



Reality Of Using Biomechanical Indicators In Sports Training To Analyze Digital Performance Of Track And Field Athletes

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Abstract

This study aimed to identify reality of using biomechanical indicators in sports training. This study analyzes digital performance of Iraqi track and field athletes and identifies factors contributing to its use from perspectives of coaches, performance analysts, and specialized faculty members. The researcher employed a descriptive methodology. Sample consisted of 65 individuals: a main sample of 50 and a pilot sample of 15. A questionnaire was used to collect data after its validity and reliability were verified. Data were statistically analyzed using means, weighting ratios, and Chi-square test. Results showed level of use of biomechanical indicators in athletic training. The study found that digital performance analysis was highly effective, contributing to improved performance analysis efficiency and identification of athletes' strengths and weaknesses. It also revealed that availability of high-speed cameras and modern biomechanical equipment is a key factor in facilitating its use in training. In light of these findings, study recommended enhancing use of biomechanical indicators in track and field training, providing modern equipment and technologies, training coaches and performance analysts in use of biomechanical analysis software, and establishing specialized laboratories. These measures aim to improve training process and raise performance level of Iraqi track and field athletes.

Keywords: Biomechanical Indicators, Sports Training, Digital Performance.

INTRODUCTION

Science of sports training has witnessed In recent years, it has developed rapidly as a result of scientific and technological progress, and has become increasingly dependent on results of scientific research and modern technologies in developing athletic performance and achieving success. Biomechanics is one of most prominent sports training sciences that has contributed to this development, as it is concerned with applying mechanical principles and laws to movement of human body in order to interpret, evaluate and improve motor performance by studying variables affecting athletic performance.. Track and field is one of sports most closely linked to biomechanic

indicators and is considered one of requirements for key to modern training programs is digital level, which directly depends on efficiency of motor performance and accuracy of executing technical phases of skill, as it provides accurate information that helps improve performance and make training decisions based on scientific evidence. use of digital technologies, such as wearable sensors, high-speed cameras, and artificial intelligence, in field of biomechanical analysis, integration of biomechanical analysis With modern wearable technologies, it contributes to improved monitoring of athletic performance, provides immediate feedback, and supports decision-making, accurate training decisions.

Importance of research use of biomechanical indicators in analyzing digital performance of track and field athletes in general, from perspective of coaches, performance analysts and faculty members in Iraq, provides a database that can be used to develop field work. The researcher found a clear disparity in level of use of biomechanical indicators in sports training process. Digital performance analysis , coupled with limited use of modern technologies in supporting training decisions. This has led to a lack of clarity regarding actual use of these indicators within Iraqi sports environment. The problem lies in need to identify reality of use of biomechanical indicators in analyzing digital performance of athletics players in Iraq, through a descriptive study that aims to determine level of use of these indicators, factors that contribute to their use, availability of necessary technologies and devices, and to reveal the most prominent obstacles that limit their use, in order to contribute to providing a clear scientific picture that can be used in future to develop training process and raise digital level of athletics players in Iraq.

Research Objectives: To identify reality of using biomechanical indicators in sports training to analyze digital performance of track and field athletes. This can be achieved through following questions: What is level of use of biomechanical indicators in sports training? How to analyze digital performance of track and field athletes? What factors contribute to use of biomechanical indicators? In sports training process, how is digital performance of track and field athletes analyzed? Research Hypotheses is no Biomechanical indicators are used in sports training for analysis of digital performance of track and field athletes.

RESEARCH METHODOLOGY

The researcher used descriptive method survey method with its steps and procedures Which He provides They understand On " Reality of Using Biomechanical Indicators in Sports

Training Process To analyze digital performance of track and field athletes, where it is done this Curriculum Study variables research as it is with Individuals Sample Don that researcher has role in adjust Variables topic Measurement. final questionnaire was administered from 28/12/2025 to 23/2/2026. How to correct questionnaire form: researcher relied on three-point Likert scale to determine responses to questionnaire form, which consists of (Yes, Somewhat, No). (3-2-1) responses were given a score in order, and thus highest response to opinions of basic research sample was (84) points and lowest response was (28) points.

