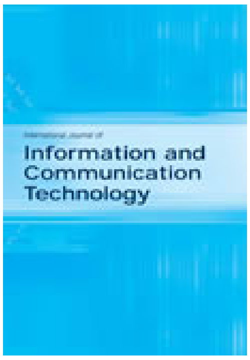
INDERSCIENCE PUBLISHERS
Linking academia, business and industry through research



International Journal of Information and Communication Technology

ISSN online: 1741-8070 - ISSN print: 1466-6642
https://www.inderscience.com/ijict

AI-driven recommendation for personalised physical education training

Ermao Xu

DOI: 10.1504/IJICT.2026.10075909

Article History:

Received:	10 October 2025
Last revised:	04 November 2025
Accepted:	11 November 2025
Published online:	06 February 2026

AI-driven recommendation for personalised physical education training

Ermao Xu

School of Physical Education,
Changzhou University,
Changzhou, Jiangsu, 213164, China
Email: xu15850578859@126.com

Abstract: The objective of this study is to explore how personalised AI-based physical education (PE) tools can enhance learning outcomes and physical fitness among college students. The research investigates the potential of AI to make PE more adaptive and data-driven through innovative motion-sensing and analytics-based game applications. Seventy-two students were divided into twelve groups, with half using AI-enhanced mobile apps that provided real-time feedback and guidance. Over eight weeks, the AI-enhanced group demonstrated significant improvements in core, upper-body, and lower-body strength ($p < 0.01$). The AI systems adapt continuously, offering immediate corrective feedback to improve performance. These results suggest that AI can effectively personalise physical training, promote independent exercise, and increase engagement in physical activity, contributing to sustainable fitness development.

Keywords: artificial intelligence; personalised physical education; recommendation system; motion analysis; fitness training; data-driven learning.

Reference to this paper should be made as follows: Xu, E. (2026) 'AI-driven recommendation for personalised physical education training', *Int. J. Information and Communication Technology*, Vol. 27, No. 6, pp.27–44.

Biographical notes: Ermao Xu is a Lecturer at Changzhou University. His research interests include school physical education and physical education curriculum.

1 Introduction

AI can now be used in college sports. That is why AI is quickly getting better. The way PE is taught has changed because of AI. Instead, we now use smart models that are built from data. Based on how well a student does in school and sports, AI can change their lessons to fit their needs. You can get help right away and work with the staff (Pham et al., 2023). It is also more likely that this will work. The 500 kids in the study were pushed 30% harder when AI was used to help the teacher. People stay fit and get stronger. They are not likely to get fat. AI can see how people move. This really does work to help kids learn more. Kids are watched as they move by systems that follow them around all the time (Zulkifli and Danis, 2022). This tells them the truth and helps them use their skill better. This is the reason why many people believe it was smart to switch to an AI-based program. It is now easy to make sure every kid gets the most out of PE. AI was used in one project to help 150 kids move schools through peer-to-peer exchange (PE). More than eighty per cent of those kids said that the classes where AI was used to teach them made them better at sports. They wanted to work out longer and harder. This is better, and it is simple to change it to fit your needs (Cao et al., 2022). Since AI is around, you do not need to check things as often. A novel graded score method is presented in this work (Wu, 2024) in order to assess and combine several elements that affect the efficacy of multimedia-assisted physical education. The algorithm uses a weight analysis method to evaluate and optimise the quality of instruction, providing information for improving multimedia material and developing curricula.

It checks student games with AI to make sure that every student learns in their own way. How clean and relaxed you feel and how well you do have changed a lot. You can change how you train people if you watch them move in real time. They help people stay healthy and teach new things (Gordon et al., 2020). AI can help find health problems early and make lesson plans for each person when it is used in care. Doing this is good for you. When you look at public health as a whole, this makes sense. Now that AI is around, you need to be a better teacher. Sixty percent of the 500 physical education teachers polled did not know the right way to use AI, which made their work harder. Is this why AI is taught in schools? To help teachers understand facts and do a better job of teaching, AI can.

1.1 AI's role in public physical education reform

AI has a big impact on college physical education. It does this in several ways, including by giving teachers resources, training, and assessments to help them get better (Wang and Liu, 2018). In order to guarantee that each person has a unique educational experience, AI-powered solutions leverage a person's biology and skills. People no longer use a 'one-size-fits-all' strategy. It will not hurt to work out more (Wang and Wang, 2017). AI helps children by being able to evaluate their growth instantly and offer support. Every teacher is allowed to change their lessons whenever they think it will help the students. The conventional 'one-to-many' strategy worked better for grownups. There is now a better way to teach. Virtual reality (VR) and augmented reality (AR) are popular choices among kids at the gym. They enjoy it and find it helpful. People are often also kept safe by AI. If AI is used, people will become more proficient and make fewer mistakes when utilising it excessively (Zhang and Zhang, 2017). This is accomplished by motion researchers looking for unwanted motions. Do you think that 85% of the time, someone will get hurt? Make sure none of their muscles are stiff or irritated by keeping an eye on their movements. AI integrated into your clothes allows you to quickly receive feedback and modify the amount of work you do. We have gotten better at telling time. Now, nothing should go wrong.

Apps that use AI to tailor exercises to each user's body type may also speed up the healing process after accidents. In addition to recovering faster, you will be less likely to get hurt again. The best instrument for teachers to develop their abilities is artificial intelligence. AI skills training is becoming more widely available at teacher training institutions (Lippke et al., 2021). AI is only useful if you know a lot about it. Additionally, AI-powered apps make it easy for everyone to find high-quality sportswear. The greatest beneficiaries of this will be children who live in low-income areas (Keiper et al., 2023). AI is able to evaluate the data and help you make choices. In addition to keeping kids healthy, this will assist the government in meeting its health goals.

