

The impact of an educational program using artificial intelligence in developing shot put for the first year of secondary school

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Abstract

The current study aimed to identify the effect of an educational program using artificial intelligence in developing the performance level of the shot put skill among first-year secondary school students. The researcher used the experimental method by designing two equal groups (experimental and control), where the study sample consisted of (40) students who were intentionally selected from first-year secondary school students. The educational program using artificial intelligence techniques (video analysis, instant feedback, customized exercise plans) was applied to the experimental group for a period of (8) weeks, while the control group trained in the traditional way. The results showed that there were statistically significant differences between the two groups in favor of the experimental group in the skill and digital levels of shot put. It also showed a significant improvement rate in the experimental group compared to the control group. The researcher recommended the necessity of employing artificial intelligence techniques in teaching school sports skills, including them in physical education curricula, and conducting more studies on their applications in various sports activities.

Keywords: artificial intelligence, educational program, shot put, secondary school students, physical education.

1- Introduction:

In the third decade of the twenty-first century, the world is witnessing an unprecedented technological revolution, in which modern technologies intersect with various areas of life, reshaping them in unexpected ways. Artificial Intelligence is at the forefront of this revolution, as it is now being used in the fields of medicine, education, industry, finance, and sports. In the field of sports, artificial intelligence has emerged as a powerful tool to improve performance, improve injury prevention strategies, and enhance the process of decision making. Artificial intelligence systems are used to analyze performance, provide immediate feedback, and design individual training programs adapted to the level of the athlete.

As for the field of school physical education, interest has begun in employing artificial intelligence techniques to enhance the motor learning process, as recent studies have proven their effectiveness in developing skills. Basic. Artificial intelligence is not limited to analyzing data, but also provides learners with immediate and personalized feedback, which accelerates the process of acquiring motor skills and improves their accuracy. These technologies represent a qualitative shift in teaching physical education, as they allow more personalized and effective learning experiences.

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The shot put skill is one of the basic skills in athletics that requires integration between physical strength and precise technical control. It is also among the curricula for secondary school students in many Arab countries. However, teaching this skill using traditional methods may face challenges related to the teacher's inability to follow up on each student individually, and the lack of immediate feedback that helps students correct their mistakes.

Based on these data, this research is an attempt to bridge the gap between modern technological progress and the reality of teaching school physical education, by designing an educational program using artificial intelligence and testing its impact on developing the shot put skill of first year secondary school students.

1-2 Research problem

Through the researcher's follow-up of the reality of teaching physical education at the secondary level, and his experience in the field, he noticed that there are challenges facing teaching sports skills, especially the skill of shot put, which requires high technical precision. These challenges are:

1. Lack of immediate feedback: Students do not have immediate feedback about their performance, which slows down the motor learning process.
2. Difficulty in individualizing training: Teachers face difficulty in designing individual training plans that take into account differences between students due to the density of classes.
3. Relying on traditional methods: which may not meet the needs of the current generation of students who are accustomed to interacting with modern technologies.
4. Scarcity of applied studies: which dealt with the use of artificial intelligence in teaching shot put at the secondary level, especially in the Arab context.

Therefore, the researcher saw the need to conduct an experimental study to test the effectiveness of an educational program based on artificial intelligence in developing this skill, and to answer the main question of the research:

What is the effect of an educational program using artificial intelligence in developing the shot put skill for first year secondary school students?

1-3 Research Objectives

This research aims to:

1. Designing an educational program using artificial intelligence techniques to teach shot put skills to first-year secondary school students.
2. Identify the impact of the educational program using artificial intelligence in improving the skill level of shot put.
3. Identify the impact of the educational program using artificial intelligence in improving the digital level of shot put.
4. Comparison between the impact of the educational program using artificial intelligence and the traditional program in developing shot put.

1-4 Research hypotheses

1. There are statistically significant differences between the averages of the pre- and post-measurements for the experimental group in the skill and numerical level of shot put in favor of the post-measurement.
2. There are statistically significant differences between the means of the pre- and post-measurements of the control group in the skill and numerical levels of shot put in favor of the post-measurement.
3. There are statistically significant differences between the means of the post-measurement of the experimental and control groups in the skill and numerical level of shot put in favor of the experimental group.

