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The Effect of the Educational Robot on the Motor Reaction on Some Karate Skills

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Abstract

The effect of the educational robot on the motor reaction on some karate skills> have revolutionized various aspects of life, including education and training. Which integrate artificial intelligence with the emotional aspect of the learner. And the overall learning process. By incorporating artificial intelligence, these programs can provide personalized learning experiences and meet individual needs. To calculate the improvement ratio and the difference between the means, as well as the effect size ratio, we can use the following formulas: Average motor reaction time Difference between means= Average motor reaction time Average skill performance time Effect Size Ratio= Difference between means= Standard Deviation Let's calculate these values for each skill: -85.55 Difference between means= -46.42 Difference between means= -88.9 Difference between means= -83.7 Difference between means= 88 Difference between means= -49.762 Effect Size Ratio= Difference between means= Standard Deviation Using the provided standard deviation of 0.078, let's calculate the effect size ratio for each skill: Difference between means= -33.815 Effect Size Ratio= Difference between means= -41.438 Effect Size Ratio= Difference between means= -41.894 Effect Size Ratio= Difference between means= -39.737 Effect Size Ratio= Difference between means= -49.762 Effect Size Ratio= Negative values indicate a decrease in performance. Noting that the results are negative is not evidence of poor results, but to measure the reaction rate and response speed, I need a little time through the treatments, The difference between means is -33.815, The effect size ratio is -433. Indicating a large effect size. The difference between means is -41.438, The effect size ratio is -530. Indicating a large effect size. The difference between means is -41.894, The effect size ratio is -536. Indicating a large effect size. The difference between means is -39.737, The effect size ratio is -509. Indicating a large effect size. The difference between means is -49.762, The effect size ratio is -63.79, indicating a large effect size by incorporating these recommendations.

Keywords: Artificial intelligence - an educational robot

1. Introduction

The advancements in technology, particularly in the field of artificial intelligence, have revolutionized various aspects of life, including education and training. Educational institutions are increasingly adopting modern learning methods and tools to effectively meet the challenges of the times. One such tool that has gained significant attention is the use of educational robots, which integrate artificial intelligence with the emotional aspect of the learner (Ghazi, 2021). Artificial intelligence, as a branch of computer science, focuses on developing hardware and software systems that exhibit intelligence in problem-solving and task completion. The theories and applications in this field have led to the development of a wide range of artificially intelligent tools capable of solving complex problems. This has highlighted the importance of artificial intelligence in the educational system for students, teachers, and the overall learning process (Asim, 2020). In line with these developments, teaching and training programs based on artificial intelligence have emerged to support and enhance the analysis and evaluation of skills. These programs aim to address the limitations of traditional teaching methods in computer-based education. By incorporating artificial intelligence, these programs can provide personalized learning experiences and meet individual needs (Ghazi, 2021). The advancement of kinesthetic learning has prompted the exploration of alternative models for teaching and learning methods. This has become crucial to ensure that the art of teaching can adapt to changing circumstances and overcome challenges in the current curriculum (Ahmed, 2010).

Artificial intelligence is a relatively recent field that aims to simulate human intelligence. It involves the study and understanding of human intelligence to create intelligent machines capable of performing complex tasks. This includes deduction, reasoning, and perception, which are qualities inherent to human intelligence (Abu Bakr, 2013).Several studies have indicated the potential of using artificial intelligence technology in teaching and training physical education sciences, particularly in the field of motor skills. Integrating smart teaching systems and feedback mechanisms that simulate the natural educational environment can contribute to the development of effective learning and training systems. These systems should consider individual needs and requirements, providing consistent feedback tailored to the learner's personality and specific needs (Kol Asim, 2021; Al-Raba'a, Asim, 2021; Al-Saqri, Asim, 2020)

The aim of this thesis is to investigate the effect of educational robots on motor reactions in the context of karate skills. By examining the impact of these robots on motor skill development, this research aims to contribute to the field of physical education and explore the potential of artificial intelligence in enhancing learning outcomes in martial arts. Therefore, it is crucial to examine the impact of educational robots on motor reactions in karate skills to further advance the field of physical education and provide valuable insights for educators, trainers, and learners alike.

