The impact of artificial intelligence vision technology on the learning interest of wushu Duanbing students in China

Authors' Contribution:
A Study Design
B Data Collection
C Statistical Analysis
D Manuscript Preparation
E Funds Collection

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Abstract

Background & Study Aim: The computer vision, it belongs to the field of artificial intelligence (AI). Programs in this field try to recognize objects in digitized images provided by cameras so that the computer can 'see' them. Much work has been done on visual information processing with the help of deep learning and neural networks. Computers can acquire large datasets of graphical images and identify features and patterns from them to apply these techniques to other images. Many processes, such as facial recognition and augmented reality, rely on computer vision techniques. The aim of this study is knowledge about the effects of applying artificial intelligence visual technology in martial arts teaching and to promote the innovative development of Duanbing teaching content and form.

Material & Methods: Using artificial intelligence visual technology combined with sports technology action evaluation indicators, case analysis, and mathematical statistics, the experimental verification was conducted in the Chinese Duanbing technology teaching process at a school in southern China. The subjects of our teaching experiment were 60 (30 experimental group and 30 control group) 5th-grade level students from a school in Shantou City. Inclusion criteria: (1) those who voluntarily participated and could actively cooperate with this experiment; (2) those who could complete all the test items. Exclusion criteria: (1) patients with contraindications to exercise; (2) subjects who became physically unwell during the experiment; (3) who were poorly compliant and did not obey the experiment.

Results: Students using artificial intelligence visual recognition technology had a significantly higher mastery of Chinese Duanbing technology than the control group. Furthermore, the technology can effectively help students autonomously correct technical actions and promote the establishment of accurate movement performance. At the same time, this technology also effectively improved students' interest in learning Duanbing techniques.

Conclusions: The findings suggest that interactive and personalized learning using AI visual technology can increase students' engagement and willingness to participate in physical education classes. Transforming learning materials into exciting and interactive formats, such as games or puzzles, can captivate students' attention and increase their interest in learning. As AI technology continues to evolve, there will likely be further opportunities to enhance the learning experience for students through innovative applications of AI visual technology.

Keywords: behavioural performance • computer vision • conventional teaching condition • emotional attitude • knowledge awareness level • martial arts

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The ultimate aim of artificial intelligence (AI) – is to understand intelligence and to build intelligent software and robots that come close to the performance of humans [1].

VR – virtual reality.

Wushu – *noun* Chinese martial arts considered collectively [22].

Training session – *noun* a period of time during which an athlete trains, either alone, with a trainer or with their team [22].

Performance – *noun* the level at which a player or athlete is carrying out their activity, either in relation to others or in relation to personal goals or standards [22].

Aerobic exercise – *noun* exercise such as walking, jogging, cycling and swimming that increases respiration and heart rates [22].

Exercise intensity – in order to improve physical fitness, exercise must be hard enough to require more effort than usual. The method of estimating appropriate training intensity levels varies with each fitness component. Cardiovascular fitness, for example, requires elevating the heart rate above normal [23].

Duanbing – 'was used to describe a category of weapons in ancient China, which over time came to encompass all short-range weapons including single and double-edged sword, mace, iron whip, and short spears. During the Republic of China, Duanbing became the name for Chinese fencing under the Guoshu system' [24].

INTRODUCTION

Encyclopaedia Britannica states: 'Artificial intelligence (AI), a digitally capable computer or computer-controlled robots perform tasks normally associated with intelligent beings. The term is often used for projects that develop systems characterized by human intellectual processes, such as the ability to reason, discover meaning, generalize, or learn from experience' [1]. Regarding computer vision, it belongs to the field of artificial intelligence. Programs in this field try to recognize objects in digitized images provided by cameras so that the computer can 'see' them. Much work has been done on visual information processing with the help of deep learning and neural networks. Computers can acquire large datasets of graphical images and identify features and patterns from them to apply these techniques to other images. Many processes, such as facial recognition and augmented reality, rely on computer vision techniques [2].

Thus, artificial intelligence vision technology uses artificial intelligence techniques such as computer vision and machine learning to enable the processing and analysis of perceptual data such as images, videos, and depth maps to extract and understand information. Such techniques help computers to simulate the human visual system and automate the processing and interpretation of large amounts of image and video data to automate tasks such as image recognition, classification, segmentation, tracking, reconstruction, and understanding.

Artificial intelligence recognition techniques are widely used in sports training, and Fei and Zhao [3] use gait tracking algorithms to assess the strength distribution characteristics of fencers. Guo [4] used VR technology with computers and big data to help taekwondo athletes overcome mental barriers. This experiment shows that the VR teaching model based on artificial intelligence and big data technology is unique and can effectively help taekwondo athletes overcome the psychological obstacles encountered during actual combat. The players' anxiety and fear indices decreased by 12.5% and 11.5%, respectively [4].