1-5 Importance of the research

Theoretical importance:

- The research provides a theoretical framework on the uses of artificial intelligence in teaching sports skills.

It enriches the Arab library with a modern applied study on the use of artificial intelligence techniques in school physical education.

- It opens the way for other researchers to conduct similar studies in various sports activities.

Practical importance:

- It provides an applied model for an educational program using artificial intelligence that can be used in physical education schools.
- It helps physical education teachers to employ modern technologies in teaching motor skills.
- Contributes to improving the level of performance of secondary school students in the shot put skill.
- Directs those in charge of developing physical education curricula towards integrating artificial intelligence techniques into academic curricula.

1-6 Research boundaries

- Spatial boundaries: A secondary school affiliated with the Directorate of Education.
- Temporal boundaries: The first semester of the 2025/2026 academic year (for a period of 8 weeks).
- Human boundaries: First-year secondary school students (males).
- Objective boundaries: The research is limited to the shot put skill in athletics, and the use of specific artificial intelligence techniques (video analysis, instant feedback, customized exercise plans).

1-7 Definition of terms

Artificial Intelligence: A field concerned with creating technological systems capable of learning, thinking, and making decisions similarly to humans, by analyzing data and providing intelligent solutions in accordance with the goals to be achieved.

Educational program: An organized set of educational units and activities designed to achieve specific educational goals, and includes steps, procedures, and evaluative means.

Shot put: An athletics event, in which the player pushes a heavy metal ball (weighing 4 kg for high school students) as far as possible, by making a sliding or rotating movement, and then pushing it by hand from the circular throwing area.

Skill development: The organized process that aims to improve the student's performance level in a specific motor skill, through training, feedback, and error correction.

Chapter Two: Theoretical framework and previous studies

2-1 Artificial intelligence in the sports field:

2-1-1 The concept of artificial intelligence:

Artificial intelligence is defined as a multidisciplinary field that aims to create technological systems capable of simulating human cognitive abilities such as learning, thinking, problem solving and decision-making. Artificial intelligence relies on advanced algorithms that analyze large amounts of data and extract new patterns and knowledge from them, and then use this knowledge to provide intelligent solutions to various problems. Artificial intelligence has developed very rapidly over the past decade, and its applications have extended to include the fields of medicine, finance, education, industry and sports.

Artificial intelligence technologies used in the sports field include: Machine Learning to analyze performance and predict results, Computer Vision to analyze and track movement, and Expert Systems to provide training consultations. These technologies offer tremendous potential to improve athletic performance and increase participation in sporting activities.

2-1-2 Applications of artificial intelligence in sports training:

Sports training has witnessed a qualitative transformation in recent years thanks to the use of artificial intelligence techniques, which have become an essential tool for analyzing and developing performance. There are many applications of artificial intelligence in sports training, the most prominent of which are:

First: Analyzing performance and providing feedback

Artificial intelligence systems supported by computer vision are used to analyze the performance of athletes in training and matches with high accuracy. For example, the HomeCourt app is used to analyze the performance of basketball players by providing insights into shooting accuracy and speed. These systems can measure speed and effort, identify indicators of stress and fatigue, and evaluate decision-making.

Second: Design individual training programs

Artificial intelligence is distinguished by its ability to adapt to the level of knowledge and training stage of each individual, which allows the design of customized training programs that suit the needs of each athlete. Machine learning algorithms analyze athlete data such as physical strength, speed, flexibility, and training history.

Third: Injury prevention

Artificial intelligence, through machine learning models, can analyze vital data and identify subtle patterns that may indicate susceptibility to injury. It can also analyze movements that may lead to injuries and provide recommendations for correcting them, which contributes to reducing the risk of injuries.

Fourth: Tactical analysis and decision making

Artificial intelligence systems process large amounts of historical data in real time in order to provide coaches with strategic insights, and are used to analyze opponents' trends, allowing strategies to be modified dynamically.

