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Research Article

An AI-Enhanced Adaptive Motor Learning Model To Sustain Skill Excellence In 3x3 Basketball Players

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Motor learning
Model, skill
Excellence
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Abstract: The importance of this research underscores the academic and practical necessity of bridging the gap between advanced scientific development and traditional educational practices in our local environment. Sustaining excellence is not a matter of chance or luck in a sustainable environment, but rather the result of technically sound learning processes. These processes enable players to develop precise motor skills that ensure optimal performance every time they shoot. This is a primary focus of this research, which also explores leveraging digital artificial intelligence systems as assessment tools and developing educational and training alternatives within university settings.
To implement this goal, the researcher selected two groups of four players each, which were divided into a control group and an experimental group. After the completion of the field experiment, the most developed player will be determined to represent the college team in the Iraqi Universities Championship for the 2025-2026 season. In addition, there is a follow-up study three months after the end of the current research to monitor the sustainability of the skill excellence of the college team. The researcher applied the adaptive motor learning model enhanced with artificial intelligence to the members of the experimental group for (4-6) weeks. At the end of the experiment period, the researcher obtained the results of the two groups, analyzed them, and discussed them to achieve the hypotheses of his current research.

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INTRODUCTION

Our present era has witnessed radical transformations in the philosophy of sports learning, shifting from traditional, rote learning to the adoption of intelligent digital models that focus on the efficiency of overall motor performance. This has presented significant challenges for those working in this field, namely, how to maintain consistent skill performance under competitive conditions. These are environments characterized by large and complex variables, which 3x3 basketball players must confront. This is where adaptive motor learning emerges as a modern educational strategy that departs from traditional learning and training methods, offering flexible pathways tailored to individual variables for each player. This is confirmed by many motor learning scholars[1] who state that "optimal motor learning is only achieved when the motor program aligns with the biomechanical characteristics of each lear

Considering the current digital revolution, artificial intelligence (AI) has become the primary driver of these transformations. This environment not only functions as an analytical tool for providing information but also extends its capabilities to assist in self-learning. Thanks to numerous complex algorithms and motion analysis software, learners can benefit from predictive feedback in real time. This feedback helps diagnose errors and suggest corrective programs before the error becomes ingrained in the motor program.[2]indicate that "integrating these intelligent tools into training scenarios significantly increases shooting accuracy in basketball by transforming complex digital data into simple and understandable motion instructions for the player."

The integration of modern technologies aims not only to develop and improve immediate motor skills but also to sustain skill excellence. This dimension is crucial as it links motor skills to the Sustainable Development Goals, specifically Goal 3 (Mental Health) and Goal 4 (Quality Learning). Sustaining excellence means preserving the player's physical capital by minimizing wasted time and energy. This has been confirmed by several scientific studies, including those by[3] who discussed sustainable digital learning as "ensuring lifelong skill development and reducing the likelihood of injury resulting from unscientific practices."

Therefore, the importance of this research underscores the academic and practical necessity of bridging the gap between advanced scientific progress and traditional educational practices in our local environment. Sustaining excellence is not a matter of chance or luck in a sustainable environment; rather, it is the result of technologically advanced learning processes. These processes enable players to develop a precise motor program that ensures optimal performance every time they shoot at the basket, which is one of the primary concerns of this research.

Research Problem: Based on his experience as a former basketball player and professor of motor learning and basketball, the researcher observed a problem with the traditional learning methods employed by some college team coaches. These methods often rely on quantitative rather than qualitative repetition, leading to high physical exertion without ensuring the sustainability of players' and learners' skill levels, especially under the pressure of competitive university matches. These matches are characterized by significant psychological, physical, and technical demands, and individual feedback from the player or coach may be insufficient, as it may not be suitable for the player's specific biomechanical needs. Therefore, the need arises to develop an adaptive motor learning model based on artificial intelligence that guarantees the player's sustained skill development and enhances their on-field performance using modern scientific methods.

Research Objectives:

- Propose an adaptive motor learning model enhanced with artificial intelligence for certain shooting techniques used by 3x3 basketball players.
- Identify the differences between the pre-test and post-test scores of the research group on certain shooting techniques used by 3x3 basketball players.
- To reveal the impact of this model on the sustainability of skill excellence among 3x3 basketball players.