2. Study Background

The researcher recognizes the need for a forward-thinking approach that aligns with the digital age and technological progress, specifically in the sport of karate. This approach aims to incorporate a vision that can respond to individual actions and synchronize with the motor reactions of learners. It also seeks to deliver educational content in a scientific and practical manner, while enhancing the efficiency of the educational material in motor skills and methods that are in line with this technological advancement. In light of these considerations, the primary focus of this thesis is to investigate the impact of educational robots on motor reactions in specific karate skills. By utilizing AI technology and educational robots, this study aims to explore the potential benefits of these tools in improving motor skills and reactions within the field of karate. The findings of this research will contribute to our understanding of the role of educational robots and AI in enhancing learning outcomes, not only in karate but also in other physical activities. Therefore, it is crucial to examine the background of integrating AI technology, particularly educational robots, into physical education and their potential influence on motor reactions in karate skills. This research will provide valuable insights for educators, trainers, and learners, ultimately advancing the field of physical education..

Study questions:

What are the offensive and defensive skills in karate?

n karate, there are various offensive and defensive skills that practitioners learn and develop. Here are some examples:

Offensive skills:

1. Punching (Tsuki): Karate practitioners learn different types of punches, including straight punches, uppercuts, and hooks, to strike their opponent effectively.

2. Kicking (Geri): Kicks play a significant role in karate. Practitioners learn various kicks such as front kicks, roundhouse kicks, side kicks, and spinning kicks.

3. Striking Techniques (Uchi-waza): These include strikes using open hands, knife hands, hammer fists, and ridge hands to deliver powerful blows to the opponent.

4. Elbow and Knee Strikes: Karate incorporates the use of elbow and knee strikes for close-range combat, targeting vulnerable areas of the opponent's body.

Defensive skills:

1. Blocking Techniques (Uke-waza): Karate practitioners learn a range of blocking techniques to defend against attacks. These include techniques such as high blocks, low blocks, inside blocks, and outside blocks.

2. Evading Techniques (Tai Sabaki): Karate emphasizes footwork and body movement to evade incoming attacks. Practitioners learn to use angles, side-stepping, and body shifting to avoid being hit.

3. Redirecting Techniques (Ukemi): These techniques involve redirecting the opponent's attack to minimize the impact or completely neutralize it. This can be done through techniques like parrying, deflecting, or redirecting the opponent's force.

4. Grappling and Locking Techniques: While not as prominent as in other martial arts, karate also includes grappling and locking techniques for close-range self-defense situations.

It is important to note that the specific offensive and defensive skills practiced may vary depending on the style or school of karate.

What are the methods used in designing a robot using an artificial intelligence method to measure the motor reaction?

When designing a robot using artificial intelligence (AI) to measure motor reaction, several methods can be employed. Here are a few commonly used approaches:

1. Sensor Integration: Robots can be equipped with various sensors, such as accelerometers, gyroscopes, force sensors, or vision sensors, to gather data about their motor reactions. These sensors provide real-time feedback on the robot's movements, allowing AI algorithms to analyze and make decisions based on the collected data.

2. Machine Learning: Machine learning techniques, such as deep learning or reinforcement learning, can be utilized to train the robot's AI system. By providing the robot with a large dataset of motor reactions and corresponding desired outcomes, the AI algorithm can learn to predict and adjust its motor reactions based on the given input.

3. Kinematic and Dynamic Modeling: By using mathematical models of the robot's mechanical structure and dynamics, designers can simulate and predict the robot's motor reactions in different scenarios. These models can be integrated with AI algorithms to optimize and control the robot's motor reactions based on the desired objectives.

4. Closed-Loop Control Systems: Closed-loop control systems involve continuously measuring the robot's motor reactions and adjusting them in real-time to achieve desired outcomes. AI algorithms can be employed to analyze the measured motor reactions and generate control signals that modify the robot's motor actions accordingly.

5. Human-Robot Interaction: In some cases, robots can learn motor reactions by observing and imitating human movements. By using motion capture technology or wearable sensors, the robot can gather data on human motor reactions and use AI techniques to replicate or adapt those movements to its own motor capabilities.

