THE IMPACT OF TRAINING METHODS AND MOTOR ABILITIES ON THE RESULTS OF DRIVE PUNCH TECHNIQUE TRAINING IN TABLE TENNIS GAMES

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Abstract

This study aims to determine the difference in the effect of the two training methods on the results of the strike drive technique in table tennis. The training method in question is; multiball training method and robot training method . In addition, this study aims to determine the interaction between training methods and motor skills on the results of the strike drive technique training in table tennis games. Motor skills are grouped into high and low motor skills. This type of research is an experiment with a 2x2 factorial design. The total sample size is 40 students divided into four groups, each group consisting of 10 students. The data analysis technique used was two-way analysis of variance, followed by the Tukey test at a significance level of a = 0.05. The results showed that: (1) Overall, the results of the drive technique practice in table tennis using the multiball training method ($\overline{X}$ = 96.20 and sd = 26.79) were lower than the robot training method ($\overline{X}$ = 103.95 and sd = 7.62), (2) There is an interaction between training methods and motor skills on the results of the drive punch technique training in table tennis games (F_o = 56.26 > F_{table} 0.05 = 4.11), (3) For the group With high motor skills, the results of the strike drive technique training in table tennis using the multiball training method ($\overline{X}$ = 120.1 and sd = 7.68) are higher than the robot training method ($\overline{X}$ = 105.2 And sd=7.27), (4) For the group with low motor skills, the results of the drive technique practice in table tennis using the multiball training method ($\overline{X}$ =72.3 and sd=13.66) are lower than the robot training method ($\overline{X}$ =102 .7 and sd = 8.14). The conclusion of this study is that the multiball training method is more effective in teaching drive technique in table tennis games for students who have high motor skills, but the robot training method is more effective in teaching drive technique for students who have low motor skills.

Keyword: Training Method, Motor Ability, Drive Shot, Table Tennis

INTRODUCTION

Sport is a useful activity to boost physical fitness ((Akhmad et al., 2021), (Supriadi, 2022). With such a definition, the government thinks that preserving sports can be expected to develop into a national activity. Physical education is an educational process that utilizes physical activity to be systematically planned (Dewi & Faridah, 2022). Physical education will make a positive contribution to students both physically and academically (Dewi & Verawati, 2021) (Endriani et al., 2022; Supriadi & Mesnan, 2022). Within the framework of the national education system, especially the history of Indonesian sports, it will provide an understanding of the state of sports in our homeland in the past,

present and possibly for the future. According to (Akhmad, 2016), national activities aim to improve physical health and fitness, achievement, human quality, instill moral and human moral values, discipline, strengthen and foster national unity, strengthen national defense, elevate national honor. Physical fitness related to health includes functional capacity characteristics influenced by activity level and other lifestyle factors (Akhmad & Mesnan, 2019)).

According to (Pane et al., 2020) table tennis is a sport that is not immune to age. Table tennis is one of the sports games that is starting to be in great demand by the people of Indonesia, and has even become a popular sport in the world, this is because table tennis is not too complicated to follow (Sitorus et al., 2021). In essence, table tennis is a simple game by hitting the ball after it bounces off the table, the movement is consistent with hitting, directing throwing and placing the ball on the opponent's table where it is hoped that the opponent cannot return the ball (Muhammad Salman Alfarisi, 2022). Table tennis is a game played by 2 people (for singles) or in pairs (for doubles) instead, using a flat table with a net as a court, and the small orange or white balls made of celluloid or plastic (Pranata & Widiastuti, 2018). Table tennis is a sport that can be played as a team or individually with fast ball games and movements so that it can improve motor development and burn calories contained in the body (Tunggal & Apriyanto, 2022). Basic technique is one of them, deep the basic technique itself is the technique of holding the bet, service technique, kick technique footwork technique and so on (Qoid Falahi & Andrijanto, 2019). There are two kinds of punching techniques, namely forehand strokes and backhand strokes (Asri et al., 2017b). In addition to the basic techniques that must be mastered by a novice athlete, the components of physical conditions must also be mastered. The accuracy of the stroke is one of them (Hasmarita & Kurnia, 2020) As for the student training center (PPLP) and student training center (PPLM) coordinated by the Ministry of Youth and Sport, table tennis is still uneven. In South Sulawesi, table tennis is not included in it. PPLP only fosters sports; Athletics, Football, Wrestling, Gymnastics, Pencak Silat, Sepak takraw, and Rowing, while PPLM only fosters sports; Athletics, Pencak Silat, and Sepak takraw.