Research Hypotheses:

- There are statistically significant differences in the research group's pre- and post-test scores for some 3x3 basketball shooting techniques.
- The proposed model contributes to improving the consistency of performance (skill sustainability) among 3x3 basketball players.

Research Scope:

- Human Scope: Players from the College of Physical Education and Sports Sciences team at the University of Babylon for the 2025-2026 academic year.
- Time Scope: From October 5, 2025, to April 25, 2026.
- Spatial Scope: The hall of the College of Physical Education and Sports Sciences at the University of Babylon, and the hall of the College of Physical Education and Sports Sciences at Al-Turath University.

MATERIALS AND METHODS

Research Methodology: The researcher adopted the experimental method in this study, which relies on a single group with pre- and post-tests to obtain results and prove the research hypotheses. This method was chosen by the researcher based on the nature of the research problem, which determined the appropriate methodology.

Research Population and Sample: The research population was defined as players from the teams of faculties of physical education and sports sciences participating in the Iraqi Universities 3x3 Basketball Championship for the 2024-2025 season. The researcher

identified 60 private and public universities and colleges. The total number of players in this championship was 240, with each participating team consisting of four players: three starters and one substitute. The researcher selected the research sample from the team of the Faculty of Physical Education and Sports Sciences at the University of Babylon. The team was divided into two groups, selected by the college coach, to determine which team would represent the college in the championship. This sample was chosen purposively to ensure the researcher's ability to adhere to the proposed model and to assist the coach in selecting the most suitable team to represent the college after the research was completed and the results obtained. The researcher also described this as a novel strategy that had not been previously implemented or tested with any teams in faculties of physical education. Therefore, the researcher suggested that his college be the first to use this model, which he expects will lead to significant improvement in the team's performance in the Iraqi Universities Basketball Championship. The 3x3 basketball tournament for the 2025-2026 season will be held at Al-Turath University under the auspices of the Student Activities Department of the Iraqi Ministry of Higher Education and Scientific Research.

Data Collection Methods and Equipment Used in Research

Data Collection Methods:

- Observation.
- Tests and Measurement.
- Registration Form (Kinovea Software).
- Motor Performance Recording Form.
- Hudl Technique Application.
- Sources and References.
- The World Wide Web.

Equipment and Equipment Used in the Research:

- Dell computer (Chinese made)
- One Casio manual stopwatch
- One Canon camera (1200 frames/second)
- Ten plastic markers (30 cm high, Chinese made)
- Two Fox whistles (Chinese made) – 5 rolls of wide colored adhesive tape.
- A regulation basketball court.
- 5 regulation basketballs (Chinese made).
- SPSS version 23 software.

Field Research Procedures

Identifying and Testing Research Variables: The researcher identified the variables for the current research based on the most important skills for achieving victory in basketball competitions, namely shooting in three forms: the free throw, the jump shot, and the layup. This procedure was carried out after consulting with the coach, a former national team player and long-time coach of Al-Hilla Sports Club in the Premier League, who has extensive experience as a player, coach, and professor at the College of Physical Education and Sports Sciences, University of Babylon, and possesses significant field experience in basketball (Prof. Dr. Nasr Hussein Abdul-Amir). The researcher also consulted with Professor (Prof. Dr. Raad Abdul-Amir Finjan), a former player for Al-Hilla Sports Club, former coach, international referee, and professor at the College of Physical Education and Sports Sciences, University of Babylon. Both agreed that the most important skill to emphasize in this selected sample is shooting in these three forms.

As for the tests that the researcher will choose, they are the direct application of the skill in its various forms without the presence of aids or a specific testing method. Rather, the researcher will perform the shooting form that will be requested of him, in the form that the player prefers and in his own way, provided that the application is within the classic performance of the skill without any movements outside the form of the skill. The player will be filmed by a video camera from a suitable place that shows the entire movement from the moment of performing the main part of the skill until the moment of finishing shooting at the basket. After that, the performance will be analyzed on the motion analysis program to determine the angle of release of the ball for the player being tested and its correspondence with the ranges and angles between them[4] from the following table:

Therefore, when the deviations that will occur in the tested player are known, the coach will know this deviation, its location and quantity, and will guide the player during the exercise by verbal feedback to increase or decrease the angle to correct it in the next attempt or to maintain this performance continuously because it conforms to the required angle.