1.2 Author contribution

The main goal of this five-part study is to ascertain how tailored physical education (PE) lesson plans could be made using artificial intelligence (AI). These sections help you understand. The use of IoT in college gym classes is growing. This section will provide an explanation of the study's goal. According to the statement, the study's goals are to ascertain how well AI-powered trainers can encourage kids' engagement and general well-being. The drawbacks of the conventional physical education curriculum and the justification for implementing AI-based teaching methods are also covered. There are several possible uses for AI in sports training and education. This section goes into further depth about these studies. Numerous types of healthy living systems and smart motion analysis have already been researched. That study is discussed in this article. Keep in mind that real-world data is necessary for PE teachers to develop their own AI-powered training plans. There are a few mistakes in this work. There are several specifics about how the exams and study are set up and run. It shows the closed-loop AI-powered system with databases, personal devices, and input mechanisms. Now, let us talk about how it was used to evaluate the efficacy of AI-assisted physical education instruction. There is also extensive coverage of the tools that can be used to see data, check its speed, and manipulate it.

The groups did not complete the same tasks before and after the test. Many people talk about numbers here. It was a better-looking bunch, bigger and more toned. People are more driven and effective when they believe they can change how they learn, grow, and move forward. It is like playing a game. This is what the conversation is about. In real life, the main points are summed up in the last part. It talks about how artificial intelligence (AI) could improve physical education by developing dynamic, data-driven learning environments. In this part, we also go over several possible fixes. They must learn about artificial intelligence and how to use it without endangering school health programs. This is something we discuss.

2 Related works

2.1 Applications of AI in PE

In addition, machine learning is being used more and more in PE. This helps keep things interesting and on track in PE. Kids work out more when they want to learn more. AI helps PE teachers figure out how to teach all of their kids better. Schools also use AI to get kids to talk to each other and check in on each other. This group's main goal is to get kids more excited about going to school and the gym. You could also become a better teacher. The school might find it useful to have new tools that use AI (Shin et al., 2021). This needs to be done in PE. ChatGPT was seen as a useful app that could assist both kids and PE teachers in various ways. Nine people talked about how ChatGPT could teach people how to run a sports team. What does ChatGPT need to change? They want to learn how to manage a sports group. How does this help them do better? You can teach other people how to play games more than ever before. Ten made an AI-powered virtual sport school where teachers can help their students and watch them work out live. A system tool that keeps track of where you are uses AI. It also comes with five fun games that are meant to get kids in shape and excited about working out. When it If it rains or the kids are sick, PE outside might not be as much fun (Goksel and Bozkurt, 2019). You can learn anything online or in person.

Even though COVID-19 is going around, the plan is set up so that kids can still go to PE class. It was also talked about how college and university students could use virtual reality to learn about and get ready for physical education (PE). SVM computers can sort and grade how well kids do in different sports. One more way is pulse swarm optimisation (PSO). This can happen because the tech layer makes fun and real AR content. You need more tools than you have to grade everything in high school and college PE. It should be easy to see and rate how well different ways of teaching work. Li et al. (2024) looked at a multi-feature fuzzyscore method that is built on AI. The machine can say normal English, but it is not clear how to use it. Three types of people care about grades: those who are in charge, those who teach, and those who just do what they are told. Last but not least, there is a new way that cuckoo search works better. The moving vector split and the student flow tool can help you make up for that. They were picked because they are great at what they do. You cannot show everyone how to play games. This is because everyone has a bad life. The back propagation neural network could be made better so that it could figure out which exercises are best for different body types (Li and Li, 2022). People worked out and did PE more often after these changes, which was good for their health.

People use a lot of old records and records of things that happened in the past to help them find their way. Now that tools are faster and better, this is possible. They can give the right drugs to many different types of people. As the kids learn, teachers need to check on and rate each child's health. The tech has to be good for this to work. Some kids do not get the health care they need because of how they are taught. Also, keep an eye on and rate each student's health. Some people in this group thought AI could be used to run a system for handling sports teams (Feng, 2023). This is how most kids learn to keep an eye on their health and sports skills. It is broken up into several groups, and a decision tree classification method called C4.5 is used to mine them. Some people use this to keep an eye on their health and growth, too. In PE class, kids write down ideas for this method. You can find out how fit the kids were and what sports skills they had. People should be able to rate how well school games are run, and they should trust teachers to do their jobs in the classroom. AI and the internet of things (IoT) have made many good things possible. IoT was used to create a device in (Rooney et al., 2023) that taught games. The Gold-SA method and the BPNN model both look at the same model, but they do so in different ways. Chen (2025) presents a deep learning-based system that uses CNNs and LSTMs with wearable technology to improve evaluation accuracy and feedback. The multimodal dataset includes data from many devices, such as heart rate monitors and accelerometers.

Adults can help kids learn and figure out how things work. In addition, they can see how their child is doing in sports even when they are not there. Making sure the kids have things to do every day is a big part of being a teacher. It is more important than getting better at sports. In the end, this is good for their health. It is not clear what the kids do after school. The authors showed a full smart service system. It had a platform for smart places, a platform for health clouds, and a platform for smart GUIs. You can save text and sound files that show you how to teach the lessons. This helps you fully grasp and remember how things are taught over time. AI takes care of things that happen in the background. Kids and adults can do things better. They need more ideas and tools. The way we teach and what we teach should change along with technology and pupil needs. It was smart to keep track of PE in 18 so that teachers and students could see how much the kids had grown. There are many different technologies used in the system, such as virtual reality, machine learning, smart recognition, and careful handling of large amounts of data. You can play the same games in VR if you know about HCI. Through the IoT, it gets data from kids in PE class. You can get good grades on the lessons if you use tools to help you study. Every PE teacher needs to get better. In order to create sports picture categorisation, Zheng and Cai (2025) looks at cutting-edge artificial intelligence (AI) techniques that impact multimedia management, recommendation algorithms, and sport data analysis skills.