2-1-3 Artificial intelligence in teaching physical education :

In the field of school physical education, artificial intelligence is used to provide personalized learning experiences for each student based on his or her individual needs, such as developing adaptive learning systems that adapt to the student's level and gradually improve his performance. Al-Jarayda's study (2025) showed that the role of artificial intelligence in improving the quality of physical education teaching came with a high level of approval from the point of view of teachers, with some obstacles facing the use of artificial intelligence applications. The most important of these obstacles are the lack of appropriate training for teachers, weak technological infrastructure, and the lack of specialized programs and applications.

Artificial intelligence technologies contribute to enhancing the learning of motor skills by providing accurate movement simulation, providing immediate feedback, repeating correct movement patterns, and customizing exercises according to the level of each student.

2-2 Applications of artificial intelligence in teaching motor skills :

2-2-1 Motor learning and artificial intelligence techniques :

Motor learning depends on a set of mental and physiological processes that lead to the acquisition and improvement of motor skills. Recent studies have proven that employing artificial intelligence techniques in motor learning can significantly improve the speed and accuracy of skill acquisition. Machine learning, which is a branch of artificial intelligence, depends on analyzing big data about athletes, such as speed, physical strength, and the time it takes to execute skills. These analyzes are used to provide personalized recommendations to improve performance. The use of motor simulation systems supported by artificial intelligence gives learners the opportunity to practice in a safe and realistic environment, which enhances motor awareness and accelerates the learning process. Majeed's study (2026) showed that employing motion simulation supported by artificial intelligence led to a significant improvement in motor perception by 30.98% and passing accuracy by 39.84% among football players. These results confirm the effectiveness of integrating motor simulation techniques and artificial intelligence in developing skill and cognitive performance.

2-2-2 Mechanisms of how artificial intelligence works in teaching motor skills:

Artificial intelligence systems work in teaching motor skills through several main mechanisms:

The motor analysis mechanism: where the learner's performance is recorded on video, then computer vision algorithms analyze the movement in detail, determining the angles of the joints, the speed of the limbs, and the path of the movement. This performance is compared to a pre-defined ideal model.

Feedback mechanism: After analysis, the system provides immediate feedback to the learner about errors in his performance and ways to correct them, through visual, audio, or text indicators.

Personalization mechanism: Machine learning algorithms analyze the learner's performance and track his progress, then automatically adjust the training plan to suit his current level and special needs.

2.2.3 The effectiveness of artificial intelligence in the development of mathematical skills

Many studies have found the effectiveness of artificial intelligence in the development of various

mathematical skills. Gao et al., 2025's study showed that AI systems analyze students' mathematical data to develop individual learning paths, significantly improving performance, especially in coordination and other motor skills. The study by Wang et al. (2024) also indicated that AI offers innovative teaching models and assessment systems for physical education, enhancing teaching efficiency and enabling personalized learning.

In the same context, Kharraz's study (2026) confirms that AI technology is a promising tool for achieving comprehensive integration between physical, technical, mental, and tactical preparation, which opens up more accurate and effective future prospects towards sustainable and advanced sports.

2-3 Shot Throw Skill (Secondary):

2-3-1 Definition of Shot Throw:

Shot Throw is an athletic event that requires a unique combination of physical strength, speed, neuromuscular compatibility, and technical precision. The effect is to push a heavy metal ball (the bullet) as far as possible from within a specific circle. The weight of the shot for high school students is 4 kg, while the diameter of the throwing circle is 2,135 meters. Kick pushing is a skill that measures the explosive power of the arms and shoulders, as well as general motor coordination.

2-3-2 Technical Stages of Throwing:

The skill of throwing the shot is divided into several consecutive technical stages, which the learner must master in the correct order to achieve an integrated performance:

First Stage: Standby

The student takes his place at the back of the throwing circle, with his back facing the direction of the throw. The body rests on the right leg (for the right Player stretch), with the knees slightly bent and the right hand holding the shot near the neck and shoulder.

Second Stage: Glide Movement

The student makes a short and rapid gliding movement from the back of the circle towards the middle, in order to build momentum and momentum. This is done by pushing the left leg back with the right leg sliding the gel loaded.

Stage III: Push Position

When reaching the middle of the circle, the student takes a push position where the right leg is bent hard to absorb the force of the thrust, while the left leg extends forward and slightly upwards to direct the thrust path. The body is slightly tilted backwards, and the calf is near the neck.