Taking into account the description above, it is predicted that the decline in table tennis performance in Indonesia is caused by a shift from the type of defensive game to the modern type of table tennis game, and the key to the success of this type of modern table tennis game lies in mastering the basic techniques of *drive strokes*. To be able to master the basic techniques of *drive strokes*, proper training methods are needed in their presentation. Individual internal factors also play an important role in achieving sports achievements, because each individual is different in the level of motor ability. However, this needs to be studied in more depth by coaches and trainers, as well as the elements involved in it. The best solution is the need to carry out scientific research on various things that can affect table tennis performance in Indonesia, more specifically to increase *drive* stroke skills through the application of two training methods , namely the multiball and robot training methods viewed from the ownership of motor skills in the game of table tennis.

The research problem formulations that can be raised are as follows: (1) Overall, are there differences in the results of table tennis *drive* technique skills for those trained using the *multiball* training method and the robot training method? (2) Is there an interaction between training methods and motor skills on the results of table tennis stroke *drive technique skills?* (3) Is there a difference in the results of table tennis *stroke* technique skills for those who have low motor skills trained using the *multiball* training method and the *robot training method* ? (4) Is there a difference in the results of the table tennis drive technique skills for those who have high motor skills who are trained using *the multiball* training method and the *robot training method* ? Basically learning motion *(motor learning)* is a learning process that has the goal of developing various optimal motion skills efficiently and effectively (Dewi et al., 2023) (Pranata & Widiastuti, 2018) (Hoorweg, 2019). Motor skills are thought to be a person's ability to master various motor activities or sports activities (Clark, 2007; Sutini, 2018)(Hasmarita & Kurnia, 2020), (Kharis & Andrijanto, 2021) (Asri et al., 2017a)

Multiball drills are a training method in which one player practices while another player feeds the ball. You will need a basket of balls (Martiwa et al., 2022). This method is often used by coaches who act as feeders (Sukamto & Hakim, 2020) Training using a large number of balls is a modern approach to table tennis training for training intensification of beginners, up to advanced players. It was explained that: *Multiball practice* can be done if the coach acts as a sparring partner , *Multiball* practice performance by combining the ball direction and acting as a sparring partner, adjusting the ball direction according to the training target (Jusrianto AS, 2020). Exercise techniques that can be tried according to the conditions above include practicing basic *strokes with a trainer or sparring* using lots of balls (hundreds of balls), evaluating and always improving the quality of the exercises (Samsuddin Siregar, 2020). Ability as a potential for the success of an activity (30). Broadly speaking, motor skills are grouped as follows; (1) coordination, (2) balance, (3) speed, (4) agility, and (5) explosive power (Pamuji et al., 2023).

To be able to determine the level of ownership of a person's motor skills, a motor ability test is selected that is oriented to the elements of speed and reaction. Measurements of movement and reaction speed can be used as factors in motor ability tests. The test items include; (1) hand reaction, (2) foot reaction, (3) hand movement speed, and (4) foot movement speed.Several studies related to relevant research (Muhammad Salman Alfarisi, 2022) can it is known that there are differences in the results, the mean of the experimental group 1 is 73.15 and that of experiment 2 is 70.45. Thus the experimental group 1 results in calculating the mean is greater than the experimental group. (Sinulingga et al., 2023) Based on a review of data analysis results from 10 journals it can be concluded that training through the use of the multiball method is able to provide an increase in forehand drive and backhand drive skills. Explains that the results of the study: (1) there is a difference in the effect of multiball massed practice and multiball distributed practice Fcount (65.346) > Ftable (4.49); (2) there is a difference in the effect between athletes who have high and low hand-eye coordination Fcount (6.901) > Ftable (4.49); (3) there is an interaction between training methods and hand-eye coordination on improving table tennis forehand drive skills Fcount (40.552) > Ftable (4.49). Conclusion: (1) training method multiball distributed practice provides better impact than multiball massed practice; (2) Athletes with high hand eye coordination are easier to learn table tennis forehand drive than athletes with low hand eye coordination; (3) there is an interaction between the training method and the athlete's hand eye coordination. Explains that the forehand drive training model can be given to novice athletes in doing the training model. the results of testing the hypothesis using the paired sample t-test test. The average value during the forehand pretest was 63.62, the posttest value was 102.85 with a difference value of 39.23. The resulting increase was 62%. The resulting significant value is 0.007. Then the average value during the backhand pretest was 68.38, the posttest value was 90.31 with a difference value of 21.93. The resulting increase was 32%. The resulting significant value is 0.009. From these results it can be concluded that there is a significant effect of the multiball training method on the forehand and backhand drive skills in table tennis extracurriculars. From the results of the study of the journal used as the basis for the author in finding and making scientific work that aims to test theories related to training methods and motor skills for table tennis drive strokes. The exercises used in this study are Multiball Exercises and Robot Exercises