The application above practices is mainly used in athletic systems, which have similarities in means to educational systems, although the purpose of both is different. Some scholars have attempted to migrate intelligent recognition techniques from competitive to educational systems, but they are still at the prospective stage of their research. Hachaj et al. [5] applied a computer vision approach to technique recognition in karate, planning to use the method to data capture in a high-end MoCap system and to build a virtual reality karate training system to support the practice and teaching of the sport. This method is planned as a pedagogical evaluation system, and the paper has no relevant empirical examples.

The application of artificial intelligence visual technology in the Chinese physical education teaching system has also gradually attracted the attention of educators. Xie and Chu [6] explored and analysed computer-assisted instruction (CAI) for sports physical education in an artificial intelligence information environment; methods: introducing the essential components of computer-assisted instruction, analysing the advantages and disadvantages of CAI in detail, proposing the concept of intelligent computer-assisted instruction (ICAI) on this basis, and combining with the preliminary survey research, using information inquiry method, derived interview method, derived scoring method and survey method, to investigate and analyse the undergraduate teaching situation in eight colleges and universities, including Beijing Sport University (China).

From the above literature, it can be seen that AI vision technologies have been gradually applied to physical education in China. Still, only some cases exist of using such technologies in local physical education in China. Native Chinese sport has a long history with unique Chinese elements and humanistic edifying functions. It emphasizes a strong connection between the body and the mind. *Wushu* is an essential element in Chinese indigenous sports culture, and it has two forms: practical combat and performance. The Chinese Duanbing are part of the *wushu* apparatus combat program. According to Ma [7], 'Chinese Duanbing was originally a term used to classify ancient Chinese weapons, which appeared as early as the Western Zhou Dynasty. The current term Chinese Duanbing is a synonym for Chinese fencing The Chinese Duanbing is a product of the modernization and transformation of Chinese sword technology, and it has a high status in the minds of ancient Chinese *Shi* (士)'. It is often used to represent the martial spirit of the Chinese nation (Figure 1).

Figure 1. Duanbing in China (a synonym for Chinese fencing).

Teaching Chinese Duanbing techniques in schools often involves one teacher instructing a class of 30-40 students. As a result, teachers feel overwhelmed throughout the teaching process, making it difficult for each student to master each technical movement correctly and to ensure student learning outcomes. Some scholars have proposed the application of AI vision technology in local Chinese physical education, such as Chen et al. [8] explored the application of AI vision technology in Duanbing teaching to better standardize technical movements and improve teaching effectiveness. However, the mechanisms underlying how AI vision technologies enhance teachers' teaching effectiveness and students' learning outcomes have been less explored.

Enhancing students' interest in learning is essential to achieving good learning outcomes. Ma [9] suggests that interest in education is the most practical and active component of learning motivation. Students' interest in learning should be constantly cultivated and stimulated in teaching. Mi [10] argues that interest is the most realistic, active, and practical element of learning motivation and that encouraging students' interest in learning is a strategy to promote education. Cao [11] discusses how information technology can transform classroom teaching in colleges and universities. He believes the new classroom teaching model integrating information technology can better realize the learning-centred teaching concept. Information technology can promote the transformation of classroom teaching in colleges and universities and thus improve students' learning effects.

Based on this, this paper hypothesizes that applying artificial intelligence vision technology to teaching Duanbing technology can improve students' learning interests.

In summary, existing research indicates that AI vision technology is essential to education development today, and coaches are already using AI vision technology in athletic training. However, fewer studies have been conducted on the use of AI vision technology in Chinese sports, and fewer scholars have studied the effects of AI vision technology on students. Given this, this paper uses AI vision technology as an intervention to examine its impact on Duanbing participants' interest in learning.

The aim of this study is knowledge about the effects of applying artificial intelligence visual technology in martial arts teaching and to promote the innovative development of Duanbing teaching content and form.

MATERIAL AND METHODS

Research subjects

In this study, a combination of stratified and whole-group sampling was used, and the subjects of our teaching experiment were 60 (30 experimental group **E** and 30 control group **C**) 5th-grade level students from a school in Shantou (China). This teaching experiment strictly adhered to ethical norms to protect the subjects' rights and interests and avoid causing harm and unnecessary suffering. Inclusion criteria: (1) those who voluntarily participated and could actively cooperate with this experiment; (2) those who could complete all the test items. Exclusion criteria: (1) patients with contraindications to exercise; (2) subjects who became physically unwell during the experiment; (3) who were poorly compliant and did not obey the experiment.

Research methodology

Experimental method

The experimental group was taught artificial intelligence vision technology + Duanbing technology, and the control group was taught the traditional Duanbing technique. The artificial intelligence visual technology was mainly involved in the learning and consolidation part of the technical movements, which the instructor practiced three times a week for six weeks after the equipment placement.