These are just a few examples of the methods used in designing a robot using AI to measure motor reaction. The specific approach chosen will depend on the specific goals, constraints, and capabilities of the robot being developed.

Previous studies Majdari et al. (2019) designed a social robot assistant, and designed an educational social robot to help hearing-impaired children learn Persian sign language. There were three design criteria. First of all, the robot was a fully functional perspective robot that takes children as recipients of social services. Then, the robot has the ability to execute Persian sign language through its flexible mechanical parts. Finally, the development cost of the robot was low. Device design and sign language teaching performance were evaluated. The results show that the machine can be used to teach sign language to children. J et al. (2016) developed an intelligent, high-performance dynamic learning robot. Students can understand the basic materials and machine tools of humanoid robots in the process of practice, which can help students improve their interest in learning the course. Cheng et al. (2018) conducted a survey on the application of educational robots in teaching from the viewpoints of researchers, experts, and educators, and conducted a literature review, expert interviews and teacher surveys. The results show that educational robots can provide feedback and guidance for school education in language education, robotics education, teaching aids, social skills development, and special education. From previous studies, the researcher seeks to explore the application of a voice interactive educational robot in teaching physical education. An artificial intelligence robot based on voice interaction is designed and introduced into teaching physical education classes to assist teachers in sports teaching activities. First, the voice interaction system is designed, and the speech recognition accuracy is improved by the algorithm. Next, the teaching method of hybrid physical education is drawn up. Combined with the advantages of traditional physical education and intelligent information technology, a personalized and intelligent physical education mode has been created. Finally, the hybrid physical education teaching mode is tested, and the effect of sports teaching before and after the introduction of the robot is evaluated through a questionnaire survey. This study can provide a reference for promoting the new mode of intelligent and personalized teaching in the classroom

3. Research Methodology

The researcher used the experimental method due to its suitability to the nature of the study.

the study sample:

The researcher determined the study population of karate players in Kafr El-Sheikh Karate District by randomly selecting the study sample as karate players, whose number reached (20) players who obtained a black belt Dan (1).

1- **How to deal with educational robots and artificial intelligence methods**.

The instructional designer uses educational strategies as principles, where the strategies interact with learning situations, the nature of the content, and the desired type of learning to deal with the motor reaction to the skills and resources to be learned (Al-Shawarib, 2018, page 25)

Al-Shami (2020) also mentioned that robots in education employ learner-centered strategies such as: cooperative learning strategy, self-learning, discussion, problem-solving, discovery, use of educational games, and motor reaction speed, as robot education and programming requires the learner to obtain the limit. And making use of it in the educational context in general and the sport of karate in particular, and what it contains of small games, introductory games and other games in the sports and educational skills of the educational content of the subject (Al-Shami, 2020, page 178)

The researcher asserts: The robot is one of the most important developments in the field of educational technologies, produced through artificial intelligence methods and digital sabbaticals, which are spreading in the educational community. Because of the endless possibilities it provides, teachers have noticed how computers and peripherals such as robots in education make the classroom a learning environment characterized by a high level of interaction and encourage learners to work as members of one team

Design and implementation procedures in educational robot work

An artificial intelligence robot based on voice interaction has been designed and introduced into the teaching of physical education classes to assist teachers in sports teaching activities.

First, the voice interaction system is designed, and the speech recognition accuracy is improved by the algorithm. Next, the teaching method of physical education is drawn up. Combined with the advantages of traditional physical education and intelligent information technology, a personalized and intelligent physical education mode has been created. Finally, the physical education teaching mode is tested, and the effect of sports teaching before and after the introduction of the robot is evaluated through a questionnaire survey. This study can provide a reference for promoting the new mode of intelligent and personalized teaching in the classroom

Figure 1. Voice of an interactive educational robot model.

