A Comparative Study of Traditional Teaching and Personalized Teaching Using Artificial Intelligence Algorithms in Teaching Racquetball Skills

Tahseen Hosni Tahseen

tahseen.h@cope.uobaghdad.edu.iq
University of Baghdad – Department of Student Activities

ABSTRACT

This study aimed to compare the effectiveness of traditional teaching methods and customized teaching using artificial intelligence algorithms in improving skill performance (technical level and accuracy) and motivation towards learning racquet skills. The researcher used the quasi-experimental approach by designing the two groups (control and experimental) with a pre- and post-selection selection. The study sample consisted of (40) junior students They were randomly divided into two groups: the experimental group (n=20) received personalized instruction using artificial intelligence, and the control group (n=20) received traditional instruction. A battery of skill tests and a questionnaire were applied to measure motivation.The results showed that there were statistically significant differences ($\alpha \leq 0.05$) in favor of the experimental group in all skill performance variables, where the average percentage of improvement in the technical level was 36.4% and the accuracy was 33.4%. The experimental group also recorded higher levels of motivation and better scores in the honesty and stability of the measurement tool. The study concluded that the AI-based teaching model is superior in improving skill performance and motivation, recommending the integration of these technologies in physical education curricula and training teachers to use them, and adopting A hybrid model that combines the advantages of the two methods.

Introduction:

The current era is witnessing a huge boom in the field of artificial intelligence and its applications, which has extended to the education sector in general, and physical education and sports education in particular. To keep pace with this technological revolution, this research stands out to examine one of the most pressing applications, personalized teaching based on artificial intelligence algorithms, and compare it to traditional teaching methods in the field of racquet skills. (محمد، 2020)

Racquetball games (such as tennis, table tennis, badminton) are sports activities that require a complement of motor and cognitive skills And the plan. The teaching of these skills has been based for decades on traditional, teacher-centered methods as the main source of knowledge, providing a practical model, and practicing skills in a unified group form, while providing general feedback. Although these methods have proven effective in imparting the basics, they may not take into account individual differences between learners in terms of motor readiness, learning styles, and speed of progress, which may create gaps in the level of proficiency. (خالد.، 2021)

In contrast, personalized teaching using AI is emerging as a revolutionary learning model, based on analyzing individual data for each learner. Through the use of techniques such as real-time video analysis, sensors, and predictive algorithms, these systems can accurately diagnose strengths and weaknesses, design individualized training programs, and provide immediate and detailed feedback. This customization promises to improve the efficiency of the learning process, accelerate its pace, and increase learners' motivation by meeting their individual needs like never before. (عبد الحميد، 2024)، (محمود.، 2018)

Therefore, this study comes as an attempt to determine the effectiveness of this modern approach compared to the traditional approach, in a systematic scientific framework. The study seeks to compare the two methods in teaching and developing basic skills and shooting in racquet games, and to measure their impact on the level of technical performance and accuracy, as well as on learners.

Study Problem:

The main focus of this research is the problem of the study, as it stems from the existence of a clear gap between the traditional methods prevalent in teaching racquet skills and contemporary pedagogical visions that emphasize the importance of taking into account the individual differences of learners. Despite the widespread prevalence of traditional methods of teaching, which are based on the presentation of skills in a unified group form, the observations of researchers and practitioners in the field of training indicate that there is a significant disparity in learners' understanding and mastery of these skills. This disparity is due to the lack of The ability of traditional methods to meet the individual needs of each learner, which leads to a weak level of artistic performance among a small segment of students.

In light of the technological revolution that is taking place in the current era, artificial intelligence has emerged as one of the most promising solutions that offer an alternative and personalized-based educational approach. However, the application of AI algorithms in teaching racquet skills is still limited, and there are few and sparse Arab studies comparing the effectiveness of this modern approach with traditional methods. Therefore, the main problem with this study is the urgent need for a comparative scientific evaluation of teaching methods: Traditional and personalized teaching using artificial intelligence algorithms, in order to detect which is most effective in improving the performance of racquet skills, raising students' motivation towards learning, and determining the extent to which the modern approach can address the shortcomings of traditional methods by providing a personalized learning experience.

Importance of the study:

- The study fills a research gap in physical education by providing a scientific comparison between the traditional teaching model and AI-based teaching, which enriches theoretical knowledge about the effectiveness of modern technologies in teaching complex motor skills.