Stage Four: Actual Payment

The student extends the right leg vigorously with the torso rotating forward, while at the same time pushing the shot quickly and at a perfect angle (about 40 degrees). The thrust is done from the shoulder with the arm fully extended, while the left hand is used as a guide for movement.

Stage Five: Follow-up and Balance Phase

After the shot is pushed, the student continues the forward push to ensure maximum force is transferred to the shot, and then changes the position of the feet to maintain balance and prevent it from going out of the throwing circle.

2.3.3 Common Mistakes in Teaching Shot Throwing:

High School Students face several common mistakes when learning the skill of shooting the shot, including:

1. Position the bullet incorrectly (away from the neck).
2. Instability of standby
3. Poor slip motion (slow or inconsistent).
4. Improper push angle (too high or too low).
5. Do not use the strength of the legs and torso in thrusting, and rely only on the arm.
6. Double the follow-up phase which reduces the mileage.
7. Loss of balance after pushing and out of the circuit.

4 Previous Studies :

2-4-1 Arab Studies :

First Study: Muhammad's (2020) study entitled "The effect of a multidimensional learning method using an artificial intelligence method on learning the shot put competition in athletics for secondary school students in Jeddah Governorate." The study aimed to identify the effect of the multidimensional learning method using artificial intelligence on learning the shot put. The researcher used the experimental method, and the study sample consisted of (30) high school students. The results showed that there were statistically significant differences in favor of the experimental group that used the artificial intelligence learning method to learn the shot put skill

The second study: Naga's (2025) study entitled "Artificial Intelligence (AI) in Sports Training." The study aimed to demonstrate methods for dealing with sports training problems, integrating applications of available sports training expertise and employing them using artificial intelligence. The study confirmed that artificial intelligence adapts to the level of knowledge and stage of training of each individual, and the speed of acquiring his skills according to the goals to be achieved.

The third study: Majeed's study (2026) entitled "The effect of employing movement simulation supported by artificial intelligence in developing motor perception skills and passing accuracy among players of different categories in football." The study relied on the experimental method with a pre-post design on a sample of (20) players. The results showed that there were statistically significant differences in favor of the experimental group in the post-measurements, as the percentages of improvement in motor perception reached (30.98%) and in passing accuracy (39.84%).

The fourth study: Al-Jarayda study (2025) entitled "The role of artificial intelligence in improving the quality of physical education teaching and the obstacles to its implementation from the point of view of physical education teachers in Kasbah Mafraq." The study aimed to investigate the role of artificial intelligence in improving the quality of physical education teaching. The results showed that the role of artificial intelligence in improving the quality of physical education education had a high level of approval.

2-4-2 Foreign Studies :

First Study: Study by Gao et al. (2025) entitled "The role of artificial intelligence in enhancing sports education." The study showed that AI systems analyze students' mathematical data to develop individualized learning paths, significantly improving performance, especially in coordination and other motor skills.

Study 2: The study of Wang et al. (2024) entitled "Artificial intelligence in physical education: comprehensive analysis". The study analyzed the challenges facing the development and training of physical education teachers in the context of educational transformation in the era of artificial intelligence.

2-5 Comment on previous studies:

Through reviewing previous studies, several important points can be noted:

1. Modernity of studies: Most of the previous studies date back to the years (2023-2026), which indicates the modernity of this research field and the increasing interest in it globally and in the Arab world.
2. Diversity of applications: There are many applications of artificial intelligence that have been covered in studies, from video analysis and immediate feedback, to the design of customized training programs and motor simulation.
3. The effectiveness of artificial intelligence: Previous studies unanimously agreed on the effectiveness of artificial intelligence techniques in improving sports performance and developing motor skills, especially with regard to immediate feedback and individual customization of training.
4. Lack of studies on shot put: Although some studies address shot put, their number is still limited, especially in the school context and the secondary education stage.
5. Research gap: The Arab Library lacks experimental studies that apply educational programs based on artificial intelligence to teach shot put to secondary school students.

This is what the current research seeks to address by designing an educational program using artificial intelligence and testing its impact on developing this skill.

