

Comparison of Training Methods and Motoric Skills to Exercise Results of Drive Shot Technique at Table Tennis

Anto Sukamto

Lecturer

Department of Sports Coaching Education
Sports Science Faculty, Universitas Negeri, Makassar, Indonesia

Abstract—This research aims to find out the differences between the effect of two methods to the results exercises on drive shot technique in table tennis. The methods are multiball and robot methods. It also aims to understand the interaction between exercise and motoric skills to the exercise results. The skills can be grouped into high and low motoric abilities. This type of research is an experiment with a 2x2 factorial design. The number of samples is as many as 40 students divided into four groups. Each group consisted of 10 students. Data collection technique refers to the variables involved in this study, namely: (1) The data on the dependent variable which were obtained from assessment of data forehand and backhand drives skills. (2) For data attribute, it can be taken through tests of motor skills using Nelson Motor Ability Test. Data were analysed by a two-way analysis of variance method, followed by Tukey's test. The results showed that the multiball method is more effective to be used in teaching drive shot technique in table tennis for students who have high motoric skills. On the other hand, the robot methods more effective use of teaching the students who have low motoric skills.

IndexTerms—Training Methods, Motoric Ability, Drive Shot Technique, Table Tennis

I. INTRODUCTION

Motoric skills for athletes is a achievement measurement. These skills can be improved with the training process. Systematic exercise is done repeatedly and with increased training load. Planning of the exercise method plays an important role in improving the functional ability of the entire system of the body, so the athlete's performance will increase. Motoric skills in exercise are aimed at achieving muscle strength and endurance. Furthermore, systematic training planning includes the content of training, training methods and organizational actions appropriate to the goals.

Every year, the exercise of tennis game has developed. The defensive type or characteristics have already been left with the advent of modern table tennis game with the offensive type game. Most of the tennis players should improve their performance regarding the dynamic of playing method. Players must have high motivation and can spend hours together with his coach to increase their skills. The exercise can be in the form of repetitive hitting so that players can have structured and systematic gameplay [1].

The shift from defensive games to offensive modern table tennis has been believed as one of the causes of the decreased performance of table tennis player in Indonesia. The key to the success of modern table tennis game lies in the mastery of drive shot basic techniques. To be able to master the basic techniques, the drive right training methods are needed.

Individual internal factors also play an important role in sports achievements, because every individual has a different level of motoric ability. However, this needs to be studied more in depth by the coaches, trainers and the players. The best solution is by conducting scientific research on a variety of things that can affect the achievement of table tennis in Indonesia. Specifically in the upgrading of drive shot skills through the application of two training methods. The methods namely multiball and robot by considering player motoric skills in table tennis. Motoric ability and technical skills affected the skills of tennis players. However, the prevalence of various inhibitors in improving the skills of players may arise internally and externally [2], [3].

There are various methods of training in table tennis, such as multi-ball method and robotic method. In some countries, multi-ball training method has been successful in increasing the quality of the national team. The coach hit the ball off the left side of the table and stood near the table. The next player to hit the ball at various speeds up the ball thrown out. This activity has repeatedly been done for the duration of the exercise ends [4].

The robotic method is usually given to beginner player in the game of table tennis, which is a partner player in the training was a robot instead of human. A robot consistently and regularly throws balls towards a player, so he can continually hone his technique and familiarize with it. Nowadays, robots have been developed to learn human arm movement and can act as a tennis coach or sparring partner to improve the table tennis players especially in long pips skills. These robots have been used widely in increasing motoric skills of players [5], [6].

The purpose of research is to determine: (1) the differences between multi-ball and robotic methods. (2) the interaction between training method with motoric skills to the results of the exercise drive shot technical skills. (3) the difference results of multi-ball methods and robot's methods for high.

II. RESEARCH METHODS

The method used in this research is experimental with the 2x2 factorial design.