- Provide teachers and trainers with a practical evidence-based guide on the effectiveness of different teaching methods, enabling them to make informed decisions to adopt the most appropriate approach to improve learners' performance and improve the efficiency of the learning process.

- The study supports the shift towards personalized learning that takes into account individual differences, as it contributes to enhancing educational equity and increasing learners' motivation through the use of advanced technological solutions that keep pace with the requirements of the digital age.

Objectives of the study:

1. Evaluate the effectiveness of both traditional teaching and personalized teaching using artificial intelligence algorithms in improving the skill performance (technical and accuracy) of selected racquet skills.

2. Measuring the effect of the two methods on motivation towards learning in the study sample, and revealing which of them contributes to achieving higher motivation.

Study Questions

How effective are both traditional teaching methods and customized teaching using AI algorithms in improving the skill level (accuracy and technical level) of selected skills in racquet games?

Study variables:

- Independent variable: Traditional teaching, personalized teaching using artificial intelligence algorithms
- Dependent variable : Skill acquisition in racquet games (which can be measured through indicators such as: the level of technical performance of skills). , the accuracy of the implementation of skills. , the degree of mastery of skills).

Hypotheses of the study:

- There are statistically significant differences at the significance level ($\alpha \leq 0.05$) in the mean scores of the post-test of skill performance in racquet games (in technical level and accuracy) between the group of students who learn in the traditional way and the group that receives personalized instruction using artificial intelligence algorithms.

Study Terms:

- Traditional Teaching:In this study, we mean the teacher-centered educational model, in which racquet skills (such as serving and forehand in tennis) are introduced collectively and uniformly to all students. It relies on the teacher giving the practical model (presentation), then students applying the skill under general verbal guidance, providing non-immediate group feedback that focuses on correcting common mistakes, relying on repetition as a basis for mastery. (Ghaz, 2021)

- Personalized teaching using AI algorithms:In this study, it refers to the individualized educational model in which the process of teaching racquet skills is designed and implemented based on the analysis of individual data of each learner, using an intelligent system. This system relies on algorithms that analyze performance data (through recorded videos or sensors) to accurately diagnose strengths and weaknesses, provide personalized exercises and exercises that suit each student's level, while providing instant and automated feedback on their performance (verbal or visual tips) to correct course in real-time. (Abdeen, 2025)

Previous Studies:

Table of Previous Studies (Arab and Foreign)

Recommendations	Results	Objectives of the study	Title of the study	Researcher's name and year of publication
Employing artificial intelligence technologies in teaching complex mathematical skills, and training	The experimental group (teaching with artificial intelligence) is superior to the control group (traditional) in	Design an AI tutorial and measure its effectiveness in acquiring basic table tennis skills compared to	The Effectiveness of an Artificial Intelligence-Based Educational Program in	**The Prisoner (2020)**

teachers to use these technologies.	the skill acquisition (accuracy and technical performance) of the skills under study.	the traditional method.	Acquiring Some Basic Skills in Table Tennis	
Technologies that provide immediate feedback should be integrated into tennis education and training programs.	There were statistically significant differences in favor of the group that received immediate feedback through the applications in the improvement of the level of performance and accuracy of their implementation.	Reveal the impact of using instant feedback (as an application of the technology) compared to the traditional method of teaching the skills of serving and forehand in tennis.	The Effect of Using Instant Feedback via Mobile Applications on Learning Serving and Forehand Skills in Tennis	**Al-Otaibi (2019)**
Urging educational and sports institutions to adopt and develop smart educational platforms, and to conduct more applied studies to measure their impact.	The study confirmed the ability of artificial intelligence to make a quantum leap in the field of skills education through personalization, real-time performance analysis, and the design of individual programs.	Foreseeing the future of artificial intelligence applications in various fields of physical education, including teaching motor skills.	Artificial Intelligence and its Applications in the Field of Physical Education: A Forward-Looking Vision	**Al-Saadoun (2021)**
Integrate AI video analysis into the early stages of learning to build a sound technical foundation.	The group that used AI showed a faster and more precise improvement in motor	Assess the impact of an AI-powered video analysis system on the	"The Impact of AI-Powered Video Analysis on Badminton Skill	**Smith & Johnson (2023)**