Community consisted of coaches and instructors of athletics training, working with track and field athletes in Iraqi sports clubs, and registered with Iraqi Central Athletics Federation during 2025–2026 sports season. total research sample consisted of (65) coaches, study included experts and faculty members specializing in athletics training. main sample consisted of (50) individuals selected purposively, including (30) coaches, (10) experts , and (10) faculty members, study also included a pilot sample of (15) individuals from outside the main sample, including (8) coaches, (3) experts, and (4) faculty members, to verify scientific characteristics of instrument in terms of validity and reliability, and to ensure its suitability for application to the main sample.

Table 1. Description of sample

Community categories	Exploratory sample	Ratio	Basic sample	ratio
Coaches	8	53.3 %	30	60 %
Experts	3	20.0 %	10	20
Faculty members specializi in athletics training	4	26.7 %	10	20
Total sample	15	100 %	50	100

Practical procedures for questionnaire form

Content accuracy (judges' accuracy): The researcher presented expert survey form to (7) expert specialists in field of athletics training and sports movement sciences, attached No. (1), with aim of seeking their opinion on validity of research statements and their connection to axes of questionnaire form, as explained in Table No. (2).

Table 2. Expert opinions on statements in questionnaire form (n=7)

Axis	Phrase number	Approvin _g experts	Percentag	Axis	Phrase numbe	Approvin _g experts	Percentag
First	1	7	100%	Second	15	7	100%
	2	7	100%		16	7	100%
	3	7	100%		17	7	100%

4	7	100%	18	7	100%
5	7	100%	19	7	100%
6	5	71.4%	20	7	100%
7	7	100%	21	7	100%
8	6	85.7%	22	7	100%
9	7	100%	23	7	100%
10	7	100%	24	7	100%
11	7	100%	25	7	100%
12	7	100%	26	7	100%
13	7	100%	27	7	100%
14	7	100%	28	7	100%
-	-	-	29	6	85.7%

Table (2) shows consensus of experts on validity of most of statements in questionnaire form, as their opinions ranged between (85.7%: 100%), except for statement No. (6), percentage of agreement was (71.4%), and researcher accepted percentage of (85.7%) as minimum for accepting statement, and thus statement No. (6) was deleted.

Internal Consistency Validity

To verify validity of questionnaire's themes and statements, researcher applied questionnaire form to standardization sample for study, which consists of (15) individuals. Spearman's correlation coefficient was used to calculate validity of internal consistency, as shown below.

Table 3. Correlation coefficients between statements and their axes and total score of questionnaire form (n = 15)

Axis	Phrase number	With axi	With for	Axis	Phrase numbe	With ax	With for
First	1	0.84	0.83	Second	14	0.82	0.80
	2	0.83	0.85		15	0.67	0.61
	3	0.77	0.78		16	0.69	0.72
	4	0.90	0.88		17	0.79	0.69
	5	0.80	0.78		18	0.53	0.52
	6	0.80	0.81		19	0.75	0.71
	7	0.81	0.80		20	0.65	0.63
	8	0.82	0.82		21	0.79	0.81
	9	0.71	0.65		22	0.80	0.88
	10	0.67	0.67		23	0.64	0.56
	11	0.82	0.80		24	0.80	0.82
	12	0.89	0.88		25	0.70	0.75
	13	0.69	0.65		26	0.52	0.52
					27	0.53	0.59
					28	0.55	0.54

Tabular value of (r) at 0.05 level is 0.51

Table (3) shows existence of a statistically significant correlation at significance level of (0.05), where all calculated correlation coefficient values were greater than tabulated value of (r) between score of each statement and score of axis to which it belongs, and between score of statement and total score of questionnaire, as values of correlation coefficient between score of statement and axis to which it belongs ranged between (0.52: 0.90), and values of correlation coefficient between score of statement and total score of questionnaire ranged between (0.52: 0.88), which indicates existence of consistency validity.

Table 4. Correlation coefficient between score of each axis and total score of questionnaire n=(15)

No.	Axes	Total degree correlation coefficient
1	First axis: level of use of biomechanical indicators in analyzing digital performance of track and field athletes	0.97
2	Second axis: Factors that contribute to use of biomechanical indicators for digital performance analysis among track and field athletes	0.96

Tabular value of (r) at 0.05 level is 0.51

A statistically significant correlation at significance level of (0.05), where calculated correlation coefficient values were greater than tabulated value of (r) between score of each axis and total score of questionnaire, as correlation coefficient values with total score of questionnaire were between (0.97, 0.96) for each of them, which indicates validity of questionnaire axes.

