

Model of table tennis skills learning based on table tennis robot approach

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Abstract

This study aims to develop a learning model using a table tennis robot. This is intended to make learning table tennis more fun and easy so that students are motivated to practice their table tennis skills. The value of the novelty of this research lies in the development of a learning model created using a table tennis robot. The table tennis robot is a ping pong ball throwing machine that the user can adjust the direction and speed of, the design of the table tennis robot itself is based on the need or urgency of the athletes to carry out training activities even without a partner. The research method used in this research is Research and Development (R&D). In this research, the research focus will be to take data samples as material in preparing appropriate learning product designs for further research. The population is 30 tennis athletes who are still students. In this study, the researcher only focused on the study in terms of compiling product design. Based on the results of processing and data analysis, it can be concluded that the table tennis ball throwing tool (Table Tennis Robot) is effective as a Table Tennis Skills Learning Model Based on Table Tennis Robot and technical drill training tool drive and spin for beginners and junior athletes in terms of accuracy in passing large quantities of balls. Viewed from the aspect of power, this Table Tennis Robot tool product is also very helpful for the coach's performance. In terms of location, this simple table tennis ball throwing device (Table Tennis Robot) can be disassembled and can be placed on various sides of the table as desired.

Key Words: tennis robot, tennis athlete, college students

Introduction

One of the educational and teaching programs that are important in shaping the fitness of students is pendidikan jasmani, olahraga dan kesehatan or known as PJOK. This PJOK learning is expected to be able to direct students to be able to do sports activities in order to create a healthy and strong young generation (Ross et al., 2021). PJOKI learning taught in schools has a very important role in various ways including: Providing opportunities for students to be directly involved in various learning experiences through physical activities, games, and selected sports that are carried out systematically. Provision of learning experiences directed at fostering physical, character development, movement skills, harmonious personality and at the same time forming a healthy and fit lifestyle throughout life (Tohaya, 2013). PJOK is education about physical activity and one of the subjects that is considered to have advantages in developing three important aspects that need to be developed by students in education, namely: cognitive aspects, affective aspects and psychomotor aspects. This is as expressed by Abduljabar in (Maulana, 2021) that "The dimensions of the relationship between body and mind emphasize three educational domains, namely: psychomotor, affective, and cognitive". So that in the learning process at PJOK, teachers are expected to teach various basic movement skills, techniques and strategies for games and sports, internalization of values (sportsmanship, honesty, cooperation, independence, etc.) as well as habituation of a healthy lifestyle (Abdulaziz et al., 2017). Where the implementation is not through conventional teaching in the classroom that is theoretical in nature, but involves physical, mental, intellectual, emotional and social elements.

An introduction to learning should be given in order to know the extent to which the child's skills in mastering basic techniques can affect their learning motivation. This is in accordance with the opinion Drake (2001) that activities must be introduced and planned in a focused manner, because they can stimulate students' motivation to learn. One of the lessons contained in the school curriculum on physical education is small game sports and one of the small game sports introduced in the school environment is table tennis. Table tennis was a popular game sport played in England in the second half of the 19th century (Straub, 2021). This sport originates from the ancient Lawn tennis game which at that time was famous for the game "PING PONG". The name comes from the sound of the ball hitting the table or the bat. The way to hit the ball is the same as playing tennis, which can be hit directly before it hits the table (Volley) or hit after the ball hits the table (Half Volley). Table tennis was originally known as a means of light entertainment for the community, where there were no standard/official rules regarding the size of the field, bat, net/net, ball, and other equipment. This non-standard rule causes table tennis to be considered as just an entertainment that is a favorite of certain groups of people, not as a sport.

Jange (2019) dan Liskustyawati (2016) explained that table tennis is a sport that can be played as a team or individually with games and fast ball movements so that it can improve motor development and burn calories in the body. Based on this, good physical education should not leave the basic motion elements of the sport itself so, it is necessary to insert an introduction so that students can adapt quickly according to basic movements (Carlson et al., 2008). essentially table tennis is a simple game by hitting the ball after bouncing to the table, the movement made is consistently hitting, directing and placing the ball to the opponent's table which is expected that the opponent cannot return the ball (Carrasco, L., Pradas, F., Floría, P., Martínez & Herrero, R., & González Jurado, 2010).

Table tennis is a simple game. "The movements carried out in this sport are consistently hitting, directing and placing the ball on the opponent's table and it is hoped that the opponent cannot return the ball" (Mahendra, I. R., Nugroho, P., & Junaidi, 2012). Therefore, in the game of table tennis, mastery of the technical skills used in the game is very important because it can affect the player's victory (Yulianto, 2015). In addition, the game of table tennis is guided by technical, physical and psychological principles. Principles of technique such as grip techniques, strokes and footwork. Physical principles such as speed, strength, agility, balance, endurance, flexibility and accuracy (Pluta et al., 2020). Psychological principles such as intelligence, emotion, motivation, fun, enthusiasm and sportsmanship (Santosa, T., & Soegiyanto, 2016). Based on this, so that students can master the technical skills of playing table tennis, these students need to be given learning. Good learning is learning that is able to involve the activeness of students in the learning process. Students are directed to solve learning problems according to the concepts being studied. Thus, the teaching approach is an important aspect in the aspect of teaching and learning as a way to achieve teaching goals. Learning is a series of learning processes for students that are planned, implemented and evaluated systematically so that students can achieve learning objectives, namely effectively and efficiently (Marzuki, I., & Kleden, 2018).