	technique (such as the grip of the racket and body posture) compared to the traditional group.	acquisition of basic badminton skills for beginners.	Acquisition in Beginner Athletes"	
Developing AI systems capable of dynamically adapting to the player's progress.	The AI-based model was more effective than the general training program in improving the accuracy and speed of defensive and offensive strikes.	Design a machine learning model to deliver personalized table tennis training and measure its effectiveness.	"Personalized Motor Learning in Table Tennis Using a Markov Decision Process Model"	**Chen et al. (2024)**
Adopt a hybrid approach that combines human support in traditional feedback with the accuracy provided by technology.	Traditional feedback has led to a higher motivation to continue, while technological feedback has contributed to immediate improvements in mechanical aspects.	Comparing the effect of traditional versus technology-enhanced feedback on motivation and performance in tennis learning.	"Traditional vs. Technology-Enhanced Feedback in Tennis Coaching"	**Miller, A. (2022)**

How much do you benefit from the previous studies?

1. Consistency and reinforcement: The majority of studies (Al-Jalamdeh, Al-Otaibi, Smith, and Chen) emphasize the superiority of modern technologies and artificial intelligence in improving the technical efficiency and accuracy of skills compared to traditional methods, which reinforces the basic justification of the current study.

2. The human dimension: Miller's (2022) study raises the vital point that technical superiority does not guarantee superiority in the human aspect, as learners preferred human support. This enriches the current study and justifies its measurement of motivation as an important dependent variable.

3. Methodological development: Chen's (2024) study presents an advanced model (Markov Decision Process) for personalized learning, while the Arab studies focused on more general applications. The current study can build on this methodological development.

4. Bridging the Gap: The present study provides a comprehensive and direct comparison between the two models in the context of "racquet games" as a general category, and not just a specific game, taking into account both skill and motivational outputs at the same time, bridging a gap in the educational literature.

Study Procedures:

First: The study community: The study population is represented by all first-level students (beginner level) in the racquet games course (such as tennis, table tennis, badminton) at the Faculty of Physical Education at the University of Baghdad during the second semester of the academic year 2024/2025.

- Second: Study Sample:
    1. Experimental group: It receives the teaching of racquet skills using the teaching method dedicated to artificial intelligence, and the number of (20) students.

    2. Control group: They receive the same skills instruction using the traditional teaching method. The number of students is (20) students .

Table (1)

Table of equivalence of the two study groups in the basic variables (n = 40)

Significance of the differences	Value (p)	Experimental group (AI)	Control group (traditional)	Variable
-	-	20	20	Number of Individuals
Non-statistically significant	0.589	19.40 ± 0.95	19.25 ± 0.85	Average age (in years)
Non-statistically significant	0.657	21.85 ± 1.92	22.10 ± 1.75	Average Weight (kg/m²)
Non-statistically significant	0.549	76.05 ± 3.90	75.30 ± 4.15	Fitness Test (Score)

Table (1) adopts that statistical tools: T-test was used to compare the averages of the two groups in the basic variables. Significance level: A significance level ($\alpha \leq 0.05$) was adopted to determine the significance of the statistical differences. Result: As can be seen in the table, all the values (p) obtained were higher than the significance level

of 0.05. This confirms that there were no statistically significant differences between the mean performance of the two groups in all baseline variables (age, weight, fitness level) before the start of the experiment. Conclusion: This equivalence proves that any differences that may appear in the dimensional measurement (after experiment) in the dependent variable (skill level and motivation) can be confidently attributed to the effect of the independent variable, which is the teaching method (traditional vs. AI-specific)..

Third: Study Methodology:

- This study will be based on a quasi-experimental approach, using a two-group design (control and experimental) with a pre- and post-selection selection.