The exercise intensity of the AI + Duanbing technique was tested in the pre-experimental period by applying the POLAR TEAM2 table and the K4B2 cardiorespiratory function meter to bring it to a moderate intensity level. With moderate-intensity aerobic exercise, the respiratory heart rate of the athletes increased significantly, reaching a heart rate of (170 ±10 to 20 beats). The subjective sensation at this point is an increased respiratory heart rate, slight sweating, and the ability to speak but not sing [12].

The moderate intensity in this experiment was controlled at (Max HR) 60%-70%, and the heart rate of the experimental (n = 30) and control (n = 30) groups was monitored in real-time by wearing a heart rate meter. During the experiment, the exercise intensity can be controlled by adjusting the exercise and interval time, the centre of gravity, and the movement's height during the practice so that the students can sweat slightly without feeling fatigued. Figure 2 shows the design flow of this experiment.

The interest in learning scale was designed concerning the practical performance scale [13], a three-item self-report scale containing 'emotional attitude', 'knowledge awareness level', and

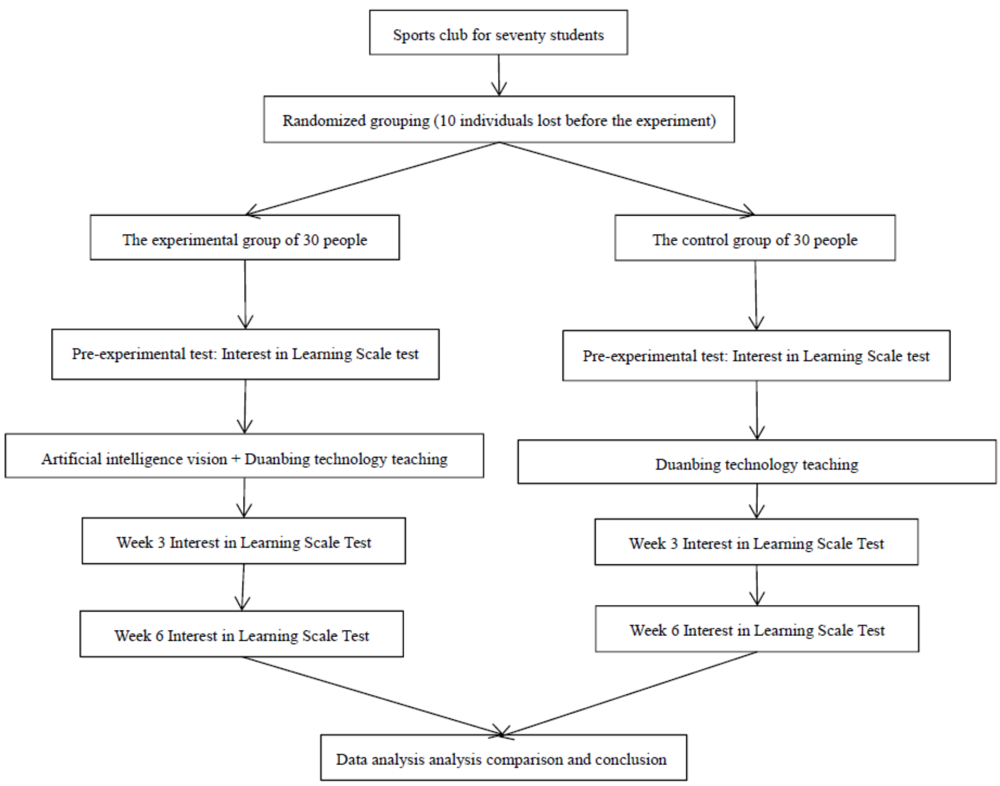

Figure 2. Flow chart of teaching experiment design.

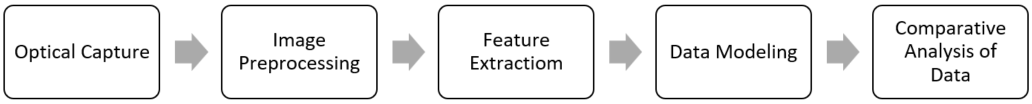

Figure 3. Working process.

'behavioural performance'. The learning interest scale's internal consistency reliability (Cronbach's alpha) was 0.85. In this experiment, the subjects conducted a total of 6 weeks of instructional experiments in which the system design, working principles, and instructional design were an essential part of the operational process.