Table 1 2 x 2 Factorial Design

Training Methods (A) Motoric Ability (B)	Multiball	Robot
	A ₁	A ₂
High (B ₁)	A ₁ B ₁	A ₂ B ₁
Low (B ₂)	A ₁ B ₂	A ₂ B ₂
Total	A ₁	A ₂

- A1B1 = Multiball methods with student groups that have a high motoric ability.
- A2B1 = Robot methods with student groups that have a high motoric ability.
- A1B2 = Multiball methods with student groups that have a low motoric ability
- A2B2 = Robot methods with student groups that have the low motoric ability.
- A1 = Multiwall methods
- A2 = Robot methods

The target population is students of sport at all universities in Indonesia. In this research, the accessible population is the entire male student at the Faculty of Sports Universitas Negeri Makassar, during programmed course table tennis. The number of samples is as many as 40 students divided into four groups; each group consisted of 10 students. Hence, formed four groups of samples from both groups training methods are: (1) The sample group training methods multiball with high motor skill (A1B1), (2) sample group robot methods with high motor skills (A2B1), (3) the sample group multiball methods with low motor skills (A1B2), and (4) the sample group robot methods with low motor skills (A2B2), (A2B2).

The exercise carried out three times a week for each group which in total was 18 (eighteen) meetings. Untrained athletes can achieve an increase of 10-25% in 6-8 weeks' exercise. More significant results can achieve with more extended exercise (Russell R. Pate, 1984).

Data collection techniques that do refer to the variables involved in this research, namely: (1) dependent variable data of drive shot technical skills, through the process of assessment both forehand and backhand drives technique. (2) For variable data attributes obtained through tests of motor skills by using Nelson Motor Ability Test, which consists of four test items; hand reactions tests, foot reaction test, speed test to move the hand, and tests the ability to move the foot. Data analysis technique used is a two-way analysis of variance, followed by Tukey's test.

III. RESULT AND DISCUSSION

Differences Multi-ball and Robotic Methods

Based on ANOVA calculations, it can be seen that the $F_{\text{observation}}$ (FA) = 6.59, was greater than the F_{table} , is equal 4.11 ($F_o = 6.59 > F_t = 4.11$), so that H_0 refused and H_1 accepted. It can be concluded that overall there are significant differences between the multi-ball methods with the results of the exercise methods of robotic toward the drive technical skills on table tennis. The interaction between training method with motoric skills to the results of the exercise drive technical skills.

Based on the summary of the calculation results of analysis of variance, the price obtained F_{count} interaction (FAB) = 56.26 and $F_{\text{table}} = 4.11$; it appears that $F_{\text{count}} > F_{\text{table}}$, so H_0 is rejected and the alternative hypothesis (H_1) is accepted.

Table 2 Data of Anova 2x2

Source of Variation	df	The Sum of Squares	The Average Sum of Squares	Fo	Ft
Average of treatment	1	400600.225			
A (training methods)	1	600.625	600.625	6.59 #	4.11
B (motor skills)	1	6325.225	6325.225	69.37 #	4.11
AB (Interaction)	1	5130.225	5130.225	56.26 #	4.11
the fallacy of experiment	36	3282.7	91.186		
Total	40	415939			

- Information:
- #: Significant at the level $\alpha = 0.05$
- Fo: F observation
- Ft: F table

The application of robot training method is better than multi-ball training methods. It focuses more on independent practice with the main opponent in the form of robot. The robot can reply a driving shot with rhythm without any influence

from environment factors. Practicing with the robot training method stimulates motivation in practice to achieve the degree of automation, good hitting motion and better forehand and backhand drive technique.

Multiball training methods in practice emphasize on joint exercises with a coach who acts as a feeder ball. The motion is determined according to the rhythm of the two. With no prior information about the opponent strategic, the student finds it difficult to return a drive shot from his opponent and to keep the ball remains in the game. Based on these results, it can recommend that the robot training methods are more appropriate in teaching drive shoot skills in a game of table tennis.