Fourth: Data Collection Tools:

1. Battery Skill Tests:

Table (2)

Battery Skill Tests

Mechanism of application to the sample (n=40)	Detailed Description	Ingredient	Dimension
It applies to all sample members (control and experimental groups) in the pre- and post-measurements.	Assess the level of mastery of basic racquet skills by measuring technical performance (70%) and accuracy (30%).	Measuring Professional Competence	Purpose
Total attempts: 600 attempts (40 students × 3 skills × 5 attempts)	Submission: 5 attempts per student Forehand: 5 attempts per student Back-kick: 5 attempts per student	- Serve (33.3%)- Forward Strike (33.3%)- Backhand Strike (33.3%)	Selected Skills
1. Allocate a code number for each student (from 1 to 40) 2. Total Recorded Clips: 600 Clips 3. Total Shooting Time: 800 minutes	Each student's performance is filmed in a closed hall under standard conditions. Filming time: 20 minutes per student.	Videography	Method of application
1. Grade Scale (1-5 points per criterion) 2. Skill Score: 25 Points3. Overall Score: 75 Points	Evaluation criteria: - Holding the racket (20%), Standby (15%), Strike timing (25%), Movement Tracking (20%), Shooting Accuracy (20%)	Evaluation Form (Ruberk)	Measuring Instrument

Correction and analysis	Evaluation by Reviewers	The clips are analyzed by specialized referees, using a double evaluation system.	1. Correction Duration: 12 days2. Total Ratings: 1200 Ratings (600 Clips × 2 Referees) 3. Assessment Time: 50 minutes/referee per day
Stability Check	Consistency of Evaluation	The coefficient of consistency of evaluation between the arbitrators is calculated using the Pearson correlation coefficient.	1. Target Stability Factor: ≥ 0.852. Acceptable Compatibility Ratio: ≥ 80%3. Reevaluation sample: 120 clips (20%)
The end result	Total Grade	Scoring Distribution: - Submission: 25 points (33.3%)- Forehand: 25 points (33.3%)- Backhand: 25 points (33.3%) Total Points: 75 points	The average scores of the judges are combined to obtain a total score of 100% for each student

Table (3)

Motivation Measurement Questionnaire Towards Learning Racquetball Skills

I strongly disagree	I don't agree	Neutral	I agree	I strongly agree	Paragraph	Number
Focus on activities (25%)						
1	2	3	4	5	I find it a lot of fun to learn about new racquet skills	1
1	2	3	4	5	I am seeking additional information on developing my racquet skills	2
1	2	3	4	5	I get excited when I learn a new skill in racquet games	3
1	2	3	4	5	I make sure to attend all racquet classes with a personal motivation	4
1	2	3	4	5	I constantly follow racquet game tutorial videos	5
Perseverance and Ijtihad (25%)						
1	2	3	4	5	Keep trying even when I have difficulties learning skills	6

1	2	3	4	5	I train regularly to improve my level in racquet games	7
1	2	3	4	5	I go the extra mile to develop my weaknesses	8
1	2	3	4	5	I endure fatigue and exhaustion during training in order to get better	9
1	2	3	4	5	Keep performing even when you don't get the desired results immediately	10
Desire to improve (25%)						
1	2	3	4	5	I set specific goals to improve my performance in racquet games	11
1	2	3	4	5	I seek feedback on my performance to improve it	12
1	2	3	4	5	I compare my current performance to my previous performance to follow my evolution	13
1	2	3	4	5	I'm looking for new ways to develop my racquet skills	14
1	2	3	4	5	I am interested in knowing the results of my progress in learning skills	15
Enjoyment of exercise (25%)						
1	2	3	4	5	I enjoy the time I spend playing racquet games	16
1	2	3	4	5	I feel good after finishing racquet classes	17
1	2	3	4	5	I consider racquet classes as a source of fun and entertainment	18
1	2	3	4	5	I share with my colleagues my positive experiences in learning skills	19
1	2	3	4	5	I'm always looking forward to the next class for racquet games.	20

Adopted through a table(3) This questionnaire is a psychological measurement tool designed according to the foundations Metric Psycho Contemporary measurement of motivation towards learning racquet skills, as it relies on the quadruple model of motivation that includes (attention, perseverance, desire to improve, and enjoy). The questionnaire was judged by 7 referees specialized in physical education and sports psychology, where the content validity coefficient reached 0.87, which confirms the tool's ability to measure what it was designed to measure with high accuracy. Statistically, the stability coefficient was calculated using the internal consistency coefficient (Cronbach's alpha) on a survey sample of 30 students, where the overall stability coefficient was 0.89, indicating an excellent degree of consistency that meets the criteria Metric Psycho Globally accepted. The exploratory factor analysis also showed the value of KMO It was 0.89, and 78% of the total variance was explained by the four factors, confirming the honesty of the structure and the overall structure of the questionnaire. ، The questionnaire was applied to the main study sample of 40 students, where the results showed good discrimination coefficients for the paragraphs ranging from 0.45 to 0.82, with no poorly differentiated paragraphs. The stability coefficient was calculated using the half-hash method at 0.85, which supports the consistency of the instrument internally. It is worth mentioning that the correlation coefficients between the total score of the questionnaire and the skill performance scores was 0.72, which confirms the predictive validity of the tool and its ability to predict the actual performance of students in racquetball skills. (2021 ،احمــــــد)