System Design

The system framework of artificial intelligence vision consists of five main components (Figure 3), namely optical capture, screen processing, feature extraction, data construction, and data comparison and analysis, which can be divided into three essential stages when working specifically:

Instructional design

The teaching content is small lunge straight stab, small lunge standing chop, and Duanbing combination attack techniques; the teaching goal is to require students to master the structure and details of the corresponding technical movements in the experimental group learning stage using AI Vision Technology. In the experimental group, the students' irregular movements were corrected with the help of the AI Vision Technology. Students in the control group were taught traditionally, and a final evaluation of the teaching results was conducted. The instructional outcomes review assessed students' technical performance, knowledge perception, emotional attitude, and behavioural performance. Artificial intelligence visualization technology can prompt students to quickly grasp the essentials of Chinese Duanbing technical movements, deepen their understanding of movement structure and movement details, and promote independent and collaborative inquiry. The teacher introduced standardized movement indicators into the AI vision technology software in advance and instructed students to master the movement essentials of small lunge straight stab, small lunge standing chop, and Duanbing combination attack techniques during the initial learning stage. The experimental group introduced the AI vision technology software, allowing students to practice in front of the camera and use the correct movement parameters for independent exploration and correction while further instructed by the teacher. The control group used the traditional Duanbing teaching method. Finally, teaching evaluation criteria were set to score the five action elements, and the scores were divided into five levels (Table 1).

Table 1. Scoring criteria.

Variable	Levels of scores				
	excellent	good	medium	qualified	unqualified
	90-100	80-89	70-79	60-69	59-40
small lunge stride	greater than or equal to 1 m	90 cm to 1m	80 to 89 cm	70 to 79 cm	60 to 69 cm
the folding angle of the large and small legs of the hind legs	179°-170°	169°-160°	159°-150°	149°-140°	139°-130°
forward tilt of the trunk	1°-10°	11°-20°	21°-30°	31°-40°	41°-50°
large and small arm angle	180°-170°	169°-160°	159°-150°	149°-140°	139°-130°

Technology principle

The intelligent vision software allows students to practice in front of the camera, combining the correct movement parameters for independent cooperative inquiry and correction, with further guidance from the teacher on the side. The control group does not introduce AI vision technology to assist teaching, and other course content remains the same for both groups. The trunk is a part of the body and is the primary extraction target. This technology can precisely quantify the evaluation criteria for this movement detail. The human body structure is considered a combination of five parts, representing some basic movements of the human body, and a hierarchical strategy was used in the classification.

Figure 4 shows the results of the type of the leading moving parts of the human body. This result uses two levels as operational mechanisms. The first level groups five related patterns of motor combinations into one giant category. For example, different combinations of activities of the upper and lower extremities and the trunk are generated by a crude classification of movements. The second level: the actions of the same combined pattern are reclassified to determine an exact type of mixed signal. The projection of each movable joint angle on a two-dimensional plane presents a digital joint angle feature vector. This is used as the first rough classification feature of human motion. The features of the same combined pattern of the human body are extracted according to the kinematic principles.

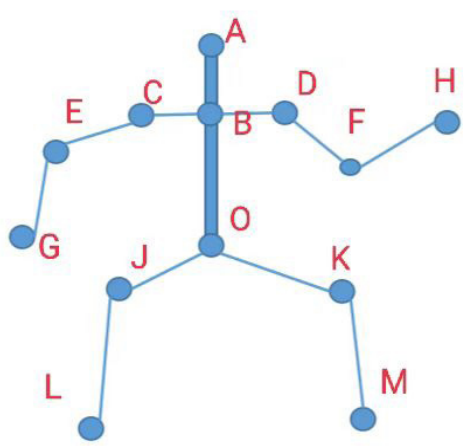

Figure 4. Various nodes of the human body under motion capture.

The following are the three main formulas associated with the model:

$$[1]\ d_{CD}(X,Y,Z) = \sqrt{(x_C - x_D)^2 - (y_C - y_D)^2 - (z_C - z_D)^2}$$

$$[2]\ \int ij\ (l_i l_j) = N\ (T_{ji}\ (l_i) - T_{ij}\ (l_j)\ |\mu^{ij},\ \sum ij\ )$$

$$[3]\ \int ij\ (l_i l_j) = \max_{k=1}^{k} N\ (T_{ji}^{k}\ (l_i) - T_{ji}^{k}\ (l_j)\ |\mu^{ij},\ \sum_{ij} k\ )\ [14].$$

The irrelevant factors controlled in this experiment are: one is the instructor: the experimental and control groups were organized by two Duanbing teachers; one is the exercise intensity: the course content of the experimental group in this study was strictly implemented according to the practical implementation plan, and the exercise intensity was set to medium intensity, and the subjects' heart rate was controlled at (HRmax) 60%-70% in the process of exercise intervention.

During the course, the exercise intensity was controlled by adjusting the intervals, the number of combinations, and the height of the centre of gravity of the movements of the subjects. To ensure that both experimental and control groups can maintain the same exercise intensity, each group will include the same physical training content in each training session to maintain heart rate; I. Site and time: experimental site: a school activity room in Southern China. II. Frequency and duration of exercise intervention: 3 times per week, Monday, Wednesday, and Friday from 3:00 to 3:40 pm, each session lasting 60 minutes.

