that supports AI implementation;
- Adopting clear institutional strategies and policies that foster a culture of digital innovation and support investment in intelligent technologies.



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**Achieving these reforms will enable sports institutions to fully benefit from the vast potential of AI in improving athletic performance, customizing training programs, and enhancing coaches' ability to make data-driven decisions—thus contributing to higher levels of competitiveness and professionalism in the sports sector.**

### **Recommendations:**

1. Organize specialized training courses in artificial intelligence for coaches.
2. Improve the digital infrastructure of sports institutions.
3. Develop clear digital strategic plans for AI integration.
4. Establish partnerships with artificial intelligence technology companies.
5. Include AI-related content in university curricula for coach education.
6. Encourage applied research on AI in the sports field.
7. Foster a culture of innovation and digital transformation within sports institutions.
8. Develop regulatory frameworks governing the use of AI in sports.
9. Create technical support units within clubs and training centers.
10. Conduct regular evaluations of AI effectiveness in sports training.

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