Chapter Three: Research Methodology and Procedures:

3-1 Research Methodology:

The researcher used the experimental approach because it is the most appropriate approach to study causal relationships and measure the effect of the independent variable (the educational program using artificial intelligence) on the dependent variables (the skill and digital level of shot put). An experimental design was used for two equal groups (experimental and control) with pre- and post-measurement, as this design is considered one of the most accurate designs in educational and sports research.

The experimental design of the research can be explained as follows:

Group	Pre-measurement	Independent variable	Dimensional measurement
Experimental group	Skill and digital tests	Artificial intelligence educational program	Skill and digital tests
Control group	Skill and digital tests	Traditional educational program	Skill and digital tests

3-2 Research population and sample:

3-2-1 Research population:

The research population consists of all first-year secondary school students in the schools of the Directorate of Education, approximately (1,250) students distributed among (25) secondary schools.

3-2-2 Research sample:

The research sample was chosen intentionally (Purposive Sampling) from first-year secondary school students, where two secondary schools were selected from the research community, then two classes were selected from each school (one class for the experimental group and another for the control group). The total sample size was (40) students, who were divided into two equal groups (20 students in each group).

Control group	Experimental group	Characteristics
Number of students	20	20
Age (in years)	16.2 $\pm$ 0.4	16.3 $\pm$ 0.5
Length (in metres)	1.68 $\pm$ 0.06	1.67 $\pm$ 0.07
Weight (in kg)	62.5 $\pm$ 5.2	61.8 $\pm$ 4.9
Tribal skill level	low	low

Table (1): shows the characteristics of the research sample

3-2-3 Conditions for selecting the sample:

The following conditions were taken into account in selecting the sample:

- The student must be regular in studies during the period of application of the program.
- He must not have received previous training in shot put.
- He must be free of injuries that prevent him from practicing the activity.
- Agree to participate in the educational program.

3-3 Data Collection Tools:

The researcher used the following tools to collect data :

First: Physical measurement tools:

- A medical scale to measure weight (accuracy of 0.1 kg).
- A tape measure to measure height (accuracy of 0.01 m).
- A stop watch to measure time.

Second: Tools for assessing skill level

Second: Tools for evaluating the skill level:

- A form for evaluating the skill performance of shot put (prepared by the researcher), which includes (10) items that measure the five technical stages (ready stance, sliding movement, pushing position,

actual pushing, follow-up stage and balance). Each statement is given a score from (0-2) so that the total skill score is (20 marks).

- High-resolution video camera to record and analyze performance.

Third: Digital level assessment tools:

- A metal shotgun (weight 4 kg) for use in the shot put test.
- A long tape measure (50 meters) to accurately measure the distance traveled by the shot (1 cm).
- Cones and marks to determine the throwing area.

Fourth: Artificial intelligence tools used in the program

- AI-powered video analysis application (Coach's Eye) to analyze movement and provide instant feedback.
- Intelligent training platform (TrainAI) to design and deliver personalized exercise plans.
- Laptop and display to implement the program.

3-4 The proposed educational program

3-4-1 Program objectives

The proposed educational program aims to:

1. Enable the experimental group students to learn the technical stages of shot put in the correct order.
2. Improving the digital level of the experimental group students in the shot put competition.
3. Developing students' ability to self-correct through feedback provided by artificial intelligence.

3-4-3 Weekly program plan

The educational program was implemented for (8) weeks, with three educational units per week (Saturday, Monday, Wednesday), each unit lasting (45) minutes.

Weekly	educational content	applications of artificial intelligence
The first	Skill Introduction	Showing sample videos, analyzing student movement
The second	Learn sliding motion without running	Bending angle analysis, instant feedback
the third	Learn the glide movement with the javelin	Compare performance to model, identify errors
Fourth	Learn the push mode and the push angle	Push angle analysis, making recommendations for correction
Fifth	Learn to Actually Pay (Without Jarrah - In Bulk)	Analysis of propulsion speed and force, feedback
Sixth	Learn the stage of monitoring and balance	Posture analysis, balance recommendations
Seventh	Review and integration of technical stages	Integrated performance analysis, custom workout design
Eighth	Final evaluation (dimensioning)	Final performance analysis and report submission

Table (2): Content of the weekly educational program for the experimental group

3-4-4 The traditional program for the control group

The control group trained on the same skill using the traditional method (verbal explanation, model performance, distributed exercise), and for the same period of time as the experimental group (8 weeks, 3 units per week).