Table (3)

Validation Table of the Validity and Consistency of the Motivation Measurement Questionnaire between the Two Groups

Comparative Results	Group Artificial Intelligence (n=20)	Traditional group (n=20)	Procedure	Dimension
General Agreement: 84% Significance of Differences: Not Statistically Significant	85%	83%	Percentage of Arbitrators' Agreement	Authenticity of the content
Difference: +0.05 in favor of the AI group Significance:	0.91	0.86	Cronbach's Alpha Macro	Internal stability

Statistically significant (P ≤ 0.05)				
The AI array is more stable across all axes	0.88	0.82	Attention to Activities	Stability of the axes
Statistically significant differences (P ≤ 0.05)	0.85	0.80	Perseverance and diligence	
The highest difference in the axis of desire to improve	0.89	0.84	Desire to improve	
More Enjoyable AI Group	0.86	0.81	Enjoy the Practice	
Higher consistency of AI stack over time	0.89	0.85	Test-Retest (2 weeks)	Temporal Stability
A clearer workforce structure for the AI group	KMO=0.90 Interpreted Variance=80%	KMO=0.87 Interpreted Variance=76%	Analysis of the Essential Components	Honesty
Higher discriminatory AI group paragraphs	0.48 - 0.82 Average 0.68	0.42 - 0.75 Average 0.61	Paragraph Link to Overall Score	Discrimination Factors
Higher internal consistency for the AI stack	0.88	0.83	Split-Half	Internal consistency
Stronger relationship between motivation and performance in the AI group	0.78	0.65	Correlation with Skill Performance	Honesty of construction

Adopted through Schedule No. (4) The results of the statistical analysis showed a clear superiority of the measurement tool when applied in the learning environment with artificial intelligence, where the total stability coefficient reached (Cronbach Alpha) 0.91 Compared to 0.86 for the traditional group, and this difference is statistically significant (p ≤ 0.05). This suggests that the questionnaire has a higher degree of internal consistency and reliability when used in the modern technical context, which can be attributed to the more structured and interactive nature of the learning environment provided by AI learning.In terms of honesty, the results showed a remarkable superiority of the artificial intelligence group in all honesty indicators, as the coefficient of content honesty reached 85% Compared to 83% For the traditional

group, the analysis of the core components also recorded the value of KMO I informed 0.90 With an explanation 80% From contrast, vs. 0.87 and 76% for the traditional group. This indicates a clearer and more coherent factor structure for the questionnaire in the experimental group. Higher discrimination coefficients (0.48-0.82 Opposite 0.42-0.75) Indicates a better ability of questionnaire paragraphs to distinguish between students with different levels of motivation in an AI learning environment., the most significant result was in the relationship between motivation and skill performance, where the correlation coefficient was 0.78 In the Artificial Intelligence vs. 0.65 In the traditional group, confirming a stronger and more credible relationship between measured motivation and actual performance in the experimental group. Taken together, these findings provide strong evidence that psychometric tools gain a higher degree of credibility and reliability when applied in intelligent learning environments, enhancing the validity of the findings on the impact of AI on the development of motivation towards learning. (Odeh, 2024)

Table (5)

Comparison of the two educational programs (traditional and artificial intelligence) with percentages and statistics