The difference Results of Multiball Methods and Robots Methods for High Motor and Low Skills Groups

Table 3 Summary of The Results of Calculations Tukey Test P1 vs. P2

The group Compared	Q count	Q table 0.05	Information
P1 with P2	4.93	3.79	Significant

Table 4 Summary of the results of calculations Tukey test P3 vs. P4

The group Compared	Q count	Q table 0.05	Information
P4 with P3	10.06	3.79	Significant

According to the table above, shows that the value $Q_{count} = 4.93$ bigger than $Q_{table} = 3.79$ the significant level $\alpha 0.05$, so the hypothesis H_0 rejected and H_1 accepted. Based on the analysis, it can explain that multi-ball training method better adapted for students who have a high motor skill, then the robot better training methods applied by students who have low motor skills, or vice versa.

Multiball training methods in practice emphasis on training in pairs between coaches and players, so it is influenced by environmental factors, especially the main opponent. For students who have high motor skills, they will have more opportunity to develop and improve their skills because they are more interested in doing more difficult and complex movements. That is students who have a high motor skill, the effectiveness of multi-ball training methods is significantly better than the robot training methods.

Moreover, this method also can enhance athletes' performance. The effectiveness of the training depends on the availability of partner or coaches. Coaches with high-level performance would make more challenge for a player in training. The athletes have to overcome this challenge and have a very effective training session for technical and tactical aspect [7].

In contrast, robot training methods better than multiball methods for students who have low motor skills. This exercise is more favored because the exercise movements are not too difficult to achieve the level of automation and better hitting motion for both forehand and backhand drive. The effectiveness of training robot methods significantly better compared with multiball training methods for the students. In fact, in many countries, the robot training method is preferred for athletes who have low-level skills. It would be highly advisable for doing simulation training for a beginner in table tennis [7].

IV. CONCLUSION

The conclusion of this research are: (1) the results of the implementation of robot training method is better than the multi-ball training methods in teaching drive shoot technique in table tennis. (2) There is an interaction between motor skills training method with the results of drive shoot technical skills training. (3) For students who have a high level of motor skills, the results of the exercise with multiball are better than the robot method. (4) For students who have a low level of motor skills, training results with the robotic method are better than the multiball.

REFERENCES

- [1] M. Reid, M. Crespo, B. Lay, and J. Berry, "Skill acquisition in tennis: Research and current practice," *J. Sci. Med. Sport*, vol. 10, no. 1, pp. 1–10, 2007.
- [2] G. Suna, M. Alp, and E. Çetinkaya, "Investigating the effects of technical trainings applied 10-12 age male tennis players on their stroke performances," *J. Hum. Sci.*, vol. 13, no. 3, pp. 4980–4985, 2016.
- [3] C.-H. Wang *et al.*, "Open vs. closed skill sports and the modulation of inhibitory control," *PLoS One*, vol. 8, no. 2, p. e55773, 2013.
- [4] S. F. Saleh, "Effects of Training With Multi-Balls on Some Visual Abilities and Counter-Attack Skills for Junior Table Tennis Players," *J. Appl. Sport. Sci.*, vol. 5, no. 2, 2015.
- [5] K. Mülling, J. Kober, O. Kroemer, and J. Peters, "Learning to select and generalize striking movements in robot table tennis," *Int. J. Rob. Res.*, vol. 32, no. 3, pp. 263–279, 2013.
- [6] J. Peters, J. Kober, K. Mülling, O. Krämer, and G. Neumann, "Towards robot skill learning: From simple skills to table tennis," in *Joint European Conference on Machine Learning and Knowledge Discovery in Databases*, 2013, pp. 627–631.
- [7] D. Jayabalakrishnan and R. K. Achanta, "A study on quantizing high level table tennis for robot training in India," *Int. J. Table Tennis Sci.*, vol. 8, pp. 5–9, 2013.