Main Experiment Procedures

Pre-Tests: The pre-test was conducted in the auditorium of the College of Physical Education and Sports Sciences, University of Babylon, on Thursday, October 9, 2025, on the main research sample (control and experimental groups). The tests were designed to obtain the pre-test results for both groups. The researcher attempted to control all external variables to ensure the post-test was administered under the same conditions and specifications as the pre-test. The researcher used the necessary equipment and tools to complete the pre-tests effectively. A form was designed to evaluate the motor

performance of both groups. This form measures the degree to which the angles of the athletes conform to the biomechanical model (defined based on kinesiology

The mechanism for preparing and applying the adaptive motor learning model: Before detailing the methodology used by the researcher, we will review the mechanism for preparing this methodology. The researcher took a series of scientific steps that reduced the time required and organized the research mechanisms within the scientific contexts followed in all rigorous scientific research. These steps are presented in stages:

- Stage One: The researcher selected all members of the experimental sample (only four players), who were randomly chosen to represent the experimental group in the research. He filmed them with a video camera as they performed five attempts of each of the selected shooting skill forms (free throw, jump shot, and ladder shot). This was done to reveal the players' levels in performing these shooting skill forms. Then, the researcher used the Kinovea program from its official website. This is a motion analysis program that allows for the analysis of the player's movement and provides precise angles and levels for the research variables desired by the researcher. These can also be matched with the ideal angles that the researcher defined in Table (1). The program can be viewed on the official website.https://www.kinovea.org/download/releases/2025.1.html
- Phase Two: After reviewing the experimental group's performance levels, the researcher used the Hudl Technique application. This program matches the player's current performance with the desired outcome and provides immediate feedback immediately after the performance. The researcher used an application compatible with the computer used for the research to ensure the program's robust performance. This program can be accessed via the link(https://apkpure.com/hudl-technique/com.ubersense.app.production). In this phase, the researcher will be able to determine the extent to which the player deviates from the ideal shooting angles and provide immediate and rapid feedback for subsequent performance adjustments. Here, the researcher will have two objective and accurate tools for measurement, comparison, and providing precise and objective feedback, thus reducing human error resulting from descriptive measurements.
- Phase Three: After completing the previous two phase identifying the skill levels under investigation, developing a model for comparison with ideal angles, and providing immediate feedback—this phase begins. The researcher developed an adaptive movement model enhanced with artificial intelligence. This model was implemented over six weeks, with three training sessions per week, each lasting 50 minutes. The model utilizes a cycle-based approach, which does not rely on random repetition of the skill but rather on guided correction during performance. The researcher began implementing this model on Sunday, October 12, 2025, at 3:00 PM in the auditorium of the College of Physical Education and Sports Sciences, University of Babylon. The model comprised three main sections:

Section One: The Intelligent Evaluation Phase (10 minutes), identical to the first two phases mentioned above. This phase involves:

- Procedure: Each player performs five throws according to their chosen skill.
- The Role of Artificial Intelligence: The performance is recorded using the Kinovea software, which immediately extracts the required angles.
- Feedback: The Hudl Technique application shows the player their deviation from the ideal path provided for comparison.

Section Two: Adaptive Movement Model Phase (30 minutes):

- Real-time predictive feedback.
- A default path for the desired skill is established to guide the player along the correct route.
- If the player attempts to shoot the ball at the wrong angle, the coach (based on the application's readings) will alert the player immediately before the ball reaches the target (the feedback here is not after the shot, but during the preparation for the shot). • The player starts from a close distance, and when they reach a certain accuracy rate (e.g., 80% of the shots are correct), they are asked to shoot from a state of fatigue (after a sprint) to ensure sustained performance under pressure and to gradually progress from easy to difficult.

Section Three: Reinforcement Phase (10 minutes):

- Performance is compared before and after the training session to help the player understand how well they have benefited from the adaptive model.
- If the player successfully corrects their trajectory after the training session, they receive encouragement from the coach to boost their morale.