2.2 Applications of AI in sports training and teaching

It is used to make rules for school and games that are better and more useful. The IoT and deep learning make this possible. PCs can always tell who is and is not healthy. We can train and lead our teams better with this. With this tech, people can also get better at what they do. It also makes trains better and safer. This is how sports have always been taught to kids. Kids should ask an adult for help when something goes wrong. Since every teacher is different, it is tough to make sure that all the kids get the help they need. In 2019, AI was used to make it smart enough to answer science questions about how sports work. Teens and kids were told to get more exercise, learn better ways to train for sports, and get help with their schoolwork and tech problems. You can use some of it to teach. The knowledge base module, the information processing module, the information processing module, and the information processing module are the other parts. It might be time to check on the kids now. This would help teachers plan lessons that are more likely to happen. Chips and the IoT have grown a lot. You will be ready for sports soon if you study math and science now. These changes are because of technology. You can see what and who is in the cloud.

This is very strong. Tech can talk to many of the moving parts in their bodies. The cloud of things fixed it. Built a machine that could do this. The computer data is looked at with several deep learning and Bayesian deep filters. These steps will help you get ready if your goals change. AI tools can now look at old data about sports and health (Wei et al., 2022). Besides that, they try to guess what will come next. This then helps them come up with better ways to prepare for sports. Caring is, without a doubt, what makes a business work. When teachers do not have much time, AI can help them check to see if their students are done with practice. In Zhang et al. (2023), the deep residue network was used to find out more about how it could be used to tell when a workout was over. After the motion shots of the kids have been taken, they are cleaned up with space scale filters and regression factors. After this step, a deep residue network is set up. Find the secret link between how they feel and how they change when they work out. Not only go to the gym. As you fill out the online application form, video clips from projects you have already worked on will be added to it. You are very smart. Their teacher can see what they did right away (Noury et al., 2022). Big things happen when pictures that have been changed are used to judge how well a sports team did.

2.3 *Comparative analysis of AI-based PE approaches*

Table 1 provides a thorough comparison of previous AI-based physical education treatments, highlighting their methodological methods, results, and limitations, in order to place our study within the body of existing literature.

Table 1 Comparison of AI-based physical education approaches

Study	*AI technology used*	*Focus area*	*Sample size*	*Duration*	*Key outcomes*	*Limitations*
Shin et al. (2021)	VR + motion tracking	Virtual PE classroom	Not specified	Single session	Enhanced engagement during COVID-19	No fitness outcome measurement; short-term only
Wang et al. (2024b)	VR + particle swarm optimisation (PSO)	Sports skill classification	Not specified	Not specified	Improved skill assessment accuracy	Focus on evaluation only, not training adaptation
Li and Li (2022)	Back propagation neural network	Exercise prescription	Not specified	Not specified	Personalised workout recommendations	No empirical validation with students
Feng (2023)	Decision tree (C4.5) + big data	Sports management system	Not specified	Not specified	Health monitoring capability	Administrative focus; limited training intervention
Zhang et al. (2023)	Deep learning + IoT	Sports training platform	Not specified	Not specified	Real-time health monitoring	No controlled comparison group
Current study	Closed-loop AI + motion analysis + gamification	Comprehensive fitness training	72 students (36 per group)	8 weeks	Significant improvements in CVE, UBS, CS, LBS ($p < 0.01$)	Single institution; baseline CS imbalance

The comparison study revealed some significant research gaps that our work fills. First, not many studies have used full fitness treatments with many parts that have been tried in the real world. This is still true even though AI has been used in PE before, for example, in Shin et al.'s (2021) virtual classroom or Wang et al.'s (2024a) skill rating systems. Plus, it is tough to say for sure how AI changes health outcomes since most of the current methods (Li and Li, 2022; Feng, 2023) do not use regulated tests with control groups. Third, most of the research done in the past has been on administrative problems or one-time demonstrations, not on long-term training programs. A strict 8-week randomised controlled design is used in our work to create a closed-loop AI system that can analyse motion, take feedback in real time, and have game-like features. With this method, the gap between what AI can do in theory and real-life fitness gains that can be measured in college PE classes is filled. We also change the intensity of the workouts and give each person specific feedback. This creates a truly dynamic learning setting that shows statistically significant improvements across multiple fitness components, which is different from systems that only track performance (Zhang et al., 2023).