Mathematical and statistical methods

All data were analysed in this study using IBM SPSS Statistics for Windows, ver. 21.0 (IBM Corp, Armonk, USA). Statistical tests were performed using repeated measures ANOVA, with the level of significance defined at 0.05, with a significant difference at $p<0.05$, and a highly significant difference at $p<0.01$. Statistical results were expressed as mean (M), standard deviation (± or SD); $\eta 2$ is calculated from the sum of squares (SS) between groups divided by the total SS (SSbetween / SStotal = $\eta 2$). In addition, count data were calculated using the chi-square test, count data were calculated to conform to a normal distribution, and repeated measures test and group simple effects test could be used.

The normality of the distribution was verified with the Shapiro-Wilk test. Meeting the condition of normality of the distribution of results will allow the use of the two independent samples t-test.

RESULTS

Scoring results for technical details

T-test results showed that the mean performance of the lunge step in the experimental group was (90.66 ±5.89) higher than that of the control group (61.97 ±8.13), t = 15.65, p<0.05, 95% CI (25.03~32.38). The mean performance of the hind legs of the experimental group was (87.30 ±5.17) higher than the mean performance of the control group in the small lunge (68.23 ±8.30), t = 10.68, p<0.05, 95% CI (15.49-22.64). The mean score of trunk anterior tilt in the experimental group was (91.90 ±5.41) higher than the mean score of small lunge in the control group (65.26 ±4.95), t = 19.90, p<0.05, 95% CI (23.95~29.31). The mean scores of small and large arm grips in the experimental group were (91.00 ±5.52) higher than the mean scores of small lunge in the control group (58.53 ±5.24), t = 23.35, p<0.05, 95% CI (29.68~35.25) (Table 2).

Comparison of the results of the interest in learning scale before, during, and after the experiment in the experimental and control groups

The time and intervention modality were analysed using repeated measures ANOVA test to explore the intervention effectiveness better. Table 3 shows an interaction effect between interventions and intervention duration in 'emotional attitude', 'knowledge awareness level', and 'behavioural performance'.

In terms of 'emotional attitude', multiple comparisons revealed that the 'emotional attitude' values of the pre-test, mid-test, and post-test increased sequentially in the AI visual intervention condition, all reaching significance levels (p<0.01); in the conventional teaching condition, the 'emotional attitude' values of the post-test were significantly higher than the 'emotional attitude' values of the pre-test (p<0.01) and mid-test (p<0.01). In contrast, the pre-test and mid-test 'emotional attitude' values were insignificant (p = 0.939). The results of the group simple effect analysis showed that in the pre-test, the simple group effect was substantial, F = 9.97, p = 0.003, bias η^2 = 0.15; in the mid-test, the simple group effect was significant, F = 134.6, p<0.001, bias η^2=0.699; in the post-test, the simple group effect was significant, F = 225.8, p<0.001, bias η^2 = 0.80 (Figure 5).

Table 2. Comparison of the scoring results between the experimental (E) and control (C) groups.

Variable	Group	M & SD	t	p	Difference 95% CI
small lunge stride	E	90.66 ±5.89	15.65	<0.05	25.03~32.38
	C	61.97 ±8.13			
the folding angle of the large and small legs of the hind legs	E	87.30±5.17	10.68	<0.05	15.49~22.64
	C	68.23 ±8.30			
forward tilt of the trunk	E	91.90 ±5.41	19.90	<0.05	23.95~29.31
	C	65.26 ±4.95			
the angle of large and small arms	E	91.00 ±5.52	23.35	<0.05	29.68~35.25
	C	58.53 ±5.24			

Table 3. Comparison between the experimental (n = 30) and control (n = 30) groups' learning interest scores before, during and after the experiment.

Factor	Group	Measurement sequence score (M & SD)			Measurement sequences the interaction effect: Group main effect			Number of measurements main effect			Interaction effect of the number of measurements and group		
		Baseline	3 weeks	6 weeks	F	bias η^2	p	F	bias η^2	p	F	bias η^2	p
emotional attitude	E	1.92 ±0.44	2.78 ±0.39	3.81 ±0.58	165.82	0.741	<0.01	201.42	0.78	<0.01	94.95	0.62	<0.01
	C	1.61 ±0.31	1.67 ±0.33	1.95 ±0.36									
knowledge awareness level	E	1.83 ±0.37	2.73 ±0.29	3.81 ±0.45	230.49	0.80	<0.01	295.87	0.84	<0.01	120.42	0.68	<0.01
	C	1.65 ±0.27	1.70 ±0.26	2.08 ±0.34									
behavioural performance	E	1.97 ±0.33	2.62 ±0.33	3.74 ±0.48	211.11	0.78	<0.01	304.02	0.84	<0.01	117.59	0.67	<0.01
	C	1.60 ±0.27	1.68 ±0.30	2.01 ±0.26									