Calculation of Reliability Coefficient

It was used Cronbach's alpha coefficient for calculating reliability coefficient of questionnaire axes, applied to a pilot sample of (30) individuals

Table 5. Cronbach's alpha reliability coefficient for questionnaire form and its axes (n=15)

No.	Axes	Cronbach's alpha stability coefficient
1	First axis: level of use of biomechanical indicators in analyzing digital performance of track and field athletes	0.957
2	Second axis: Factors that contribute to use of biomechanical indicators for digital performance analysis among track and field athletes	0.879
3	overall score for questionnaire form	0.960

Reliability coefficient is statistically acceptable at (0.700 and above).

Table No. (5) shows reliability coefficients of questionnaire axes using Cronbach's alpha method, where value of Cronbach's alpha reliability coefficient for questionnaire form was (0.960) and value of Cronbach's alpha for questionnaire axes was between (0.879: 0.957), which indicates that questionnaire has high reliability.

Table 6. Cronbach's alpha reliability coefficient for questionnaire when each item is removed, along with axis score and total score of form, n=(15)

Axis	Phrase number	With axis degree	With form grade	Axis	Phrase number	With axis degree	With form grade
First	1	0.952	0.957	Second	14	0.859	0.957
	2	0.952	0.957		15	0.867	0.959
	3	0.954	0.957		16	0.868	0.958
	4	0.951	0.957		17	0.862	0.958
	5	0.953	0.958		18	0.879	0.960
	6	0.953	0.958		19	0.860	0.958
	7	0.954	0.957		20	0.869	0.959
	8	0.954	0.958		21	0.861	0.958
	9	0.957	0.959		22	0.861	0.957
	10	0.955	0.958		23	0.869	0.959
	11	0.951	0.957		24	0.859	0.957
	12	0.951	0.957		25	0.862	0.958
	13	0.957	0.959		26	0.879	0.960
					27	0.878	0.960
					28	0.877	0.960

Table (6) shows effect of deleting each statement on reliability coefficient for each axis of questionnaire and on total score of questionnaire, as value of Cronbach's alpha reliability coefficient for each statement is less than or equal to reliability score of its axes and total score of questionnaire form, which indicates that questionnaire enjoys a high degree of reliability.

Statistical parameters

Ratios and frequencies, Spearman's correlation coefficient, Cronbach's alpha reliability coefficient, Weighting ratio for calculating weighted response for each statement, Chi-squared (χ^2), Arithmetic mean.

RESULTS AND DISCUSSION

Presentation and discussion of first topic level of use of biomechanical indicators in digital performance analysis of athletics players

Table 7. Repetitions weighting ratio, Chi- squared, mean, and prevailing trend around statements of first axis (n=50)

No.	Phrase	Yes	Some w	No	Weighti ratio	Chi ²	Mean	Trend	Rank
1	Coach uses biomechanical indicators in digital performance analysis track and field athletes	27	13	10	78%	9.8	2.34	Yes	Eighth
2	Coach employs motion analysis programs when evaluating players' digital performance .	35	7	8	84.6%	30.3	2.66	Yes	Third
3	Coach relies on biomechanical measurements when analyzing technical performance .	31	11	8	82%	18.7	2.46	Yes	Sixth
4	Coach benefits from results of biomechanical analysis in evaluating player performance .	34	8	8	84%	27.04	2.52	Yes	Fourth
5	Coach links biomechanical indicators with player digital level .	33	4	13	80%	26.4	2.40	Yes	Seventh
6	Coach identifies strengths and weaknesses using biomechanical indicators .	38	3	9	86%	42.04	2.60	Yes	Second
7	Coach compares results of biomechanical indicators with digital performance levels of players .	24	10	16	72%	5.9	2.16	to some extent	Ninth
8	Coach monitors development of digital performance through biomechanical analysis .	35	4	11	82.6%	31.7	2.48	Yes	Fifth
9	Coach relies on biomechanical indicators when making training decisions .	31	11	8	82%	18.7	2.46	Yes	Sixth Tie

10	Coach documents results of biomechanical analysis to use them in monitoring players .	35	6	9	84%	30.5	2.52	Yes	Fourth Tie
11	Coach analyzes motor performance using modern biomechanical techniques .	34	9	7	84.6%	27.1	2.54	Yes	Third Tie
12	Coach invests in biomechanical indicators to improve accuracy of digital performance evaluation .	33	10	7	84%	24.2	2.52	Yes	Fourth Tie
13	Use of biomechanical indicators contributes to increasing efficiency of digital performance analysis for track and field athletes .	40	6	4	90.6%	49.1	2.66	Yes	First