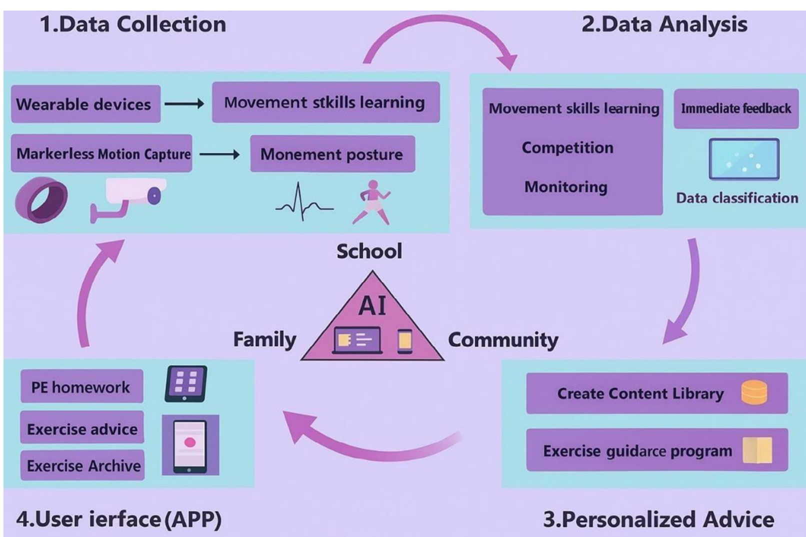
2.4 Research gap and study positioning

There are still three big gaps in the study, even with all the cool uses we have talked about so far. First, there is not a lot of real-world proof that AI-enhanced PE therapies are better than regular PE therapies that use standard fitness parameters. Second, most research does not give a clear picture of the exact AI processes (like feedback loops and adaptation algorithms) that allow progress to be made. Third, not enough research has been done on how gamification and AI-based personalisation could work together in exercise settings (Yang et al., 2020). To fill in these gaps, our study uses a closed-loop system based on theory. This system includes tracking movements [equation (2)], modelling energy use [equation (3)], and feedback systems that work more like games. It is also important to carefully keep track of growth in upper-body, core, and lower-body strength, as well as cardiovascular endurance. Based on data, this method has many useful parts that give teachers good ideas for using AI in PE classes.

3 Methodology

A closed-loop gadget run by AI is used for physical education (PE) in the study. It has smart monitors, data analytics, and a way for everyone to give input, as shown in Figure 1. It can connect more than one place.

Figure 1 Framework of AI-based PE (see online version for colours)



Before it was used in the AI plan, much of the raw data was cleaned up and made more normal. Equation (1) was used to level out the data so that it could be used more.

$$X' = \frac{X - \mu}{\sigma} \tag{1}$$

where

X' normalised data

X raw input value

μ mean of dataset

σ standard deviation.

You could rate how well someone moves with change and learn useful things about how people move if you watched them do it. We did the following to find out how much movement there was in each frame.

$$F_i = \sqrt{\left(x_i^2 + y_i^2 + z_i^2\right)} \tag{2}$$

You can move through space in three different ways with the help of the x_i, y_i and z_i marks. In this part, you can see how hard the kids are working and how well they can plan their moves. The AI system used a regression-based equation (3) to find connections between body data and figure out how much energy each person used.

$$EE = \alpha \times HR \times \beta + BW + \gamma \tag{3}$$

The numbers ±, 2 and 3 were found with tests. The number of times your heart beats in one minute is your heart rate, or HR. The number used to measure weight is kg. From time to time, this plan made it easy to change how much you worked out. It made sure the person was okay. In the closed-loop system, there are health apps for your phone, tech that you wear, and motion cams that use computer vision. Its job is to record your heart rate, how much energy you use, and how much you move (Quyang, 2024). AIs put together moves based on how well they worked together in the past. Picture tools, things that look and feel like games, and fun things were used to get the point across quickly. This lets them change their strength and method quickly. There are many places where people share training information, such as at school, at home, and with groups. This might help friends stay together. Giving information, going over it, and acting on it do not need to take a lot of time. They can learn in ways that work for them and keep them interested.

3.1 Research design and participants

This study looked at how apps with AI can change how fit kids are. It was not just any two groups that were put together; it was set up like an experiment. For your information, 22 college students took part in the study. There was a difference of 0.8 years in age between the people in the group. There were 32 women and 40 people. Everyone who took part in seeing if they were ready filled out a physical activity readiness questionnaire (PARQ). Kids who had heart problems, were hurt recently, or were sick in any other way could not play. Everyone was split into two groups: The AI-improved group's (AEG) PE classes were better because they had fun AI-run training apps. Real people: they did not use AI and went to real schools. To find out how strong they were, people in both groups did tests on their UBS, CS, and LBS (upper body, core, and side body). For CVE, the short Harvard step test was used. For UBS, the long arm hang test was used. You had to do the plank test for CS. Next was the wall-squat test. There were people in PE to help with every step. Like a test to see how well health apps for kids that use AI worked, there were only two sets, and no one was caught. Seventy-two college students in group AEG did PE, and 72 college students in group TG did PE. You can see how much skill was gained by looking at equation (4).

$$FI = \frac{T_1 - T_0}{T_0} \times 100 \tag{4}$$

What was the number before the test? It was T0. After the test, what was the number? It was T_1.

3.2 Intervention program

The eight-week plan that held the AEG also included apps like Active Arcade, Tuby, Jumpr, and Sports Play. They each had an app that tracked their progress, gave them feedback, and, in real time, gave them ideas for workouts that would work best for them. There were points, prises and leaderboards, so it felt more like a game. People were more likely to do it after reading this. Twice a week, different workouts were shown. You worked out your heart and lungs all week. You worked on making your legs stronger all week. Over time, the workouts were changed so that everyone could find one that they liked. During PE, the TG did moves they could do on their own, like push-ups and hops. The old-fashioned way, without any tools, was used to teach these jobs.

3.3 Statistical analysis

We learned more about the health and social traits from this. To find out how the group changed before and after the help, a certain kind of t-test was used. To see how the groups were different after the help, a different kind was used. SPSS was used for all the tests, and $p < 0.05$ was chosen as the significance level. Equation (5) helped us figure out which numbers were important for each part of the study. This is what you get when you add the mean (X^2) and the standard deviation (SD).

$$X^2 = \frac{1}{n} \sum_{i=1}^{n} X_i$$

$$SD = \sqrt{\frac{\sum_{i=1}^{n} \left(X_i - \bar{X}\right)^2}{n-1}} \tag{5}$$

Pair-sample t-tests were used with equation (6) to find out what changes happened within the groups.

$$t = \frac{D}{SD / \sqrt{N}} \tag{6}$$

N lets us know how many people took part in the study. *D* separates the two groups. You can use something called an SD to show them. In statistics, 0.05 or less was picked as the important number.