METHODOLOGY
The scientific method is a procedure of seeking the truth, by identifying problems and formulating them, studying literature, formulating hypotheses, collecting and processing data, testing hypotheses and drawing conclusions. The research method is experimental with a 2x2 factorial design. Determination of the research design refers to (Sugiyono, 2010) The 2x2 factorial design anava factorial design can be seen in table 1 as follows:

Table 1. Factorial Design Anava 2 x 2 Factorial Design

Training Method (A)	Multiball A$_1$	Robot A$_2$
High Motor Ability (B$_1$)	A$_1$B$_1$	A$_2$B$_1$
High Motor Ability (B2)	A$_1$B$_2$	A$_2$B$_2$
Total	A$_1$	A$_2$

Information:

A$_1$B$_1$: Group *multiball* method capable students high motor.

A$_2$B$_1$: *Robot* training method with groups capable students high motor.

A$_1$B$_2$: *Multiball* practice method with group of students who have low motor skills.

A$_2$B$_2$: *Robot* training method with groups capable students low motor.

A$_1$: : *Multiball* practice method .

A$_2$: : *Robot* training method .

Population And Sample

The target *population* is sports students in all universities in Indonesia. Meanwhile, the accessible population *is* all male students at FIK UNM Makassar who are temporarily programming table tennis courses. The sample was obtained from the reachable population, namely based on research in the academic field, 100 students who are temporarily programming table tennis courses. Out of 100 people in the reachable population, 80 people were taken as a sample. Then from the 80 samples were randomized again to determine which 40 samples were included in the *multiball training method group* and the other 40 samples were included in the *robot training method group*. This is in accordance with the opinion of experts that: In experimental research , for example with a 2x2 factorial design, researchers can draw samples 2 (two) times from the same population because the aim is to compare the effects of influence (Putra et al., 2021) After that, the two groups of exercise methods were tested for their motor skills and the results were used as T-scores, then sorted starting from the highest score until with lowest score. Each group of training methods took 27% of the 40 samples and the results obtained were 10.8 rounded up to 10 samples. So the 10 people in the sample from the highest score sequence are classified as the high motor ability group and the 10 people from the lowest score order as the low motor ability group, the scores between high and low motor skills are omitted. The expert's opinion explains that: If the test takers are large enough, then the division of the upper group and the lower group, 27% of the sample with high scores is taken as the upper group, and 27% of the sample with low and low scores as the lower group Nurhasan, 2001. Thus, 4 (four) sample cells were formed from the two groups of training methods, namely: (1) Samples of the *multiball* training method group with high motor skills (A$_1$B$_1$), (2) Sample group of *robot* training methods with high motor skills (A$_2$B$_1$), (3) Sample group of *multiball* training methods with low motor skills (A$_1$B$_2$), and (4) Sample group of *robot* training methods with low motor skills (A$_2$B$_2$), (A2B2).

Table 2. Grouping of Experimental Samples

Training Method (A) / Motor Ability (B)	Multiball (A1)	Robot (A2)	Amount
High Miles (B1)	10	10	20
Low KM (B2)	10	10	20
Total	20	20	40

Research procedure

After the samples were grouped into 4 cells, the first and third groups (A $_1$ B $_1$ and A $_1$ B $_2$) were trained using the *multiball* training method , while the second and fourth groups (A $_2$ B $_1$ and A $_2$ B $_2$) were trained using the *robot training method* . The treatment is carried out outside class hours, the frequency of practice for each group, 3 (three) times a week, for 18 (eighteen) meetings. Expert opinion explains that previously untrained people can achieve a 10-25% increase with 6-8 weeks of practice . Greater results will be achieved with longer practice.

Data Collection Instruments

The data collection technique used refers to the variables involved in this study, namely: (1) For dependent variable data obtained through data on drive technique skills , namely through data on the motion process assessment of *forehand* and *backhand drive techniques*. (2) Attribute variable data can be obtained through a motor ability test from *the Nelson Motor Ability Test* , which consists of 4 (four) test items; hand reaction test, foot reaction test, hand movement speed test, and foot movement ability test.