The curriculum for the adaptive educational model for the experimental group was completed on Sunday, 12/07/2025, and here it must be emphasized that the kinetic model proposed in this research does not consume energy or additional resources that are not available in all colleges and sports clubs and is accessible to everyone. Here we see that the time, tools and approach are different from what is known, as it is a model that depends on sustainability and economics and the introduction of technology into its content. After completing this stage, the researcher will be able to determine which of the two groups (the control) And experimental) will be a 3×3 basketball team for the College of Physical Education and Sports Sciences / University of Babylon based on the results of the pre- and post-tests for the purpose of implementing the fourth stage.

The fourth stage: In this stage, the researcher measured the sustainability of excellence by following the motor performance of the selected forms of shooting skill by following the matches of the college team that will participate in the 3×3 Iraqi Universities Basketball Championship, where the researcher used the same procedures and applied the same form that was used in the post-test. Also, the result of sustainability was governed by the results of the sequence of the team participating in the tournament, as the difference between the end of the curriculum and the beginning of the tournament was more than (3) months, which is an appropriate period to reach sustainability in achievement. And testing the adaptive motor model.

Pretests: After completing the adaptive educational model, which lasted (6) weeks, the researcher conducted the post-tests for the two research groups in the hall of the College of Physical Education and Sports Sciences / University of Babylon on Wednesday, December 10, 2025, on the main research sample (control and experimental) with the tests that were specified to obtain the results of the post-test for the two groups. The researcher tried to prove all the external variables that he could control so that the post-test was applied with the same conditions and specifications with which the pre-test was applied. The researcher used the necessary equipment and tools to complete the post-tests.

Statistical Methods: The researcher used the SPSS statistical package (version 23) to process the research data and employed the following statistical methods:

- Mean.
- Standard deviation.
- Paired samples t-test.
- Non-paired samples t-test.
- Effect size (Cohen's d).

RESULTS AND DISCUSSION

Presentation and Discussion of Results:

- Presentation of the Control Group's Pre- and Post-Test Results for the Research Variables

The researcher used the statistical analysis method (paired samples t-test), utilizing the results achieved by the control group in the pre- and post-tests for the selected shooting shapes. These results stemmed from the sample members' performance and its alignment with the ideal shooting angles for each shape, as shown in Table (4).

- Presenting the results of the experimental group in the pre- and post-tests for the research variables

The researcher used the statistical analysis method (paired samples t-test) based on the results achieved by the experimental group in the pre- and post-tests for the selected shooting shapes in the research. These results stemmed from the performance of the sample members, who were subjected to the adaptive motor learning model, and were matched with the ideal shooting angles for each shape, as shown in Table (5).

- Presenting the Results of the Control and Experimental Groups in the Post-Test for the Research Variables

The researcher used the Independent Samples t-test to extract the results for the control and experimental groups. This was done through the post-test results for both groups, which are presented in the two preceding tables, and for the selected target practice skills. Table (6) illustrates this.

- Presentation of the results of sustaining skill excellence (performance in the follow-up test) for the experimental group:

The researcher used Cohen's d-test statistical analysis for the experimental group, which was selected to represent the College of Physical Education and Sports Sciences, University of Babylon, in the 2025-2026 season. This analysis measured the sustainability of skill excellence during the Iraqi Universities 3x3 Basketball Championship. Table (7) illustrates this.

Discussion of Results: By reviewing Table (5) of the control group, the reader may observe that this group showed significant improvement after the pre-test, with

the exception of jump shots. This improvement is attributed to the coach's ability to provide feedback at various levels. The coach focused on correcting body angles during shooting based on his observation and accumulated experience in basketball. This allowed the players to make considerable adjustments to their shooting angles, except for jump shots, which are considered the most mechanically challenging. Jump shots require jumping while maintaining focus on body angles to achieve the ideal shot and score points.