4 Results

4.1 Pre-test scores

At the start of the study, both groups were about as fit as each other. See how the pre-test went in Table 2. The groups were not that different when it came to LBS, UBS, and CVE ($p < 0.05$). It was clear that CS had changed a little ($p = 0.012$).

Table 2 Pre-test fitness performance

Component	*Traditional group (M ± SD)*	*AI-enhanced group (M ± SD)*	*p-value*
CVE (fit index)	52.9 ± 18.7	50.6 ± 12.1	0.74
UBS (sec)	34.7 ± 23.5	42.1 ± 27.2	0.21
CS (sec)	64.3 ± 33.9	97.4 ± 60.1	0.012*
LBS (sec)	57.8 ± 24.3	69.8 ± 58.7	0.29

Note: *Significant at $p < 0.05$.

4.2 Post-test scores

Both groups got better after eight weeks of work, but the AI-enhanced group did much better in every way (Table 3).

Table 3 Post-test fitness performance

Part	*Group conventional (M ± SD)*	*Group enhanced by AI (M ± SD)*	*p-value*
CVE (fit index)	68.4 ± 16.8	81.1 ± 16.2	0.003**
UBS (sec)	36.2 ± 21.9	65.4 ± 43.5	0.001***
CS (sec)	66.2 ± 30.8	127.2 ± 72.1	<0.001***
LBS (sec)	68.3 ± 31.1	104.7 ± 54.4	0.002**

Note: **$p \leq 0.01$; ***$p \leq 0.001$.

4.3 Paired sample comparisons

The control group's CVE and LBS both went up a lot before and after the intervention, as shown in Table 4. But UBS and CS did not change much.

The AI-enhanced group's health was very different from the safety group in all four ways. Table 5 shows that the CS and LBS methods worked the best.

Table 4 Changes before and after (traditional group)

Part	*Average difference*	*t*	*p-value*
CVE	+15.5	4.08	<0.001***
UBS	+1.1	0.29	0.77
CS	+2.0	0.46	0.65
LBS	+10.5	3.19	0.002**

Note: **$p \leq 0.01$; ***$p \leq 0.001$.

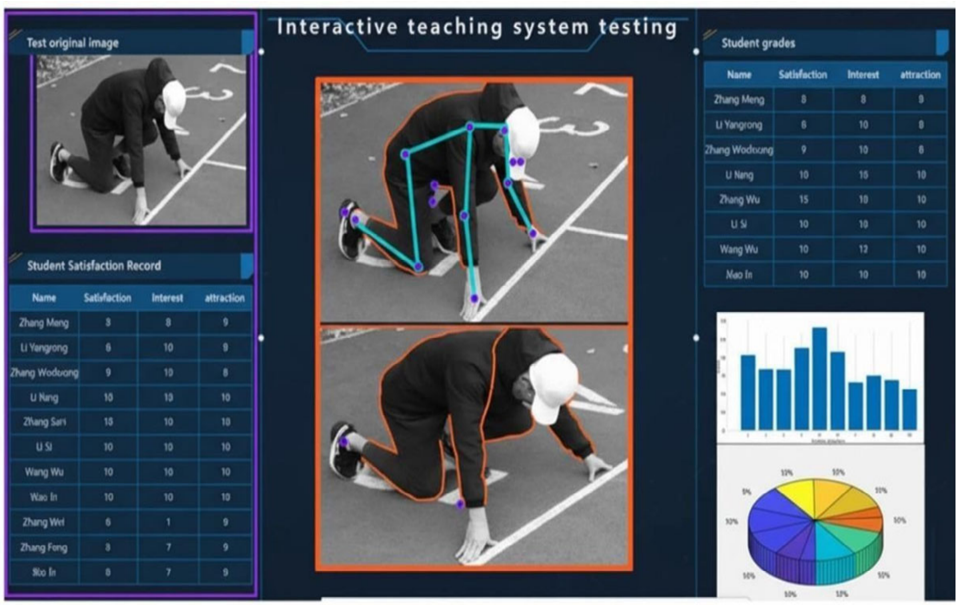
In the school, everyone can talk at the same time. This helps teachers stay on track with their lessons. It can also track and show how kids stand and move over time. The machine's screen and the test results can be seen in Figure 2.

Table 5 Changes before and after (AI-enhanced group)

Part	*Average difference*	*t*	*p-value*
CVE	+30.1	12.1	<0.001***
UBS	+23.3	3.9	0.001***
CS	+29.4	3.3	0.003**
LBS	+35.8	4.1	<0.001***

Note: $^{**}p \leq 0.01$; $^{***}p \leq 0.001$.

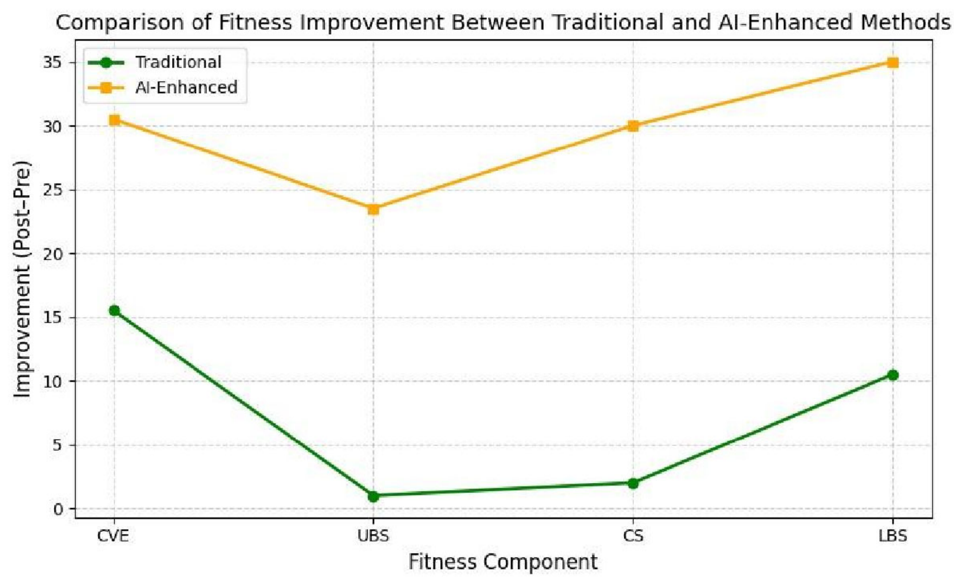
Figure 2 Test result analysis and display interface (see online version for colours)