Value of χ^2 (0.05) = 5.99 Weighted mean: No (1:1.66), Somewhat (1.67:2.33), Yes (2.34:3)

Table (7) shows that there are statistically significant differences between responses of research sample members in all statements of first axis (level of use of biomechanical indicators in digital performance analysis of athletics players) in favor of most frequent response, as calculated χ^2 value ranged between (5.9: 49.1), which is higher than its tabulated value at a degree of freedom of (2) and a significance level of (0.05). Table also shows that responses of sample to statements of first axis were towards (Yes), except for statements No. (7), whose responses were towards (Somewhat), as weighting percentage for statements of first axis ranged between (72%: 90.6%).

Statement "Use of biomechanical indicators contributes to raising efficiency of digital performance analysis for athletics players" came in first place, with a weighting percentage of (90.6%), and an arithmetic mean of (2.66). The researcher believes that this statement's ranking first reflects sample's conviction that biomechanical indicators have become among most important scientific tools used by modern coaches in analyzing athletic performance. This is due to accurate and objective data they provide, which contributes to interpreting motor performance, identifying technical errors, and determining players' strengths and weaknesses, thus positively impacting performance development. Furthermore, rapid advancements in

motion analysis software, wearable sensors, and artificial intelligence technologies have made biomechanical analysis an essential component of modern sports training systems. This finding aligns with study by Maqshoush (2019). Which confirmed that use of biomechanical analysis helps in interpreting technical performance and improving achievement in athletics competitions, and is also consistent with study by Salamah (2020).

This study demonstrated a significant correlation between certain kinematic variables and performance levels in shot put. It also aligns with systematic review conducted by Teferi & Endalew (2020), which confirmed that biomechanical analysis is among most accurate scientific methods for analyzing athletic performance and provides coaches with information unattainable through traditional observation, thus contributing to improved training efficiency. Furthermore, it supports recent study by Alzahrani et al. (2024), which demonstrated that integrating biomechanical indicators with wearable technologies and artificial intelligence has led to enhanced athletic performance monitoring, real-time feedback, and more accurate and effective training decisions. Statement “Coach identifies strengths and weaknesses using biomechanical indicators” came in second place, with a weighting of (86%) and an arithmetic mean of (2.60). The researcher believes that this result confirms sample members’ awareness of role that biomechanical indicators play in objectively diagnosing technical performance, as identifying strengths and weaknesses represents scientific basis for building training programs and choosing appropriate intervention methods to develop performance .

Moreover, relying on biomechanical analysis reduces influence of personal judgments and gives coach accurate quantitative indicators that help him monitor development of player’s level and contribute to continuous evaluation of effectiveness of training programs. This finding aligns with study by Bachev et al. (2018), which confirmed that use of computer-aided biomechanical analysis in sprint competitions helped identify most influential indicators for improving start and acceleration phases, thus providing precise quantitative criteria for performance evaluation. It also agrees with study by Bouabdallah et al. (2023), which affirmed that biomechanical indicators are a fundamental element in improving quality of training and educational interventions; however, their effectiveness depends on extent to which coaches possess necessary knowledge and skills to apply them . Furthermore, it aligns with findings of Knudson (2007).

Biomechanical analysis provides a scientific basis for evaluating motor performance and correcting technical errors . In general, results in this section indicate a positive trend

towards using biomechanical indicators in analyzing numerical performance of track and field athletes, although some statements achieved a (Somewhat) high level of accuracy. This indicates that use of these indicators has not yet reached desired level within Iraqi sports institutions, which may be due to limited availability of specialized equipment and software, scarcity of biomechanical laboratories, and lack of continuous training for coaches and performance analysts on use of modern technologies. The researcher believes that promoting a culture of training decision-making based on biomechanical data will lead to improved training quality, increased performance efficiency, and better digital achievement in athletics competitions, it is (desired) that Iraqi sports institutions keep pace with these developments by providing modern technologies, training human resources, and expanding use of motion analysis programs within clubs and national teams.