As for Table (6), we note the results of the experimental group that was randomly selected to apply the adaptive movement model. It excelled in obtaining good results and outperformed the control group in all the studied variables (elbow angles, knee, and release angles). The researcher attributes this development in the post-test to the commitment and application of this group to the adaptive movement model derived from artificial intelligence applications, which modified many of the players' body angles and allowed them to adjust and correct the angles during and after performance. The researcher identified a set of central factors that were the reason for this:

- The effectiveness of the adaptive learning model. The development observed in the experimental group aligns with what is mentioned in motor learning resources, and the researcher agrees with what Schmidt & Lee (2020) stated: "Motor learning peaks when the learner possesses the ability to evaluate their performance in real time." This is also what we observe when performing certain shots. Moments after the shot is taken, some players are dissatisfied or anticipate that it won't score two points, even before they reach the basketball hoop. This is precisely what the researcher aimed for here. By using visual overlay with the Kinovea software, the player was able to construct an accurate mental model of the skill through repeated, real-time feedback from the coach. This facilitated the correction of the motor program and its transition from a specific to a precise program capable of self-correction and real-time correction before the shot. This helped in the rapid acquisition of motor trajectories to achieve angles

- that are almost ideal for shooting. This was confirmed by the study by Goh et al. (2023) on the effectiveness of reinforcement systems in high-precision skills.
- Artificial intelligence is a tool for reducing kinetic waste. The remarkable development of this group
- demonstrates the modification and correction occurring in their motor programs, particularly in body angles during aiming. All of this points to the success of the adaptive motor model in achieving energy efficiency for the group members. The traditional training used by the control group may have involved some redundant movements resulting from inaccuracies in neuromuscular coordination. Here, Duarte et al. (2023) state that "intelligent
- analysis systems not only correct the skill but also reprogram the nervous system to operate along less energy-intensive pathways." This explains the large effect size achieved by the experimental group after the experimental program, at least three months later. It should be noted that the proposed model provided the experimental group with performance-parallel correction, which is entirely consistent with the concept of integrated real-time feedback. This aligns with what Schmidt & Lee (2020) stated: "The human brain needs a corrective signal during performance, immediately before or after performance, to adjust the motor path." Here, artificial intelligence fulfilled this role by detecting errors or deviations in motor paths and body angles. Which the human eye could not perceive, and this is what happened to the control group. Despite the feedback provided by the trainer, it was not based on an accurate view of the angles and mechanics of the entire body movement.
- Artificial Intelligence and Cognitive Sustainability. From a sustainability perspective, the proposed adaptive motor model has gone beyond simply developing the skill or motor program; it has extended to performance independence. By using artificial intelligence programs, the player becomes able to identify errors in their own motor program, enabling them to rely on themselves and understand their body movement during shooting. This transforms them from recipients of external feedback to users of internal feedback, thus creating internal cognitive sustainability that allows them to continue what they have learned during the Iraqi Universities Championship. This aligns perfectly with Abdul Karim, Muhammad (2022). It also connects to the fourth Sustainable Development Goal (quality learning) through the ability to learn and self-correct. Here, the researcher confirms and agrees with what Holmes et al. (2019) have shown, and it is considered one of the most prominent pillars of digital learning in the
- Performance Sustainability (Follow-up Test). When analyzing the results of the follow-up test in Table (7), we see that the stability at the sample level, despite the three-month training break, was largely good. This is a good indicator of the correction and modification of the motor program in a way that reinforces the principle of neural consolidation for the players. The proposed motor model transferred the skill and the entire motor program from

Table 1: Show Ideal Biomechanical Standards in Basketball Shooting Formations

S	The shape of the aiming skill	Units	Elbow angle (urbanization)	Angle of attachment (launch)	Angle of release from the body
1	Free throw	Degree	90	180	45
2	Jumping shot	Degree	90	175	50
3	Peak shot	Degree	130	170	undefined

Table 2: Free Throw Performance Evaluation Form (Example)

sub-skill	Units	Elbow angle (preparation)	Angle of attachment (launch)	Angle of release from the body
The perfect angle		90	180	45
Player 1	Degree			
Player 2	Degree			
Player 3	Degree			
Player 4	Degree			

One degree is calculated for each deviation from the ideal angle, and zero if the angle measurement matches the ideal angle during performance.

Table 3: Show table of distribution of the adaptive educational model

S	weeks	Educational objective
1	Weeks 1 & 2	Adapting to the system, identifying each player's “ideal pattern," and correcting fixed angles.
2	Weeks 3 & 4	Focusing on "real-time feedback" during performance and repeating the skill under varying conditions.
3	Weeks 5 & 6	Increasing physical stress (fatigue) and measuring the stability (sustainability) of biomechanical pathways.