Source: Reprinted with permission from 'Practical Application of Interactive AI Technology Based on Visual Analysis in Professional System of Physical Education'

The stomach (CS), arms (UBS), and legs (LBS) all got stronger after the surgery. Your lungs and heart got stronger. Figure 3 shows these. The other group and the AI group both went through the same thing. The group with AI did better than the group without AI in every way. It was clear that the strong parts of the body got better first. You can do these things with apps that use AI to make tech fun and give you clear tips. The other group worked out and ran faster and stronger. Their upper body and core strength did not change much, though. Things stayed the same. Growth trends come in many forms. It is good for your health to work with AI.

Figure 3 Relative improvements (post-pre difference) in fitness performance across four components for both groups (see online version for colours)



4.4 Discussion

When used with AI-powered apps in a closed-loop physical education system, the old ways of working out might not work as well as they used to. Some people in the AI-enhanced group had a lot more endurance and strength in their upper bodies. They also had a lot more stamina and strength in their cores. AI may have helped with the better work because it gives feedback, new ideas, and different results right away. An AI tells kids right away what they are doing wrong while they are moving. This helps them keep the right form and figure out how much energy they need for class. This changes their bodies in bigger ways over time. Using games to learn was another way to keep people interested and motivated. PE does not keep kids interested or on track when used by itself. Digital tools with points, leaderboards, and fun tasks are better for both. They got stronger in their legs and their blood flow got better, but it did not change how strong their core or upper bodies were. It seems that working out often might not give all of your muscles the stress or energy they need to get in shape. Focused, slow strength training can also help your upper and middle body get stronger. For PE classes to be more useful, they need closed-loop AI systems that look at data and change what they say to students based on how well they do.

This work is good for you and makes the class more fun and friendly. AI should be looked into more in the long term to see how it can be used for different kinds of training and how to help PE teachers learn about it.

4.4.1 Statistical robustness and effect size interpretation

Our findings' statistical robustness calls for serious thought. The notably high standard deviations, especially in CS (SD = 72.1) and LBS (SD = 54.4), imply significant individual variance in response to AI-based training, even though the AI-enhanced group showed much superior increases across all fitness components ($p < 0.01$ for most measures). This variability implies that some students gained significantly more from AI personalisation than others, perhaps as a result of variations in learning preferences, involvement with gamified parts, or starting fitness levels. The results may not be as applicable to larger student populations with a wider range of physical abilities and degrees of technology literacy due to the small sample size (n = 36 per group).

4.4.2 Limitations and confounding factors

Our results could have been impacted by a number of confounding variables. First, the greater absolute increases seen in the AI-enhanced group may be partially explained by the baseline imbalance in core strength (CS: $p = 0.012$) between groups. Second, regardless of AI's capacity for adaptation, the novelty effect of using mobile applications might have momentarily boosted motivation. Third, the Hawthorne effect cannot be completely ruled out because students in the AEG were aware that they were being watched by technology, which might have increased their effort levels. Furthermore, even though the eight-week intervention period demonstrated notable short-term increases, it was not long enough to ascertain if these improvements were temporary adaptations or long-term behavioural changes. Additionally, the study was carried out in a single institutional setting, which may restrict its ecological validity in other educational environments with diverse student demographics and resource levels.

4.4.3 Implications for future research

Longer study periods (at least 16–24 weeks) should be used in future research to evaluate the long-term retention of fitness gains and validate the durability of AI-enhanced physical education treatments. The generalisability of results would be strengthened by larger, multi-centre investigations with stratified sampling depending on baseline fitness levels. Furthermore, gathering qualitative data via focus groups and student interviews may offer more profound understandings of the psychological processes underpinning increased motivation and engagement. The best technological elements for individualised physical education could be found through comparative research looking at various AI algorithms and feedback modalities.

4.5 Effect size analysis and clinical significance

Effect sizes offer vital information regarding the size and practical impact of these changes, whilst statistical significance (p-values) shows the dependability of observed differences. Cohen's d effect sizes for all assessed fitness components are shown in Table 6, providing more insight into the practical effects of AI-enhanced training.

Table 6 Effect size analysis for fitness improvements

Component	*Traditional group effect size (Cohen's d)*	*AI-enhanced group effect size (Cohen's d)*	*Between-group effect size*	*Interpretation*
CVE (fitness index)	d = 0.83 (large)	d = 2.49 (very large)	d = 0.75 (medium-large)	Substantial practical difference
UBS (sec)	d = 0.05 (negligible)	d = 0.54 (medium)	d = 0.76 (medium-large)	Meaningful upper-body improvement
CS (sec)	d = 0.06 (negligible)	d = 0.49 (small-medium)	d = 0.98 (large)	Strong core strength gains
LBS (sec)	d = 0.43 (small-medium)	d = 0.61 (medium)	d = 0.75 (medium-large)	Notable lower-body enhancement

Effect size interpretation: negligible ($d < 0.20$), small ($0.20 \le d < 0.50$), medium ($0.50 \le d < 0.80$), large ($0.80 \le d < 1.20$), very large ($d \ge 1.20$).