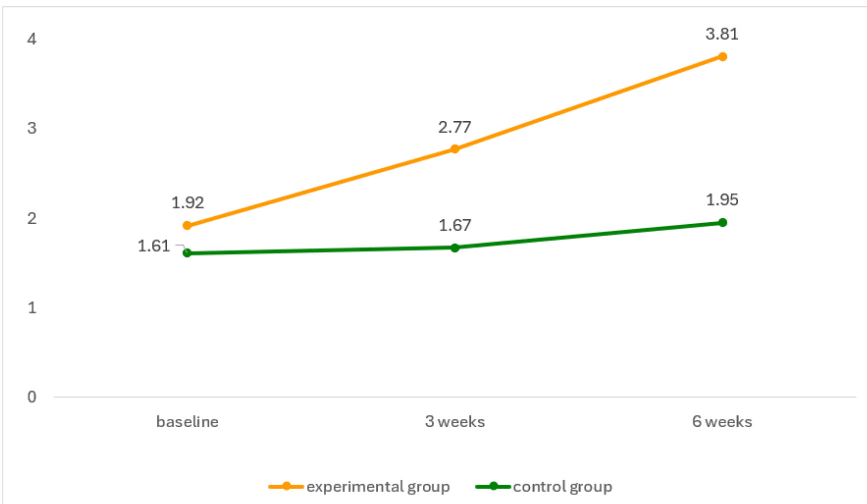

Figure 5. Comparison between the experimental group (n = 30) and the control group (n = 30) before, during and after the experiment on the estimated marginal mean of 'emotional attitude'.

In terms of 'knowledge awareness level', multiple comparisons revealed that the values of 'knowledge awareness level' in the pre-test, mid-test, and post-test increased sequentially under the AI visual intervention condition, all reaching significance levels (p<0.01); in the conventional teaching condition, the values of 'knowledge awareness level' in the post-test were significantly higher than the values of 'knowledge awareness level' in the mid-test (p<0.01) and post-test (p<0.01). In contrast, the 'knowledge awareness level' values were not significantly different from the pre-test's (p = 0.23). The results of the group simple effect analysis showed that in the pre-test, the simple group effect was significant, F = 4.74, p = 0.03, bias η^2 = 0.08; in the mid-test, the simple group effect was significant, F = 215.3, p<0.001, bias η^2 = 0.79; in the post-test, the simple group effect was significant, F =277.9, p<0.001, bias η^2 = 0.83 (Figure 6).

In terms of 'behavioural performance', multiple comparisons revealed that the 'behavioural performance' values of the pre-test, mid-test, and post-test decreased sequentially in the AI visual intervention condition, all reaching significance levels (p<0.001); in the normal teaching condition, the 'behavioural performance' values of the post-test were significantly higher than the 'behavioural performance' values of the pre-test (p<0.001) and mid-test (p<0.001). In contrast, the 'behavioural performance' values of the mid-test and post-test were not a significant difference (p = 0.44). The results of group simple effect analysis showed that in the pre-test, the simple group effect was significant, F = 22.77, p<0.001, bias η^2 = 0.28; in the Midwest, the simple group effect was significant, F = 135.4,

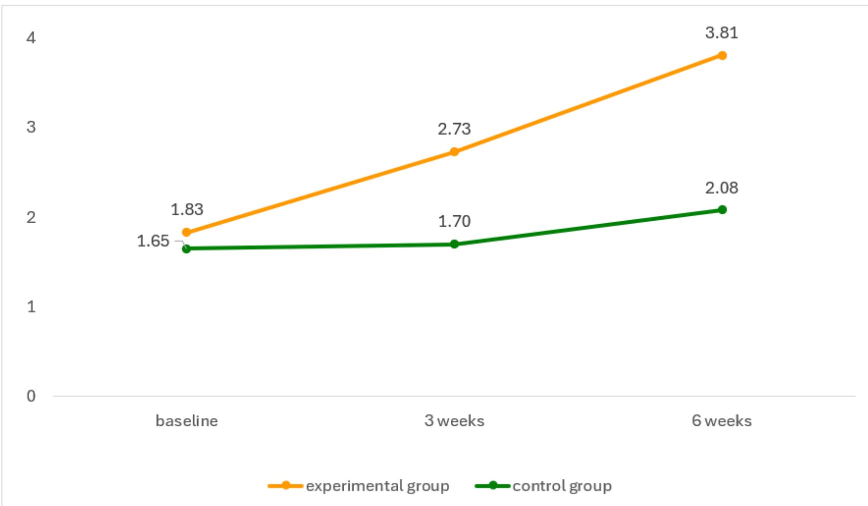

Figure 6. Comparison between the experimental group (n = 30) and the control group (n = 30) before, during and after the experiment of estimating the marginal mean of 'knowledge awareness level'.