Table 4: Shows the mean, standard deviation, t-value, and sigmoid value for the research variables, along with their significance

Search variables		Free throw	Jump shooting	Peaceful shooting
Pre-test				
Elbow angle (preparation)	Mean	3.5	5.1	6.2
	Std	2.1	2.05	3.1
Ball trajectory, angle of attachment (launch)	Mean			
	Std	5.1	-4.6	7.3
Angle of release from the body	Mean	2.7	4.2	3.8
	Std	5.8	4.6	6.1
		3.1	4.05	4.4
Post-test				
Elbow angle (preparation)	Mean	2.8	4.5	4.7
	Std	1.9	1.8	2.7
Ball trajectory, angle of attachment (launch)Mean	Mean	4.7	-3.9	5.02
	Std	2.3	3.7	3.2
Angle of release from the body	Mean	5.1	4.2	5.9
	Std	2.8	3.5	4.0
Calculated t-value		6.82	4.18	6.18
Sig. value		0.05	0.106	0.04
Indication type		sig.	Non Sig.	Sig.

Table 5:Shows the mean, standard deviation, t-value, and Sig. It also indicates their statistical significance

Search variables		Free throw	Jump shooting	Peaceful shooting
Pre-test				
Elbow angle (preparation)	Mean	3.7	5.4	6.0
	Std	2.7	2.1	2.8
Ball trajectory, angle of attachment (launch)				
	Mean	5.4	3.7	6.7
	Std	2.1	4.0	3.5
Angle of release from the body	Mean	5.4	4.8	6.0
	Std	3.3	4.2	3.7
Post-test				
Elbow angle (preparation)	Mean	1.3	2.6	1.4
	Std	0.9	1.3	0.9
Ball trajectory, angle of attachment (launch)	Mean	2.0	1.5	2.0
Std		0.4	1.6	1.04
Angle of release from the body	Mean	2.0	2.1	2.4
	Std	0.6	1.3	0.9
Calculated t-value		4.91	8.14	6.22
Sig. value		0.025	0.01	0.00
Indication type		Sig.	Sig.	Sig.

Table 6: Shows the mean, standard deviation, t-value, and sig. It also shows their statistical significance

Search variables		Free throw	Jump shooting	Peaceful shooting
Control group				
Elbow angle (preparation)	Mean	2.8	4.5	4.7
	Std	1.9	1.8	2.7
Ball trajectory, angle of attachment (launch)	Mean	4.7	-3.9	5.02
	Std	2.3	3.7	3.2
Angle of release from the body	Mean	5.1	4.2	5.9
	Std	2.8	3.5	4.0
Experimental group				
Elbow angle (preparation)	Mean	1.3	2.6	1.4
	Std	0.9	1.3	0.9
Ball trajectory, angle of attachment (launch)	Mean	2.0	1.5	2.0
	Std	0.4	1.6	1.04
Angle of release from the body	Mean	2.0	2.1	2.4
	Std	0.6	1.3	0.9
Calculated t-value		7.42	8.26	7.03
Sig. value		0.00	0.01	0.00
Indication type		Sig.	Sig.	Sig.

Table 7:Shows the mean, standard deviation, correlation coefficient, effect size, t-value, and p-value, along with their statistical significance

Search variables		Free throw	Jump shooting	Peaceful shooting
Results of the College Team in the Post-TestElbow angle (preparation	Mean	1.3	2.6	1.4
	Std	0.9	1.3	0.9
Ball trajectory, angle of attachment (launch)	Mean	2.0	1.5	2.0
	Std	0.4	1.6	1.04
Angle of release from the body	Mean	2.0	2.1	2.4
	Std	0.6	1.3	0.9
Results of the College Team in the Iraqi Universities		1.4	1.8	1.3
Championship (Sustaining Excellence)Elbow angle (preparation)	Mean			
	Std	1.0	1.6	1.2
Ball trajectory, angle of attachment (launch)	Mean	1.8	1.7	2.4
	Std	0.7	1.3	0.8
Angle of release from the body	Mean	2.3	1.8	2.2
	Std	1.0	1.0	1.3
Pearson simple correlation coefficient		0.86	0.91	0.88
Type of connection		Strong expulsion	Strong expulsion	Strong expulsion
Cohen's d value (effect size)		0.83	0.86	0.90
Type of impact		Great impact	Great impact	Great impact