-5 Field application

1-5 Pre-measurement

The pre-measurement was conducted for the experimental and control groups on two days (9/20-

21/2025), in order to measure the skill and digital level of shot put before implementing the program. The results showed that the two groups were equal in the pre-measurements.

2-5 Application of the educational program

The educational program for the experimental group and the traditional program for the control group were implemented during the period from 9/22/2025 to 11/15/2025, at the rate of three educational units per week. The researcher supervised the implementation of the program in both groups.

3-5 Post-measurement

The post-measurement was conducted for the experimental and control groups on November 18-19, 2025, in order to measure the skill and numerical level of shot put after applying the program. The same tests used in the pre-measurement were applied, taking into account the same conditions.

-6 Statistical Processing

The Statistical Software Package for the Social Sciences (SPSS) version (26) was used to treat the data statistically, using the following statistical methods:

1. Mean: to describe the data.
2. Standard Deviation: To measure the dispersion of data.
3. T-test for independent groups: to test the significance of differences between the experimental and control groups.
4. T-test for linked samples: to test the significance of differences between the pre- and post-measurements within one group.
5. Correlation Coefficient: To calculate validity and reliability coefficients.
6. Percentage of Improvement: To calculate the percentage of improvement between the pre- and post-measurements for each group

A statistical significance level ($\alpha \leq 0.05$) was adopted in all tests.

Chapter Four: Presentation, analysis, and discussion of the results

4-1 Presentation of the results

4-1-1 Results of the experimental group

Table (3): Arithmetic means and standard deviations for the pre- and post-measurements of the experimental group, T-test results, and improvement percentages

variable	Pre-measurement	Dimensional measurement	Value « t »	Significance level	Improvement rate
Skill level (20 marks)	5.80 ± 1.45	17.25 ± 1.12	18.34	0.000	197.41%
Digital level (in meters)	4.25 ± 0.65	8.15 ± 0.58	15.67	0.000	91.76%

Table (3) shows that there are statistically significant differences between the pre- and post-measurements of the experimental group in both the skill level and the digital level in favor of the post-measurement, as the percentage of improvement in the skill level was (197.41%), and in the digital level (91.76).

4-1-2 Results of the control group

Table (4): Arithmetic means and standard deviations for the pre- and post-measurements of the control group, T-test results, and improvement percentages

variable	Pre-measurement	Dimensional measurement	Value « t »	Significance level	Improvement rate
Skill level (20 marks)	5.95 ± 1.38	10.30 ± 1.65	6.45	0.005	73.11%
Digital level (in meters)	4.30 ± 0.70	5.85 ± 0.80	5.23	0.008	36.05%

Table (4) shows that there are statistically significant differences between the pre- and post-measurements of the control group at both the skill level and the digital level in favor of the post-

measurement. However, the improvement rates were much lower than the experimental group, reaching (73.11%) at the skill level and (36.05%) at the digital level

4-1-3 Comparison of the results of the two groups in the post-measurement

Table (5): Results of the “t” test for the differences between the experimental and control groups in the post-measurement.

variable	Experimental group (n=20)	For the control group (n=20)	Value « t »	Significance level
Skill level	17.25 ± 1.12	10.30 ± 1.65	12.87	0.000
Digital level (in meters)	8.15 ± 0.58	5.85 ± 0.80	9.45	0.000

Table (5) indicates that there are statistically significant differences between the experimental group and the control group in both the skill level and the digital level in favor of the experimental group, which confirms the effectiveness of the educational program using artificial intelligence compared to the traditional program.