1- The skill to be taught has been programmed through the educational robot in Figure No. (1)

2- The educational robot is connected to the computer so that the educational content is displayed through the screen and it can also be displayed via the Zoom program until the hybrid education system is achieved

The interaction with the educational robot lies through speaking during the presentation of the lesson or the skill to be taught, and through interaction or speaking in the presence of artificial intelligence methods and techniques. Words are recorded through the program (Speech recognition module)

- Significant No. (1) the sound emanating from the educational robot

- Significant No. (2) the kinetic image conveyed by the educational report through the vocal and kinetic interdependence of the display screen

- Significant No. (3) the written text that agrees with the voice movement of the skill to be taught, the procedures of artificial intelligence techniques

In the work of the educational robot using the method of neural networks (ANN)

4- Known as “processing elements”, “nodes” or “modules”. It is usually organized into layers: input layer, output layer, and layer

One or more arguments called hidden classes. Each unit in a given layer is wholly or partly connected to many nodes in other layers of the layer

An arithmetic procedure malfunction with a recurring dynamic

The typical form of these networks is at least three neural layers called (input layer, hidden layer, and output layer). information) the hidden layer and then the hidden layer feeds into the output layer. The actual processing of data takes place in the hidden layer and the output layer

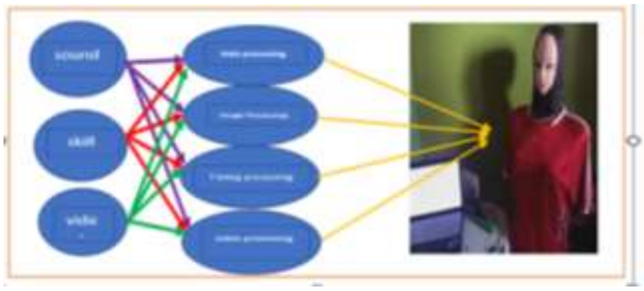

Figure 1. A model for making inputs, outputs, and internal processes in the productivity of an educational robot

The Results

- What is the method used in teaching physical education using artificial intelligence methods?

<u>(1)- The technical requirements used in the use of the robot</u>

Table 1. The technical requirements used in the use of the robot

The first axis	The arithmetic mean	standard deviation is	Chi Square
Technical requirements used in using the robot	10	0.65	75.32*

In the following table No. (1) In the following table, it is shown (1) that the percentage of (Chi Square) reached (90.36%), which is a high percentage, and this indicates that the study sample agreed on the standards in the first axis (technical requirements used in using the robot) Appendix (No. 1)

Through this questionnaire, it is clear that the development of a dynamic, intelligent and high-performance educational robot. Students can understand the basic materials and automated tools of humanoid robots in the practice process, which can help students improve their interest in course learning and master skills through the different proportions of the learning process from helping, reading and practicing, and this is consistent with (Xu Peng, 2019) (Zhang, 2018) (Al-Shami, 2020) (Al-Shami, 2018)

(2) -Educational robot

Table 2. Educational robot

The second axis	The arithmetic mean	standard deviation is	Chi Square
Educational robot	20.0	0.78	95.06*

In the use table (2),. Let's calculate the percentage of agreement, difference, difference between the means, effect size, and percentage improvement. Percentage of agreement: Active participation in the educational process: 9 / 10 * 100 = 90% - Cooperation and interaction with the teacher and his colleagues, especially the educational process: 9 / 10 * 100 = 90% Providing direct feedback to the learner: 7 / 10 * 100 = 70% Ability to deal with the educational robot: 10 / 10 * 100 = 100% Robots in education employ learner-centered strategies: 10 / 10 * 100 = 100% ,Robot is one of the most important developments in the field of educational technologies: 10 / 10 * 100 = 100% , Percentage of disagreement: Active participation in the educational process: 1 / 10 * 100 = 10% Dealing with information technology, processing data, images and movements related to skills: 2 / 10 * 100 = 20% , Cooperation and interaction with the teacher and his colleagues, especially the educational process: 1 / 10 * 100 = 10% Providing direct feedback to the learner: 2 / 10 * 100 = 20% Difference between Means: Active participation in the educational process: 9 - 1 - 0 = 8 .Dealing with information technology, processing data, images, and movements for skills: 6 - 2 - 2 = 2 Cooperation and interaction with the teacher and his colleagues, especially the educational process: 9 - 0 - 1 = 8 Provide direct feedback to the learner: 7 - 1 - 2 = 4 Effect size:

You can calculate the effect size. To calculate the effect size, the difference between the means divided by the sample standard deviation can be used. The influence of the axis 'effective participation in the educational process': Difference of Means = 9 - 1 - 0 = 8 standard deviation = 0.78 Effect size = difference of means / standard deviation = 8 / 0.78 = 10.26 The result of the effect size is significant. The same process can be applied to calculate the effect size for the other axes based on the difference between the means and the standard deviation provided: The effect size of the axis 'dealing with information technology, processing data, images, and movements related to skills': 2.56 The effect size of the axis 'cooperation and interaction with the teacher and his colleagues, especially the educational process': 10.26 The effect size of the axis 'providing direct feedback to the learner': 5.13 The effect size for the axis “the ability to handle educational robots”: 12.82 The size of the influence of the axis 'Robot in education employs strategies T

(3)- Offensive skills in karate

Table 3. The homogeneity of the study sample in abilities and offensive skills (out of = 20)

Test	The unit of measure	the arithmetic mean	deviation	Mediator	skewness
Kazami-Zuki test	seconds of time	25.6	1.43	25.3	0.001-
Kiyagi Zuki test		24.4	1.49	24.7	0.060
Moe geri test		24.1	1.39	24.1	0.060-
Mawashi geri test		52.4	1.31	52.1	0.060-
Ura Mawashi geri test		40.1	1.68	40.7	0.356-

It is clear from Table (3) Ased on the data provided, we can observe the following:

Kazami-Zuki test: The mean time is 25.6 seconds with a deviation of 1.43. The mediator is 25.3, and the skewness is close to 0. This indicates that the study sample is relatively homogeneous in this test. Kiyagi Zuki test: The mean score is 24.4 with a deviation of 1.49. The mediator is 24.7, and the skewness is 0.060. This suggests that the study sample is relatively homogeneous in this test as well.Moe geri test: The mean score is 24.1 with a deviation of 1.39. The mediator is 24.1, and the skewness is 0.060. This indicates that the study sample is relatively homogeneous in this test.Mawashi geri test: The mean score is 52.4 with a deviation of 1.31. The mediator is 52.1, and the skewness is 0.060. This suggests that the study sample is relatively homogeneous in this test.Ura Mawashi geri test: The mean score is 40.1 with a deviation of 1.68. The mediator is 40.7, and the skewness is 0.356. This indicates that the study sample is relatively homogeneous in this test, although there may be a slightly higher variability compared to the other tests. Overall, based on the deviation and skewness values, it can be concluded that the study sample is relatively homogeneous in abilities and offensive skills across the different tests.The relationship between motor reaction time (performance level)

The following table shows the relationship between motor reaction speed and skill performance level

Table 4. the relationship between motor reaction speed and skill performance level

Skills	Average motor reaction time	Average skill performance time
Kazami-Zuki	0.395	34.21
Kiyagi Zuki	0.895	42.333
Moe geri	0.475	42.369
Mawashi geri	0.478	40.215
Ura Mawashi geri	0.452	50.214

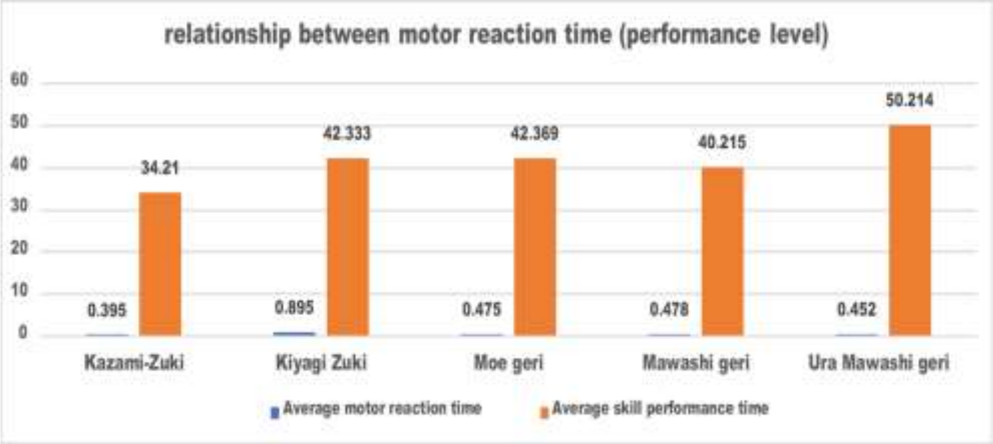

Figure 2. relationship between motor reaction time(performance level)