In a study conducted by Junaidi, A et al (2020) the development of variations in table tennis learning using an ejection machine, presented in the form of a lecture supporting textbook. The results of this study indicate that textbooks are appropriate to be used as supporting materials for lectures and for table tennis coaches. The difference in the research written in this article is that the learning model developed is oriented to the ability of table tennis viewed from the aspect of power, the product of a simple table tennis ball throwing device (Robot Table Tennis) is also very helpful for the performance of the trainer. Besides that, to be able to achieve learning objectives, educators, especially lecturers who will provide teaching, must be able to choose and apply methods, models, teaching styles that are predicted to be more effective to facilitate students in learning table tennis skills. The ability to choose relevant teaching styles and the use of technology in education is not just a way to vary the process, but a grand scenario to facilitate so that students move a lot to try, take initiative, be creative and do a lot of things physically, mentally, emotionally and socially so that good learning is achieved. Innovative learning is needed in changing the conventional learning system to creative learning in order to achieve the expected learning objectives so that students can master movement skills, especially table tennis playing skills. When providing table tennis skills learning to students, there are many problems faced, including: students prefer other more fun sports such as badminton, lecturers who lack experience so that there is minimal renewal of learning models and methods, and others. So we need a solution to the above problems, namely by developing a table tennis skill learning model. This development is needed so that table tennis learning becomes more fun and easy so that it makes students motivated to practice their table tennis skills. Referring to these problems, researchers feel the need to conduct research on learning models to improve basic technical skills in the table tennis branch. The novelty value of this research lies in the development of a learning model made using a table tennis robot. Table tennis robot is a ping pong ball throwing machine that can be adjusted both direction and speed. Based on this, the theme of this research is "*Learning Model of Basic Table Tennis Technique Based on Table Tennis Robot*".

Material & methods

The research method that will be used in this research is Research and Development (R & D). Research and development (R&D) is a basic research activity to obtain information on user needs (needs assessment), followed by development activities to produce products and assess the effectiveness of these products (Sugiyono, 2012). Meanwhile, according Punaji (2015) Development research is a process used to develop and validate educational products, which can be in the form of processes, products and designs.

Based on the above definition, it can be concluded that the R & D research method is research conducted to develop or make a product by going through a process used to produce and validate the product so that it can function and be useful. The subject is 30 tennis athletes who are still college students for data collection stage. This development research plans to use two expert validations, namely learning experts and table tennis experts. The R&D method used follows the method developed by Borg & Gall and adapted by Sugiyono through 10 stages. These ten stages are divided into two parts and divided into a two-year study. The stages carried out in the first year are: potentials and problems, data collection related to potentials and problems, product design, validation and revision, small group trials, revisions, and final models. The following is the flow of the R & D method referring to the Borg & Gall model and adapted by Sugiyono, which is described in the following figure:

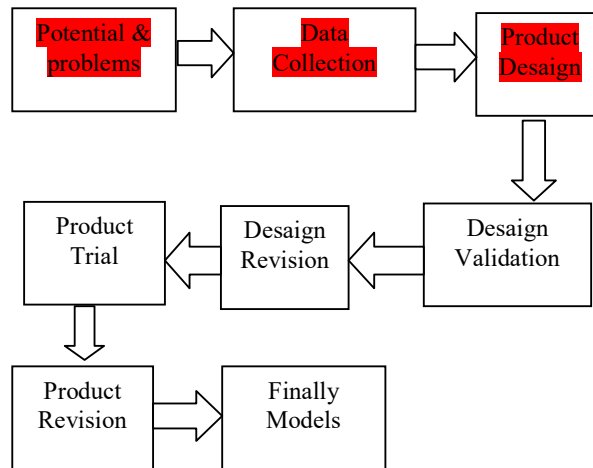


Fig.1 Research Flow

In this study the research focus was more directed at taking data samples as material in preparing learning product designs that were adapted to further research. when viewed based on the R&D model used, namely Borg and gall, the research conducted included in the initial research where the results will become a benchmark or reference, in compiling a product design in the form of a robot-based table tennis learning model (not discussed in this study).

Ensure that table tennis robots have the same role as a partner in exercise, so that later it can be developed into a validated learning model of its validity, researchers conduct simple tests where participants are asked to do table tennis games with the concept: first, paired with partners, secondly in pairs with a robot. The value of the test results will be taken and averaged for further analysis.

Results

Based on the results of the research conducted, the following data were obtained. The results of the test conducted on 30 tennis athletes who are still college students and obtained the following data:

Table 1. Results of the rearch

Skill chop	Couple	Tools(Robotic)
Forhand	49	51
Backhand	33	46
combination	50	57

Based on the results of the table above, it is known that there was an increase in skills after being given Robotic training, respondents experienced a significant increase in their chop forhand, backhand, and combination skills.