Data analysis technique

The technique used in analyzing the data is a two-way analysis of variance (ANAVA) with a significance level of a = 0.05 (prof. dr. sugiyono, 2010) The requirements needed in the analysis of variance are the normality test using the Liliefors test, the homogeneity test using the Barlett test, and followed by the Tukey test if there is an interaction.

RESULTS

The results of the research conducted explain that the calculation of the Anova 2x2 factorial design can be seen in table 3 as follows

Table 3. Summary of calculation results of Anava 2x2

Source of Variation	Dk	JK	KT	Fo	Ft
Average	1	400600,225			
Treatment					
A (Practice Method)	1	600,625	600,625	6.59#	4,11
B (K. Motor)					
AB (Interaction)	1	6325,225	6325,225	69,37#	4,11
Experimental Fallacy	1	5130,225	5130,225	56,26#	4,11
	36	3282.7	91,186		
Amount	40	415939			

Information:
: Significant at level α = 0.05
Dk : degrees of freedom
JK : Sum of squares
KT : Average sum of squares
Fo : Price F observation
Ft : Price F table

Overall Differences in the Results of *Drive* Technique Skill Training in Table Tennis Games Between the *Multiball* Training Method and the *Robot Training Method*

Based on the results of the Anava calculations, it can be seen that the F observation between columns (FA) = 6.59, is actually larger than the F table, which is equal to 4.11 (Fo = 6.59 > Ft = 4.11), so that Ho is rejected and H1 is accepted. Thus it can be concluded that overall there is a significant difference between the *multiball training method and the robot* training method on the results of table tennis technique skills *training*. The results of the table tennis *drive* technique skills training using the *robot* training method ($\overline{X}$ = 103.95 and s = 7.62) were better than the results of

the table tennis *drive stroke technique skills training* using the *multiball training method* ($\overline{X}$ = 96.20 and s = 26, 79).

The Interaction Between Training Methods With Motor Abilities Towards The Results Of *Drive* Punch Technique Skill Training In Table Tennis Games

$_{calculated}$ F interaction (FAB) = 56.26 and F $_{table}$ = 4.11, it appears that F $_{count}$ > F $_{table}$, so the null hypothesis (H $_0$) which states there is no interaction is rejected and the alternative hypothesis (H $_1$) is accepted.

The Differences in the Results of Table Tennis Punch *Drive* Technique Skill Training Through the *Multiball* Training Method and the *Robot Training Method* For the High Motor Ability Group

Table 4. Summary of *Tukey* Test calculation results

Group Compared to	Q $_{count}$	Q $_{table\ 0.05}$	Information
P1 with P2	4.93	3.79	Significant

Based on the table above , it shows that the value of Q $_{count}$ (Q $_h$) = 4.93 is greater than Q $_{table}$ = 3.79 or Q $_{count}$ > Q $_{table}$ at a significant level α 0.05, thus the null hypothesis (Ho $_)$ is rejected and the alternative hypothesis (H1) is accepted, meaning that the results of the table tennis stroke *drive* technique skills training for the high motor ability group through the application of the *multiball* training method ($\overline{X}$ = 120.10 and s = 7.68) higher than trained with the *robot training method* ($\overline{X}$ = 105.20 and s = 7.27).

The Differences in the Results of Table Tennis Punch *Drive* Technique Skill Training Through the *Multiball* Training Method and the Robot Training Method for the Low Motor Ability Group

Table 5. Summary of *Tukey* test calculation results

Group Compared to	Q $_{count}$	Q $_{table\ 0.05}$	Information
P4 with P3	10.06	3.79	Significant

Based on the table above , it shows that the value of Q $_{count}$ (Q $_h$) = 10.06 is greater than Q $_{table}$ = 3.79 or Q $_{count}$ > Q $_{table}$ at a significant level of α 0.05, thus the null hypothesis (Ho $_)$ is rejected and the alternative hipothesis (H1) is accepted, meaning that the results of table tennis *stroke* technique skills training for the group with low motor skills through the application of the *robotic* training method

($\overline{X}$ = 102.7 and s = 8.14) higher than the *multiball training method* ($\overline{X}$ = 72.3 and s = 13.66)

RESEARCH DISCUSSION

Overall , the results of the practice of the *Drive* Punch Technique Skills Table Tennis Game Using *Robot* Training Method Is Better Than *Multiball Training Method*.