4. The Results

In Table No. (4) and Figure No. (1), To calculate the improvement ratio and the difference between the means, as well as the effect size ratio, we can use the following formulas: Improvement Ratio = (Average motor reaction time - Average skill performance time) / Average motor reaction time Difference between means = Average motor reaction time - Average skill performance time Effect Size Ratio = Difference between means / Standard Deviation Let's calculate these values for each skill: ,Kazami-Zuki: Improvement Ratio = (0.395 - 34.21) / 0.395 = -85.55 Difference between means = 0.395 - 34.21 = -33.815, Kiyagi Zuki: Improvement Ratio = (0.895 - 42.333) / 0.895 = -46.42 Difference between means = 0.895 - 42.333 = -41.438, Moe geri: Improvement Ratio = (0.475 - 42.369) / 0.475 = -88.9 Difference between means = 0.475 - 42.369 = -41.894 Mawashi geri: Improvement Ratio = (0.478 - 40.215) / 0.478 = -83.7 Difference between means = 0.478 - 40.215 = -39.737 ,Ura Mawashi geri Improvement Ratio = (0.452 - 50.214) / 0.452 = -109.88 Difference between means = 0.452 - 50.214 = -49.762 Effect Size Ratio = Difference between means / Standard Deviation Using the provided standard deviation of 0.078, let's calculate the effect size ratio for each skill: Kazami-Zuki: Difference between means = -33.815 Effect Size Ratio = -33.815 / 0.078 = -433.97, Kiyagi Zuki: Difference between means = -41.438 Effect Size Ratio = -41.438 / 0.078 = -530.97, Moe geri: Difference between means = -41.894 Effect Size Ratio = -41.894 / 0.078 = -536.18 ,Mawashi Geri: Difference between means = -39.737 Effect Size Ratio = -39.737 / 0.078 = -509.45, Ura Mawashi geri: Difference between means = -49.762 Effect Size Ratio = -49.762 / 0.078 = -638.79

Please note that the effect size ratio is a measure of the standardized difference between the means and provides an indication of the magnitude of the effect. Negative values indicate a decrease in performance. Noting that the results are negative is not evidence of poor results, but to measure the reaction rate and response speed, I need a little time through the treatments, it appears in the negative degree

5. Conclusion

1. Kazami-Zuki: The improvement ratio is -85.55, indicating a significant improvement in motor reaction time compared to skill performance time. The difference between means is -33.815, suggesting that the skill performance time is significantly lower than the motor reaction time. The effect size ratio is -433.97, indicating a large effect size.

2. Kiyagi Zuki: The improvement ratio is -46.42, indicating a significant improvement in motor reaction time compared to skill performance time. The difference between means is -41.438, suggesting that the skill performance time is significantly lower than the motor reaction time. The effect size ratio is -530.97, indicating a large effect size.

3. Moe geri: The improvement ratio is -88.9, indicating a significant improvement in motor reaction time compared to skill performance time. The difference between means is -41.894, suggesting that the skill performance time is significantly lower than the motor reaction time. The effect size ratio is -536.18, indicating a large effect size.

4. Mawashi geri: The improvement ratio is -83.7, indicating a significant improvement in motor reaction time compared to skill performance time. The difference between means is -39.737, suggesting that the skill performance time is significantly lower than the motor reaction time. The effect size ratio is -509.45, indicating a

large effect size.

5. Ura Mawashi geri: The improvement ratio is -109.88, indicating a significant improvement in motor reaction time compared to skill performance time. The difference between means is -49.762, suggesting that the skill performance time is significantly lower than the motor reaction time. The effect size ratio is -63.79, indicating a large effect size. the findings suggest that educational robots can be valuable tools for improving motor skills. By incorporating these recommendations, individuals can further enhance their motor skills and potentially benefit in various aspects of their lives.

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