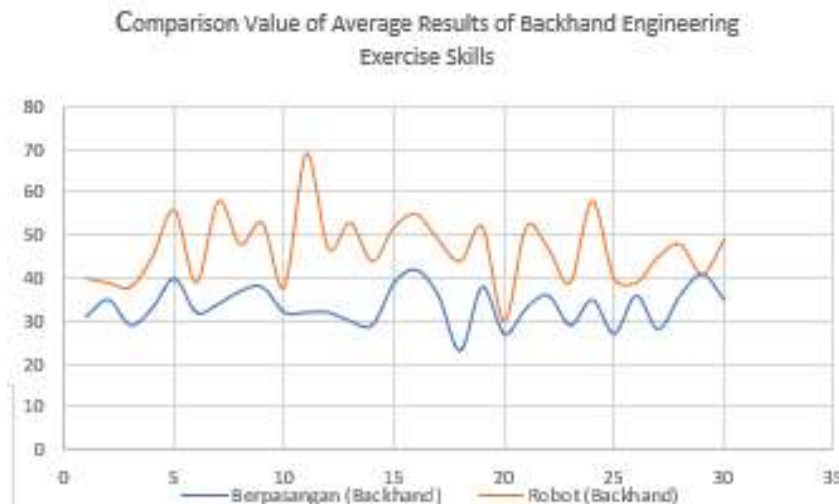


Fig.2 Comparison Value of Average Results of Backhand Engineering Exercise Skills



Fig.3 Comparison Value of Average Results of Forehand Engineering Exercise Skills

Based on the results of research conducted within a period of two weeks, it was found that the average strokes produced by players for one minute with the forhand technique were 49 strokes, the bankhand technique was 33 strokes and a combination of 50 strokes while the results of the table tennis trial with the tool (table tennis robot) the average score for the forhand is 51 strokes, the bankhand is 46 strokes, and the combination is 55 strokes. The results of the research that have been carried out refer to the conclusion that the use of tools (table tennis robots) in improving table tennis learning skills is very effective. This is evident from the difference in the average number of strokes produced by players in one minute.

Dicussion

Researchers found a significant difference between the robot method and the couple method. This difference shows that the robot method is more effective in improving table tennis hitting skills compared to the couple method. The results of this study are in line with research conducted by Yakin & Andrijanto, (2021) which shows that the effectiveness of the use of tools in learning table tennis skills is much more effective. This is because the reflected ball is much more stable both in terms of speed and distance. Apart from that, the ball has been set in speed and rotation so that each participant can focus on mastering the technique and not on the incoming ball. Yudha et al., (2022) added that the ball throwing robot in the table tennis game plays a very important role in the training process, which can serve as a tool for ball drill exercises in large quantities, so that the quality of the athlete's stroke will increase and the performance of the trainer/training partner will be lighter. When compared to many ball drill exercises manually, the possibility of errors in baiting is greater because of human limitations. In addition, for players who will practice independently without a partner, it is greatly helped by the table tennis ball throwing robot technology. Robot method as a technological advancement to train the ability of table tennis athletes to be more skilled in the competence of table tennis stroke techniques. Therefore, conducting various research with this tool is aimed at further improving the athlete's ability. Further Rachman et al., (2017) said that in terms of energy, training using a simple ball throwing device is more effective than without using a tool, because the trainer/partner doesn't have to bother spending energy to feed a large number of balls, but just adjusts the buttons on the remote control automatically. In terms of space effectiveness, this product is a practical training tool because it can be disassembled and can be placed on various sides of the table as desired, both in front near the net, in the middle of the table, and at the back of the table. The impact felt by athletes when training with the robot method is the increased accuracy of strokes and speed of strokes as the main abilities that must be possessed during the match

Conclusions

Based on the results of data processing and analysis, it can be concluded that the table tennis ball throwing device (Robot Table Tennis) is effective as a Learning Model for Table Tennis Skills Based on Table Tennis Robots and drill training tools for drive and spin techniques for beginners and junior athletes in terms of accuracy. / accuracy of ball bait in large quantities. Viewed from the aspect of power, the product of a simple table tennis ball throwing device (Robot Table Tennis) is also very helpful for the performance of the trainer. In terms of place, the product of a simple table tennis ball throwing device (Robot Table Tennis) can be disassembled and can be placed on various sides of the table as desired. The limitation of this research is that in the test, it is difficult to control the factor of the number of strokes with two different methods in the same amount of time. Logically with the same time span, the number of balls thrown by the machine robot will be more than with the couple method because of human error in the couple method. In future research, it is hoped that further research will be carried out by comparing the two methods with the same time and level of athlete focus factor

Conflicts of interest

The authors have no conflicts of interest to declare. All co-authors have seen and agree with the contents of the manuscript and there is no financial interest to report. We certify that the submission is original work and is not under review at any other publication.

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