4.5.1 Interpretation of effect sizes

AI-enhanced therapies yielded both statistically significant and practically substantial gains, according to the impact size study. The AI-enhanced group's cardiovascular endurance (CVE) improvement produced a very large effect size (d = 2.49), meaning that the average student in this group improved more than 2.5 standard deviations above their baseline – a clinically significant improvement that is infrequently seen in short-term fitness interventions. On the other hand, albeit statistically significant ($p < 0.001$), the traditional group's CVE improvement resulted in a considerable but smaller effect (d = 0.83). Significant practical differences attributed to AI personalisation are shown by the between-group effect sizes, which range from 0.75 to 0.98 across all components.

The difference between the results for core strength (CS) and upper-body strength (UBS) is very significant. Students' functional strength remained mostly unaffected, and the traditional group displayed low effect sizes (d = 0.05 and 0.06, respectively), indicating that these changes lack practical value despite statistical testing. On the other hand, medium effect sizes (d = 0.54 for UBS and d = 0.49 for CS) were attained by the AI-enhanced group, indicating significant increases in everyday functional capacity. These results imply that although standard PE techniques might not sufficiently treat individual strength imbalances, AI's adaptive feedback systems precisely target and correct weaker muscle areas.

4.5.2 Statistical power and confidence intervals

Post-hoc power analysis shows that our study has sufficient statistical power ($1-\beta > 0.80$) to identify medium to large effects given our sample size of 36 participants per group. The significant individual variability previously mentioned was reflected in the relatively large 95% confidence intervals for various variables, such as the CS improvement for the AI-enhanced group, which ranged from 8.7 to 50.1 seconds. This variability highlights a significant finding: although most students benefit from AI personalisation, response heterogeneity indicates that 20–30% of participants saw only slight improvements. This is probably because of things like inconsistent app engagement, ceiling effects caused by pre-existing high fitness levels, or technical issues with motion-tracking accuracy. The durability of our results is reinforced by the convergence of statistical significance ($p < 0.01$), significant effect sizes ($d > 0.75$ for most between-group comparisons), and consistent directional increases across all four fitness components. Though ANCOVA adjustment for baseline differences still produced significant between-group effects ($F = 8.94$, $p = 0.004$), the baseline imbalance in CS ($p = 0.012$) necessitates careful interpretation. This pre-existing difference may have slightly inflated the absolute magnitude of CS improvements in the AI-enhanced group.

4.6 Practical considerations: scalability, teacher training, and data privacy

Three crucial issues must be resolved for AI-driven PE systems to be successfully implemented on a large scale.

1 *Scalability:* we had to spend a significant amount of money on wearable sensors, motion-tracking cameras, and mobile devices for our closed-loop system (about \$150–200 per student). Institutions with limited resources could utilise AI-PE through a tiered deployment paradigm that ranges from smartphone-only apps to complete sensor integration. According to our findings, even basic-tier AI feedback resulted in quantifiable gains, suggesting that advanced technology is helpful but not necessary.

2 *Teacher training:* the success of implementation is directly impacted by the fact that 60% of PE teachers lack sufficient AI literacy, as highlighted by Gordon et al. (2020). We suggest an organised framework for professional development that includes:

   a basic AI concepts and data interpretation (8–12 hours)

   b scenario-based training for troubleshooting and integrating AI with conventional methods (12–16 hours)

   c continuing collaborative learning communities.

   Crucially, AI should supplement teacher experience rather than replace it. Our system worked well because it combined algorithmic personalisation with instructor supervision to provide motivational support and make judgement choices when sensor data seemed abnormal.

3 *Data privacy:* AI-PE systems raise serious ethical issues by gathering motion patterns, video recordings, and sensitive physiological data [heart rate, energy expenditure via equation (3)]. Strict data minimisation protocols (collecting only necessary metrics), informed consent processes outlining data collection and algorithm use, frequent algorithmic audits to detect potential bias (our high standard deviations partially reflected algorithmic performance variations across body types), and adherence to data protection laws (GDPR, FERPA) are all necessary components of implementation. In order to address concerns about surveillance, students should have private training choices and control over whether their performance is displayed on shared leaderboards. Institutions should have transparent data governance policies that are examined by ethical boards and do privacy impact assessments before implementation.

5 Conclusions

Kids might be more interested in PE if AI-based tools are used instead of the old ones. They might like this better. There is no doubt that learning places made just for kids with special needs are helpful. This is true because they did all the moving chores so much better. You can always change how hard you work out with the help of AI, and you can see your progress in real time. These things will help you get in better shape and get stronger. AIs study data, watch things move, and use tools to make the world more like video games. AI can help kids do better in sports. Many kids could also do better and fairer PE with AI. To be a teacher, you have to stick to the rules. You should keep good habits for life. However, PE teachers should learn more about AI. AI should be taught in schools, and students should be able to use the right tools. AI could be used to make PE systems that are more open to everyone, make better use of data, and can change. That is the reason for this study. These things will also help you do better in school and keep you healthy.

Funding

2025 Annual General Project of Philosophical and Social Sciences Research in Jiangsu Universities – 'Study on Promoting the Integrated Inheritance and Development of Dragon and Lion Dance in Campuses of Jiangsu Province' (NO. 2025SJYB0941).

Declarations

The author declares that he has no conflicts of interest.

References

Cao, F., Lei, M., Lin, S. and Xiang, M. (2022) 'Application of artificial intelligence-based big data AI technology in physical education reform', *Mobile Information Systems*, Vol. 2022, No. 1, p.4017151.

Chen, W. (2025) 'Integrating deep learning and wearable technology for real-time, scalable, and objective physical education assessment', *International Journal of Information and Communication Technology*, DOI: 10.1504/IJICT.2025.10070825.