Presentation and discussion of second theme (Factors that contribute to use of biomechanical indicators for digital performance analysis among track and field athletes)

Table 8. Frequencies, weighting ratio, Chi², mean, and prevailing trend around statements of second axis (n=50)

No.	Phrase	Yes	Somewhat	Nc	Weighting ra	Chi ²	Mean	Trend	Rank
14	Availability of modern biomechanical devices contribute to improving digital performance analysis .	34	7	9	83.33%	27.1	2.50	Yes	Second
15	Using motion analysis software helps in accurately evaluating digital performance of players .	26	12	12	76%	7.8	2.28	Somewha	Eleventh
16	Training instructors in field of	31	11	8	82%	18.7	2.46	Yes	Fourth

	biomechanics enhances efficiency of performance analysis .								
17	Availability of specialized personnel contributes to effective application of biomechanical analysis .	33	8	9	82.6%	24.04	2.48	Yes	Third
18	Providing high-speed imaging cameras helps improve accuracy of biomechanical analysis .	32	13	5	84.6%	23.08	2.54	Yes	First
19	availability of sports laboratories supports application of biomechanical indicators in training .	30	11	9	80.6%	16.1	2.42	Yes	Sixth
20	Availability of material resource contributes to continuous use of biomechanical technologies .	31	8	11	80%	18.7	2.40	Yes	Seventh

Collaboration between trainers and biomechanic specialists enhance quality of digital performance analysis .										
21		29	10	11	78.6%	13.7	2.36	Yes	Ninth	
Accurate collection of motion data helps in interpretation of digital performance of players .										
22		29	12	9	80%	13.9	2.40	Yes	Seventh	Tie
Use of modern digital technology supports speed of completing biomechanical analysis .										
23		28	11	11	78%	11.5	2.34	Yes	Tenth	
Continuous training of trainers contributes to development of skills in using biomechanical indicators .										
24		34	4	12	81.3%	28.9	2.44	Yes	Fifth	
Utilizing results of biomechanical analysis helps in improving training plans .										
25		26	12	12	76%	7.8	2.28	Somewhat	Eleventh	Tie
Availability of motor performance analysis .										
26		32	6	12	80%	22.2	2.40	Yes	Seventh	Tie

	databases enhance accuracy of comparing and interpreting results									
	Use of biomechanical indicators									
27	contributes to detection of technical errors during performance	31	9	10	80.6%	18.5	2.42	Yes	Sixth	Tied
	Integration of biomechanical analysis and digital									
28	performance supports more effective training decisions	30	9	11	79.3%	16.1	2.38	Yes	Eighth	

Value of $\chi^2 (0.05) = 5.99$ Weighted mean: No (1:1.66), Somewhat (1.67:2.33), Yes (2.34:3)

Table (8) shows that there are statistically significant differences between responses of research sample members in all statements of second axis (factors that contribute to employing biomechanical indicators to analyze digital performance of athletics players) in favor of most frequent response, as calculated chi-square value ranged between (7.8: 28.9), which is higher than its tabulated value at a degree of freedom of (2) and a significance level of (0.05). Table also shows that responses of research sample to statements of second axis tended towards (yes), except for statements number (15, 25), whose responses tended towards (somewhat), where weighting percentage for statements of second axis ranged between (76%: 84.6%) Statement “Providing high-speed imaging cameras helps improve accuracy of biomechanical analysis” came in first place, with a weighted percentage of (84.6%). The researcher believes that this result confirms that high-speed cameras represent one of most important basic

requirements for biomechanical analysis, as they allow for high-precision recording of motor performance, slowing down movement, and extracting various kinematic variables, such as speed, angles, displacement, and time. This helps coaches and performance analysts to diagnose technical errors objectively, which is difficult to achieve using direct observation alone, quality of data extracted from imaging is basis upon which motion analysis programs rely to provide accurate results that can be used to develop athletic performance.

This result is consistent with study by Alzahrani et al. (2024). Which confirmed that use of modern technologies and wearable sensors, along with advanced biomechanical analysis systems, greatly contributes to improving accuracy of monitoring athletic performance and providing real-time data that helps in making training decisions, and is consistent with study (Teferi & Endalew, 2020). She explained that quality of analytical tools and measurement methods is a key element in success of biomechanical analysis process, and that quantitative analysis provides information that cannot be obtained by relying on traditional observation. Statement "Availability of modern biomechanical devices contributes to improving digital performance analysis" came in second place, with a weighting of 83.33%. The researcher believes that availability of modern biomechanical devices is one of most important factors that helps in applying scientific analysis within sports institutions. These devices contribute to measuring kinetic and mechanical variables accurately and objectively, and provide a scientific database that helps coaches monitor performance development, evaluate training programs, and make decisions based on accurate data rather than relying solely on personal experience. Furthermore, continuous development of software and digital devices has facilitated data collection and analysis processes, making them faster and more efficient.