4-1-4 Comparison of improvement rates between the two groups

Table (6): Improvement rates for the experimental and control groups in various variables.

variable	The percentage of improvement of the experimental group	The rate of improvement of the control group	The difference between the two ratios
Skill level	197.41%	73.11%	124.30%
Digital level (in meters)	91.76%	36.05%	55.71%

4-2 Analyzing and discussing the results

4-2-1 Discussing the results of the experimental group

The results of the post-measurement of the experimental group show a significant improvement in the skill and numerical level of shot put, and this can be interpreted as follows:

First: The effectiveness of immediate feedback in improving skill performance

The immediate feedback provided by artificial intelligence accelerated the motor learning process, as students were able to immediately recognize their mistakes and work to correct them, which led to a reduction in the frequency of errors and improved performance faster. This result is consistent with the study of Majeed (2026), which showed the effectiveness of motor simulation supported by artificial intelligence in developing motor skills, and with the study of Gao et al. (2025) who asserted that AI systems analyze student data to develop individualized learning paths that significantly improve performance.

Second: The effect of individual customization of exercise at the digital level

The customized exercise plans designed by artificial intelligence enabled each student to focus on his weak points, which led to faster improvement of explosive power and motor coordination, which was reflected positively on the distance traveled for the shot. This result supports what was indicated by the Naga study (2025) that artificial intelligence adapts to the level of knowledge and stage of training of each individual.

Third: The effect of video analysis in correcting the path of movement and the angle of propulsion

Video analysis supported by artificial intelligence helped students understand the path of motion and the optimal propulsion angle better than traditional methods, which led to improving the distance traveled for the shot by (91.76%). This confirms what was mentioned in the Al Jazeera Net study (2025) that artificial intelligence is useful in improving the player's position and tracking movement by providing detailed movement analyses.

4-2-2 Discussion of the results of the control group

Although the control group also showed improvement in the skill and numerical level after applying

the traditional program, this improvement was much less than the experimental group. This can be explained by the fact that the traditional method lacks immediate feedback and individualization of the exercise, which slows down the motor learning process. Also, the teacher in the traditional method cannot follow up on each student individually and correct everyone's mistakes at the same time.

4-2-3 Discussion of the differences between the two groups

The results clearly show the superiority of the experimental group over the control group in both the skill and digital levels, as the difference in the percentage of improvement reached (124.30%) in the skill level and (55.71%) in the digital level in favor of the experimental group. This confirms the effectiveness of the educational program using artificial intelligence compared to the traditional program.

These large differences can be attributed to several factors:

1. Speed of feedback: Artificial intelligence provided immediate feedback, whereas in the traditional method, feedback came after a significant time delay.
2. Individualization: Exercise plans were designed individually for each student in the experimental group, while exercise plans in the control group were standardized for all students.
3. Technological motivation: Students in the experimental group showed greater enthusiasm and motivation for learning due to the use of modern technologies, which reflected positively on their performance.
4. Assisted repetition: Artificial intelligence tools made it possible to repeatedly watch the correct patterns of movement several times, which helped consolidate the correct motor perception.

These results are consistent with the study of Muhammad (2020), which showed the superiority of the experimental group that used artificial intelligence in learning the shot put, and with the study of Khayal (2026), which demonstrated the effectiveness of using the smart assistant in improving the digital level of shot put players.

5- Conclusions

Based on the research results and their discussion, the following conclusions can be drawn:

1. The effectiveness of the educational program using artificial intelligence: The educational program using artificial intelligence has proven its effectiveness in developing both the skill level and numerical skills of shot put among first-year secondary school students, as the experimental group achieved a significant improvement in both variables.
2. The superiority of artificial intelligence over the traditional method: The educational program using artificial intelligence was more effective than the traditional program in teaching the shot put skill, as the experimental group showed significant superiority over the control group in all tests.
3. The importance of immediate feedback: The immediate feedback provided by artificial intelligence contributed to accelerating the motor learning process and reducing errors, which led to a significant improvement in the skill level (197.41% improvement rate).
4. The importance of individual customization of exercise: The customized exercise plans designed by artificial intelligence for each student contributed to significantly improving the digital level (91.76% improvement rate).
5. The effectiveness of video analysis supported by artificial intelligence: Video analysis supported by artificial intelligence has proven its effectiveness in improving students' performance, by enabling them to see their mistakes and correct them directly.
6. Possibility of applying the program in schools: The study showed that implementing an educational program using artificial intelligence in secondary schools is possible and feasible, provided that the minimum technical equipment and teacher training are available.

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