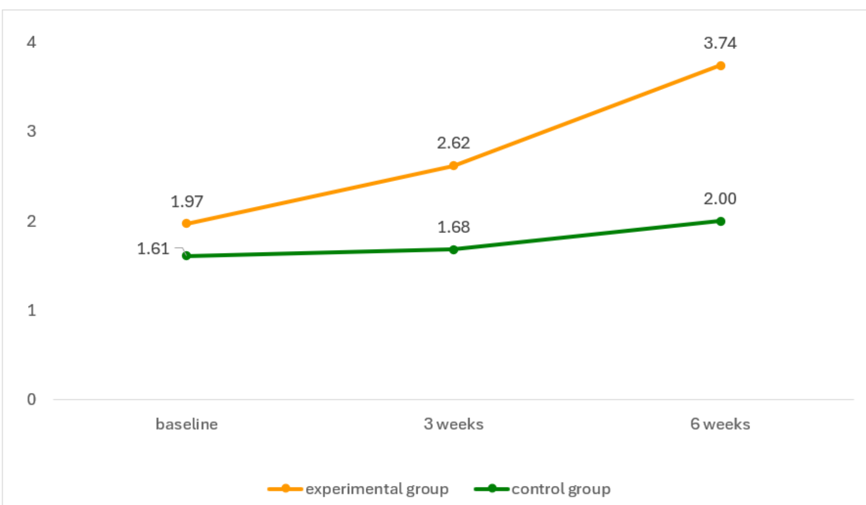

Figure 7. Comparison between the experimental group (n = 30) and the control group (n = 30) before, during and after the experiment on the estimated marginal mean of 'behavioural performance'.

$p<0.001$, bias $\eta^2 = 0.70$; in the post-test, the simple group effect was significant, $F = 295.3$, $p<0.001$, bias $\eta^2 = 0.84$ (Figure 7).

DISCUSSION

The reasons why artificial intelligence vision technology improves the effectiveness of Duanbing learning

Exploring how AI vision techniques can improve Duanbing motor learning is worthwhile. These technologies offer multiple advantages, including personalized learning, feedback and assessment, simulation and visualization, accessibility, and scalability. First, AI vision technologies can personalize the learning experience. By analysing student performance in real-time, AI algorithms can identify areas where students need more help and adjust the curriculum, accordingly, accelerating the learning process and helping students acquire knowledge faster [15].

Second, these technologies can provide real-time feedback and assessment to help students progress quickly and avoid developing bad habits or incorrect techniques. In addition, AI vision technologies can simulate real-world scenarios and provide an immersive training experience that helps students build their situational awareness and decision-making skills [16]. Finally, AI vision technologies can help students better understand and retain information by visualizing complex concepts and techniques.

In addition, these technologies can improve accessibility to learning. For example, for students with visual impairments or other disabilities, AI systems can adapt to their needs and provide alternative modes of instruction. Furthermore, AI vision technologies can help overcome language barriers by providing real-time translation or captioning.

Finally, AI vision technology can also help address scalability challenges in education. For example, providing individualized training to each student can be difficult due to limited resources and instructors. However, by providing automated feedback and guidance, AI systems can help bridge this gap, allowing instructors to focus on more complex tasks. In addition, AI vision technology can help standardize training for students in different regions, ensuring that all students receive consistent, high-quality instruction [17].

In summary, it is essential to delve into AI vision technologies in Duanbing motor learning that can improve learning outcomes, personalize learning, provide real-time feedback and assessment, simulate and visualize, improve accessibility and scalability, and help students acquire knowledge and skills. However, while the benefits of AI vision technologies are clear, there are challenges in implementing these technologies in practice. For example, large amounts of data need to be collected and processed, and high-quality algorithms need to be developed to enable the application of AI vision technologies. In addition, privacy and security issues also need to be considered to ensure that student and teacher information is adequately protected. Therefore, these challenges must be carefully considered, and practical solutions must be developed when implementing AI vision technologies.

Analysis of the reasons why artificial intelligence vision technology improves students' interest in learning

As artificial intelligence (AI) gains more traction in education, there is a growing interest in exploring how AI visual technology can improve students' interest in learning. From a cognitive psychology perspective, AI visual technology can enhance students' cognitive engagement, motivation, and accessibility, leading to better learning outcomes and increased interest in the subject matter. This discussion explores how AI visual technology can achieve these goals, particularly in Chinese Duanbing.