Feng, J. (2023) 'Designing an artificial intelligence-based sport management system using big data', *Soft Computing*, Vol. 27, No. 21, pp.16331–1652.

Goksel, N. and Bozkurt, A. (2019) 'Artificial intelligence in education: current insights and future perspectives', *Handbook of Research on Learning in the Age of Transhumanism*, pp.224–236, IGI Global, Hershey, Pennsylvania.

Gordon, M., Patricio, M., Horne, L., Muston, A., Alston, S.R., Pammi, M., Thammasitboon, S., Park, S., Pawlikowska, T., Rees, E.L. and Doyle, A.J. (2020) 'Developments in medical education in response to the COVID-19 pandemic: a rapid BEME systematic review: BEME Guide No. 63', *Medical Teacher*, Vol. 42, No. 11, pp.1202–1215.

Keiper, M.C., Fried, G., Lupinek, J. and Nordstrom, H. (2023) 'Artificial intelligence in sport management education: playing the AI game with ChatGPT', *Journal of Hospitality, Leisure, Sport & Tourism Education*, Vol. 33, No. 11, p.100456.

Li, S., Wang, C. and Wang, Y. (2024) 'Fuzzy evaluation model for physical education teaching methods in colleges and universities using artificial intelligence', *Scientific Reports*, Vol. 14, No. 1, p.4788.

Li, Y. and Li, X. (2022) 'The artificial intelligence system for the generation of sports education guidance model and physical fitness evaluation under deep learning', *Frontiers in Public Health*, Vol. 10, No. 8, p.917053.

Lippke, S., Schalk, T.M., Kühnen, U. and Shang, B. (2021) 'Pace of life and perceived stress in international students', *PsyCh Journal*, Vol. 10, No. 3, pp.425–436.

Noury, P.L., Polman, R., Maloney, M. and Gorman, A. (2022) 'A narrative review of the current state of extended reality technology and how it can be utilized in sport', *Sports Medicine*, Vol. 52, pp.1473–1489, DOI: 10.1007/s40279-022-01669-0.

Pham, T., Nguyen, T.B., Ha, S. and Ngoc, N.T. (2023) 'Digital transformation in engineering education: exploring the potential of AI-assisted learning', *Australasian Journal of Educational Technology*, Vol. 39, pp.1–19, DOI: 10.14742/ajet.8825.

Quyang (2024) 'The evaluation method for the completion degree of sports training action based on a deep residual network', *Journal of Intelligent & Fuzzy Systems*, 10 January, Vol. 46, No. 1, pp.677–691, DOI: 10.3233/JIFS-233773.

Rooney, D., Gilmartin, E. and Heron, N. (2023) 'Prescribing exercise and physical activity to treat and manage health conditions', *Ulster Medical Journal*, Vol. 92, No. 1, pp.9–15.

Shin, S., Cho, J. and Kim, S.W. (2021) 'Jumple: interactive content for the virtual physical education classroom in the pandemic era', *Proceedings of the Augmented Humans International Conference*, Association for Computing Machinery, New York, NY, pp.268–270.

Wang, J., Yang, Y., Liu, H. and Jiang, L. (2024a) 'Enhancing the college and university physical education teaching and learning experience using virtual reality and particle swarm optimization', *Soft Computing*, Vol. 28, pp.1277–1294, DOI: 10.1007/s00500-023-095284.

Wang, J.H. and Wang, Z.B. (2017) 'Research on college physical education teaching mode based on multimedia teaching system', *Agro Food Industry Hi Tech*, Vol. 28, No. 1, pp.353–356.

Wang, T., Xu, H., Li, C., Zhang, F. and Wang, J. (2024a) 'Dynamic insights into research trends and trajectories in early reading: an analytical exploration via dynamic topic modeling', *Frontiers in Psychology*, Vol. 15, No. 2, p.1326494.

Wang, X. and Liu, Y.G. (2018) 'Cooperative learning method in physical education teaching based on multiple intelligences theory', *Educational Sciences: Theory & Practice*, Vol. 18, pp.2176–2186, DOI: 10.12738/estp.2018.5.117.

Wei, S., Wang, K. and Li, X. (2022) 'Design and implementation of college sports training system based on artificial intelligence', *International Journal of System Assurance Engineering and Management*, Vol. 13, pp.971–977, DOI: 10.1007/s13198-021-01149-0.

Wu, C. (2024) 'Analysis and assessment of multimedia-assisted physical education quality based on graded score algorithm', *International Journal of Information and Communication Technology*, Vol. 24, No. 8, pp.52–63.

Yang, D.P., Oh, E.S. and Wang, Y.C. (2020) 'Hybrid physical education teaching and curriculum design based on a voice-interactive artificial intelligence educational robot', *Sustainability*, Vol. 12, No. 19, p.8000.

Zhang, N. and Zhang, Z. (2017) 'Research on teaching practice growth mode of students majoring in physical education', *Eurasia Journal of Mathematics, Science and Technology Education*, Vol. 13, pp.7111–7120, DOI: 10.12973/ejmste/78737.

Zhang, Y., Duan, W., Villanueva, L.E. and Chen, S. (2023) 'Transforming sports training through the integration of internet technology and artificial intelligence', *Soft Computing*, Vol. 27, No. 20, pp.15409–15423.

Zheng, Y. and Cai, L. (2025) 'Artificial intelligence-based automatic identification and classification of diverse sports using advanced deep learning models', *International Journal of Information and Communication Technology*, DOI: 10.1504/IJICT.2025.10071786.

Zulkifli, A.F. and Danis, A. (2022) 'Technology in physical education: using movement analysis application to improve feedback on sports skills among undergraduate physical education students', *Social Sciences & Humanities Open*, Vol. 6, No. 1, p.100350.