Robot training method in its implementation emphasizes independent training with opponents in the form of ball-throwing aids (*robots*), meaning that they return punches with their own rhythm and ability, meaning that they are not influenced by environmental factors. In terms of anticipating an incoming ball, with information available in advance, it makes it easier to return shots. Practicing with the application of *robotic* training methods stimulates more motivation in practicing to achieve a level of automation of hitting movements with both *forehand drive* and *backhand drive techniques*.

Multiball training method in its implementation emphasizes joint training in pairs with the coach acting as ball feeder, meaning that in carrying out a stroke movement is determined according to the rhythm of the movements of the two. In other words, he practices the skills of the *drive punch technique* by carrying out punches directed at the coach according to the rhythm and ability of each, so that the smoothness of the practice is influenced by environmental factors, especially from the

coach. In terms of anticipating the ball, without prior information, in the early days of practice it will be difficult for students in terms of returning shots. It is rather difficult for students to keep the ball in the game. Based on the discussion of the research results, it can be recommended that the *robot* training method is more suitable to be applied in teaching/training stroke *drive* technique skills in table tennis games.

There is an interaction between the training method and motor ability on the results of the practice of hitting drive technique skills in tennis

The results of the 2x2 analysis of variance, regarding the interaction between training methods and motor skills on the results of table tennis stroke drive technique skills training, showed F $_{observation}$ = 56.26 > F $_{table}$ 0.05 = 4.11. This value illustrates that if the multi ball training method is better applied to students who have high motor skills, then the *robot training method* is better applied to students who have low motor skills, or vice versa.

For students who have high motor skills, the results of practicing table tennis *stroke* technique skills are through the application of the *multiball* training method Better Than *Robot Training Method* (A1 > A 2)

Multiball training method in its implementation emphasizes training in pairs between coaches and players, so that the smoothness of the training is influenced by environmental factors, especially the opponents themselves. For students who have high motor skills, this will actually be able to develop their ability to achieve increased skills, because they are more interested in doing more difficult (complex) movements. Implementation by using a table tennis court as a whole, means that the training atmosphere has described the actual game of table tennis. This will also lead to passion in improving the practice of his punch *drive* technique skills. That is, for students who have high motor skills, the effectiveness of the *multiball training method* ($\overline{X}$ = 120.1 and sd = 7.68) is significantly better than the *robot training method* ($\overline{X}$ = 105.2 and sd = 7.27).

Based on the discussion of the research results, it can be recommended that for students who have high motor skills, the *multiball training method* is more suitable to be applied in practicing drive *stroke* technique skills in table tennis games.

For Students Who Have Low Motor Abilities, The Results of Table Tennis Punch *Drive* Technique Skill Training through the Application of the *Robot* Training Method are Better Than the *Multiball Training Method*

Robot training method in its implementation emphasizes independent training with opponents in the form of *robotic aids,* meaning that it performs a punching movement according to its own rhythm and is not influenced by environmental factors. For students who have low motor skills, exercises like this are activities that are very popular, because according to him the exercises are not too difficult to generate enthusiasm in achieving the level of automation of hitting movements both forehand and backhand, and the expected results will *be* achieved *,* meaning practicing with the application of *robotic training methods* for students who have low motor skills stimulates more enthusiasm to achieve a level of automation of hitting movements with both *forehand* and *backhand techniques* . This means that for students who have low motor skills, the effectiveness of the *robot training method* ($\overline{X}$ = 102.7 and sd = 8.14) is significantly better than the *multiball training method* ($\overline{X}$ = 72.3 and sd = 13.66) .

Based on the discussion of the research results, it can be recommended that for students who have low motor skills, the robot training method is more suitable to be applied in practicing drive *stroke* technique skills in table tennis games.

CONCLUSION

The conclusions from the results of this study are: (1) Overall , the results of the practice of hitting drive technique skills in table tennis games through the application of the *robot* training method are better than the *multiball training method* . (2) There is an interaction between training methods and motor skills on the results of the practice of hitting *drive technique skills* in table tennis games. (3) For students who have a high level of motor skills, the results of the practice of hitting drive

technique skills in table tennis games through the application of the *multiball* training method are better than the *robot training method*. (4) For students who have a low level of motor skills, the results of the practice of hitting drive technique skills in table tennis games through the application of the *robot* training method are better than the *multiball training method* .

Acknowledgments or Notes

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