- After training, in competitions, or after long periods of inactivity. As indicated by a number of scientific studies and research, and in agreement with (Duarte et al. (2023)), "Systems that rely on real-time analysis ensure the quality of repetition, and the quality of repetition is the main driver for sustaining excellence in high-precision sports such as basketball." Here, the researcher must mention that the team from the College of Physical Education and Sports Sciences / University of Babylon, which is the experimental group in our research, achieved first place in the Iraqi Universities 3x3 Basketball Championship held in the capital, Baghdad, at the Ashur University Hall, under the auspices of the Student Activities Department at the Iraqi Ministry of Higher Education and Scientific Research, from 03/15-18/2026. This achievement confirmed that the adaptive motor learning model proposed in this research contributed to obtaining this achievement, and this is consistent with[5]. Digitalization in this field has served the environment of sustainability by reducing the number of coaches and teachers or reducing the time of training and learning that is exhausting for the learner and the educational and training staff. This research represents the sustainability of resources within the college, and this green training, which reduced the kinetic and physical waste of the players, is consistent with what[6] mentioned about "adopting environmentally friendly training strategies. Here we are not only preparing a player, but we are also maintaining efficiency of movement for the longest possible period of time, which is the essential definition of sports sustainability.

Conclusions

- This study demonstrated that the AI-enhanced adaptive motor learning model was more effective in modifying and correcting motor programs, particularly shooting angles, in the experimental group.

- This proposed model enhanced the autonomy of internal feedback among members of the experimental group, transforming them from passive recipients of feedback to active participants in modifying and correcting the motor program.
- The results of the follow-up test (skill excellence sustainability) showed that its impact was not limited to the post-tests of the experimental group but extended to the long-term consolidation of motor programs and the college team's victory in the Iraqi Universities Championship for the 2025-2026 season.
- This study also confirmed that integrating AI systems into the university environment plays a significant role in intellectual, physical, and skill sustainability by optimizing the physical, skill, and intellectual resources of athletes in Iraqi universities, thus achieving the principle of sustainable development.

Recommendations:

- The researcher recommends the widespread adoption of AI-based motor and skill programs as a reliable digital model for training and teaching all athletic levels at the University of Babylon.
- The researcher recommends updating the traditional motor learning curriculum at the college to include digital AI applications as a key component of the teaching process, keeping pace with global digital advancements.
- Extensive, long-term scientific studies should be conducted on other activities and skills to measure the impact of these technologies in reducing sports injuries that may result from biomechanical errors during learning.
- An interactive digital database should be created to store all motor programs for athletes across all sports, serving as a resource for researchers in their studies and for coaches in evaluating and developing motor programs and selecting athletes.

REFERENCES

1. Schmidt, R. A. and Lee, T. D., et al., 2018. Motor Control and Learning: A Behavioral Emphasis 6th Edn., Human Kinetics, Champaign, Illinois, USA, ISBN-13: 9781492586623, Pages: 552 0 1-10.0.
2. Leznoff, A and Sussman, GL., 1989. Syndrome of idiopathic chronic urticaria and angioedema with thyroid autoimmunity. J. Allergy. Clin. Immunol., 84: 1-10.0.
3. Holmes, W., et al., 2019. Artificial Intelligence in Education: Promises and Implications for Teaching and Learning 1st Edn., Routledge, Milton Park, Abingdon, Oxfordshire, England, United Kingdom, ISBN-13: 9781794293700, Pages: 242 0 1-10.0.
4. Al-Ubaidi and Nadia 2023. Applied Biomechanics and Artificial Intelligence in Basketball. Community Library, Amman 0 1-10.0.
5. Khalil and Ibrahim., 2023. Modern Motor Learning Theories in Light of Digital Transformation. Arab Thought House, Cairo 0 1-10.0.
6. Al-Shammari and Ali., 2024. Sports Sustainability: Strategies for Maintaining Skill Excellence Among Elite Athletes University of Baghdad. 0 1-10.0.
7. Abdul Karim and Muhammad., 2022. Artificial Intelligence and its Applications in Physical Education and Sports Sciences. University for Sports Sciences, Iraq. 0 1-10.0.
8. Goh, K. W., et al. 2023. The Impact of Augmented Feedback on Motor Learning in Sports Officiating and Playing. 0 1-10.0.