Cognitive engagement is a crucial learning component that involves actively processing information, connecting new knowledge to prior experience, and reflecting on the learning process [18]. AI visual technology can foster cognitive engagement by presenting information in interactive and engaging ways. For instance, AI-powered chatbots and virtual assistants can assist students in interacting with the content and answering their questions, creating a more personalized and engaging learning experience. Additionally, AI visual technology can convey information through visual and multimedia formats, facilitating better comprehension of complex concepts and promoting knowledge retention over long periods [19]. For example, in the Chinese Duanbing, AI visual technology can create interactive 3D models of various techniques, providing students with a more immersive and engaging learning experience.

Motivation is another crucial factor in learning, and AI visual technology can play a pivotal role in enhancing students' motivation to learn. Personalized and interactive learning experiences provided by AI visual technology can help students feel more invested in their learning and more confident in their ability to succeed [20]. Furthermore, AI-powered gamification can incentivize learning and make it more enjoyable, thereby increasing motivation. For example, in Chinese Duanbing, AI visual technology can be employed to create games that teach and reinforce the various techniques used in the sport, making the learning process fun and engaging.

Finally, AI visual technology can also improve accessibility for students with disabilities. AI-powered voice recognition software, for instance, can enable visually impaired students to interact with content in new ways. Likewise, AI-powered language translation can help students who speak different languages learn together. In addition, by promoting inclusivity and accessibility in education, AI visual technology can enhance students' interest in learning and create more equitable learning opportunities [21]. For example, in Chinese Duanbing, AI visual technology can provide audio descriptions of movements for visually impaired students and translations for international students interested in learning the sport.

In conclusion, AI visual technology can enhance students' interest in learning by improving cognitive engagement, motivation, and accessibility. In the specific context of Chinese Duanbing, AI visual technology can create more engaging, personalized, and inclusive learning experiences. As AI technology advances, innovative applications of AI visual technology in education will likely continue to emerge, creating more effective and enjoyable learning environments for students from diverse backgrounds and abilities.

Limitations and future research

This study explores the application of artificial intelligence (AI) visual technology in improving the learning interest of Chinese primary school students. In the process, several limitations were identified, which we consider to be one of the key focus areas for future research. This article will discuss these limitations and propose directions for future research.

It should be noted that although AI visual technology can provide more vivid and diverse learning methods, it can only solve some problems. Students learning interest is influenced by many factors, such as family background, social environment, personality, and personal experience. Therefore, we must refrain from excessively relying on AI visual technology to improve students' learning interests but should view it as an auxiliary tool. Future research must explore integrating multiple teaching methods to enhance students' learning interests.

Furthermore, technical issues may arise when applying AI visual technology, such as hardware failures and improper software applications. These problems may hurt students' learning, resulting in unintended consequences. Therefore, future research needs to explore how to solve these technical problems to improve the reliability and stability of AI visual technology.

Moreover, applying AI visual technology requires significant computing and data resources. Investing in these resources may incur high costs, creating difficulties for areas with limited educational resources. Therefore, future research must explore utilizing AI visual technology to improve student's learning interest in situations with limited resources.

Finally, future research should further explore the application of AI visual technology in education. For example, how to use AI visual technology for personalized teaching, customize teaching plans according to students' characteristics and needs, and use AI optical technology to assess students' learning situations and adjust teaching strategies promptly. These issues are one of the key focus areas for future research.

In summary, AI visual technology has great potential to improve the learning interest of Chinese primary school students, but there are also limitations. Therefore, future research needs to explore integrating multiple teaching methods to improve student's learning interests, solve technical problems, conserve resources, and explore the broader application of AI visual technology in education. Only by considering these limitations comprehensively can we better utilize AI optical technology to improve student's learning interest and promote education development in China.

CONCLUSIONS

The findings suggest that interactive and personalized learning using AI visual technology can increase students' engagement and willingness to participate in physical education classes. Additionally, AI-powered real-time image recognition applications can foster students' curiosity and encourage them to explore and learn more deeply about their surroundings. Finally, transforming learning materials into exciting and interactive formats, such as games or puzzles, can captivate students' attention and increase their interest in learning.

Overall, these results demonstrate the effectiveness of AI visual technology in promoting students' interest in learning during physical education classes. As AI technology continues to evolve, there will likely be further opportunities to enhance the learning experience for students through innovative applications of AI visual technology. Continuous promotion of AI in physical education is necessary to enhance teaching and learning quality and effectiveness and to benefit more students.

Recommendations

Based on the practices above, the following recommendations are proposed to further advance the application of AI in physical education: enhance the development and application of advanced AI technologies and complex algorithms to meet physical education's evolving needs and environment; strengthen the promotion and dissemination of AI applications in physical education to increase awareness and usage; establish AI education platforms that integrate AI technology with physical education to provide more precise and personalized teaching services that cater to the needs and goals of diverse students; strengthen faculty construction and improve teachers' ability to apply AI technology to better promote its application in physical education.

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