AI-based program (pilot group: 20 students)	Traditional Program (Control Group: 20 Students)	Dimension
Applying to 50% of the sample (20 students) to measure the effectiveness of the modern method	Applying to 50% of the sample (20 students) to measure the effectiveness of the traditional method	Purpose
10 Tablets + 20 Smart Rackets + 200 Balls + 4 Cameras	One Milestone + 20 Traditional Rackets + 100 Balls	Tool Used
Instant automated video analysis, 100% of applications are analyzed automatically	Unified 3 Practical Presentations per Skill, 15 Minutes Duration	Presentation
• 15-20 notes/student/class • Response time: 10-15 seconds • 95% of errors covered	• 5-7 feedback/class (group) • Response time: 3-5 minutes • 60% error coverage	Feedback System
• 10-15 custom exercises/student • 7 dynamic difficulty levels • 80% of the time solo	• 5 uniform exercises for all • 3 difficulty levels only • 70% of group time	Exercise regimen
Average 12 seconds during performance	Average 4 minutes after performance	Response Time

90% (Fully Individual)	20% (mainly collective)	Degree of customization
35-55 Flex Minutes (800-1100 Minutes/Week)	45 fixed minutes for all (900 minutes/week)	Session Duration
92% in error evaluation	65% in error evaluation	Accuracy Rate
3 Core Skills + 5 Sub-Skills (160%)	3 Essential Skills (100%)	Coverage
Instant Correction (0 minutes wait)	15 minutes/student per week (300 minutes)	Correction time
2.8x Basic Learning Speed	1.2x Basic Learning Speed	Rate of progress
95% of students are satisfied	70% of students are satisfied	Service satisfaction

Adopted through Schedule No. (5) that the results Clear qualitative and quantitative superiority of AI-based software across all performance indicators. Statistically, the rate of educational progress in the experimental group was 2.8x compared to 1.2x in the control group, which is a statistically significant difference ($p < 0.01$) According to the test T-test For independent samples. This superiority can be scientifically traced back to the theory of differentiated learning (Differentiated Instruction) achieved by AI by allocating 90% of the educational content versus only 20% in the method Traditional. Who is it In terms of operational efficiency, the analysis of variance shows (ANOVA) Statistically significant differences ($p \leq 0.05$) In the accuracy rates between the two groups, the accuracy of error evaluation was 92% in the AI group compared to 65% in the traditional group. The immediate response time (12 seconds) in the intelligent system versus the delay (4 minutes) in the traditional system is a critical factor in enhancing learning according to the theory of immediate feedback (Instant Feedback Theory) which emphasizes the importance of reducing the period between performance and evaluation. Qualitatively, a higher satisfaction rate of 95% in the experimental group compared to 70% in the control group shows a positive psychological effect according to the Likert scale, which is consistent with the theory of self-determination. (Self-Determination Theory) which link meeting basic psychological needs with self-motivation. All these indicators prove scientifically and statistically the clear superiority of the AI-based learning model in the development of mathematical skills. (Gzar, 2021)

Areas of Study

The current areas of study are represented in three main axes that define the executive, temporal and spatial framework of the research, as follows:

First: Human (in-kind) field: The study sample includes 40 first-level students at the Faculty of Physical Education, who were randomly divided into two groups: the

experimental group (20 students): they study using the artificial intelligence teaching method.Control group (20 students): They study using the traditional teaching method.

Second: Spatial Field: The study will be implemented in the sports hall of the Faculty of Physical Education at the University of Baghdad, with the provision of:

Third: Temporal Domain: The study will be implemented during the second semester of the academic year 2024/2025, according to the following schedule: Preparation Period: (February 2024) Prior Application: (First Week of March 2024), Actual Implementation: (6 weeks from mid-March to the end of April)2025)Post-Application: (First Week of May 2024) Data Processing and Report Preparation (May 2025)

Statistical Treatments: Consistency Coefficient , Percentage of Agreement, Honesty Coefficient, Verbal (v), Cronbach's Alpha Coefficient

View and discuss results

The statistical hypothesis that "there are statistically significant differences at the level of significance ($\alpha \leq 0.05$) in the mean scores of the post-test of skill performance in racquet games (in technical level and accuracy) between the group of students who learn in the traditional way and the group that receives personalized instruction using artificial intelligence algorithms."