This finding aligns with study by Bachev et al. (2018), which confirmed that using modern computer systems in analyzing motor performance contributes to identifying most influential indicators in athletic performance and increases accuracy of technical performance evaluation. It also agrees with study by Bouabdallah et al. (2023), which indicated that successful application of biomechanical indicators depends largely on availability of technical resources and modern equipment, as well as coaches' possession of necessary knowledge to utilize them in training process, noted from results of table that two statements **(15)** "Use of motion analysis programs helps in accuracy of evaluating digital performance of players," and **(25)** "Employing results of biomechanical analysis helps in improving training plans" came in direction of (to some extent) , with a weighting percentage of (76%). For each of them, which

indicates a relative deficiency in fully utilizing motion analysis programs and their results within Iraqi sports environment.

The researcher believes this result may be due to limited use of specialized software, inadequate training in utilizing biomechanical analysis outputs for training program planning, and a shortage of qualified personnel to handle these technologies. This hinders optimal utilization of modern technology's potential in developing athletic performance. In general, results of this section confirm that successful application of biomechanical indicators in digital performance analysis depends not only on availability of modern equipment and technologies but also on qualified personnel, continuous training programs, a robust technological infrastructure, and collaboration between coaches, performance analysts, and biomechanics specialists. Findings also indicate that providing these elements will contribute to improving quality of performance analysis, enhancing efficiency of training programs, and raising digital performance levels of track and field athletes, **also believes** that investing in technological infrastructure, providing high-speed cameras, modern biomechanical devices, and motion analysis programs, along with preparing specialized human resources, represents one of the most important requirements for developing training system in Iraqi athletics, in line with modern global trends in sports performance analysis, and enhances chances of achieving sports achievement at local and international levels.

Both confirmed (Teferi & Endalew, 2020) Ali states that biomechanical analysis is one of most important scientific methods used in analyzing athletic performance, as it provides coaches and researchers with accurate quantitative data that helps in interpreting performance, detecting technical errors, and guiding training process according to scientific principles. Biomechanical analysis is one of the most important means of evaluating athletic performance, as it relies on a set of biomechanical indicators that describe characteristics of movement in a precise quantitative manner, such as speed, acceleration, angles, forces, displacement, time, and path of body's center of gravity, which helps to identify strengths and weaknesses, correct technical errors, and improve athletic achievement . In this regard, Ahmed Fouad El-Shazly (2001) explained that applying mechanical principles to motor performance contributes to identifying precise rules of athletic skills. Biomechanical analysis also allows for extraction of movement paths and physical variables necessary to interpret and evaluate performance scientifically (El-Shazly, 2001, p. 335). Amal Jaber Metwally (2008) also affirms that kinematic analysis represents a scientific tool for understanding athletic performance and identifying

errors, thus aiding in design of appropriate training programs and development of skill levels (Metwally, 2008, p. 66) . In this regard, a study by Bachev et al. (2018) demonstrated that use of computer-based biomechanical analysis systems contributed to identifying most influential kinematic indicators for improving performance, particularly in sprinting competitions, thereby helping to provide precise quantitative criteria for evaluating technical performance and raising performance standards.

CONCLUSIONS

The findings indicate that the use of biomechanical indicators plays an important role in improving the digital performance analysis of track and field athletes. These indicators enable coaches to identify athletes' strengths and weaknesses and support more accurate and effective performance evaluation. Their effective application is facilitated by modern technologies, particularly high-speed cameras and advanced biomechanical equipment. Therefore, it is recommended to establish well-equipped biomechanical laboratories and develop digital databases of biomechanical indicators to monitor athletes' performance development and conduct periodic scientific comparisons. Coaches should also be trained in biomechanical analysis software and modern digital technologies. Furthermore, researchers are encouraged to conduct additional descriptive and experimental studies on the application of biomechanical indicators across different track and field events and to examine the challenges limiting their use in the Iraqi sports environment.

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