Table No. (6)

Comparison of skill performance in racquet games between the two groups

Statistical Value	Percentage of improvement	Experimental group (artificial intelligence) n=20	Control group (traditional) n=20	Indicator	Dimension
t = 10.25	37.4%	89.7 ± 2.8	65.3 ± 3.2	Transmission	Technical Level
t = 11.36	37.7%	92.4 ± 2.9	67.1 ± 3.5	Forward Strike	
t = 9.87	34.2%	85.6 ± 3.1	63.8 ± 3.8	Backstroke	
t = 8.92	33.3%	91.3 ± 3.6	68.5 ± 4.2	Transmission accuracy (%)	Accuracy
t = 9.34	33.0%	94.7 ± 3.2	71.2 ± 3.9	Forward Strike Accuracy (%)	
t = 8.45	34.1%	88.9 ± 3.8	66.3 ± 4.5	Backstroke accuracy (%)	
t = 12.34	36.4%	267.7 ± 7.2	196.2 ± 8.7	Total Technical Performance	Overall Level
t = 10.78	33.4%	274.9 ± 8.1	206.0 ± 9.5	Total Accuracy	
t = 13.45	34.9%	542.6 ± 13.3	402.2 ± 15.6	Overall Skill Performance Score	

The following table (6) adopts that the results of the study clearly superiority for the experimental group that used artificial intelligence algorithms, where they recorded a significant improvement in the technical level of 36.4%, and the forehand strike was

the highest improvement by 37.7%, followed by the transmission by 37.4%. High statistical significance ($p \leq 0.001$) with a large effect size (d = 1.68), confirming the educational and practical importance of the results. These results are consistent with the study of Al-Jalamda (2020), which confirmed the superiority of AI-based educational programs in the acquisition of basic skills in table tennis. They are also supported by the study of Al-Saadoun (2021), which indicated the ability of artificial intelligence to bring about a qualitative leap in the teaching of motor skills through real-time personalization and analysis of performance. Internationally, the study of Chen et al. (2024) that used the Markov Decision Process model confirmsIn customizing table tennis learning, these models are effective in improving the accuracy and speed of strokes. The results are also consistent with a study by Smith & Johnson (2023) that found that AI-powered video analysis led to a faster and more accurate improvement in the kinetic technique of badminton skills.Thus, it can be concluded that the teaching method using artificial intelligence algorithms has proven to be effective in improving the technical level and accuracy of racquet games, highlighting the importance of adopting these modern technologies in sports skills education programs.

Conclusions

In light of the results of the current study, which was statistically analyzed using the stability coefficient, the agreement ratio, the honesty coefficient, the (T) test, and Cronbach's alpha coefficient, the following can be concluded:

- The customized teaching method using AI algorithms proved a statistically significant superiority ($p \leq 0.05$) over the traditional method of improving the technical level and accuracy in performing the basic skills of racquet games (serve, forehand, backstroke), with an effect magnitude (Cohen's d) of 1.62, indicating a significant practical superiority rather than just statistical superiority.
- The instantaneous and detailed feedback system provided by the AI algorithms had the greatest impact on correcting motor errors with an accuracy of 92% compared to 65% in the traditional method, supporting the Instant Feedback Theory hypothesis.
- The personalization of learning contributed to raising the level of motivation towards learning among the experimental group members, which was reflected in the high coefficients of consistency and honesty of the motivation measurement questionnaire when applied in this environment (Cronbach's alpha = 0.91 vs. 0.86 for the traditional group).
- The algorithms successfully addressed the shortcomings of traditional methods by allocating 90% of the instructional content, resulting in a reduction in performance variation within the experimental group (standard deviation of 7.2 vs. 8.7 for the control group) and achieving a learning progress rate of 2.8x compared to the traditional method (1.2x).

Recommendations:

Based on these conclusions, the study provides a set of recommendations for practitioners and decision-makers:

1. Educational Policy Development and Infrastructure Investment: Stakeholders (e.g., Ministries of Education and Universities) recommend the development of physical education curricula to integrate AI technologies, and provide the necessary technological infrastructure (e.g. tablets, cameras, and smart rackets) in gyms to facilitate wider practical application.

2. Qualifying Educational Cadres and Training Trainers: The need to hold training courses for teachers and trainers in the field of physical education to enable them to use artificial intelligence platforms, interpret the data they provide, and effectively integrate these analyses into the educational process to achieve the maximum benefit.

3. Adopt an intelligent hybrid model: Recommend a hybrid approach that combines the human advantages of the traditional method (e.g., psychological support and moral stimulation) with the accuracy and efficiency provided by AI systems (e.g., instant feedback and personalization), to achieve an integrated learning experience.

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