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Effect of Multiball Training Using a Throwing Robot on Forehand Hitting Skills in Athletes with Table Tennis Disabilities

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Abstract
This study aims to find out: how much influence multiball training using throwing robots on athletes with disabilities in South Sulawesi and developing a program of multiball training methods using ping pong ball throwing robots in improving forehand shots. This research is an experimental research in the form of a pre-post test design group. The population in this study is athletes with disabilities in South Sulawesi. The sample determination technique is random sampling. The data analysis techniques used were descriptive statistical analysis, paired and unpaired t-tests with the help of the SPSS computer program version 20. Based on the results of the study, it can be concluded as follows: (1) the treatment group trained with multiball exercises had a significant effect on the increase of forehand strokes for athletes with disabilities in South Sulawesi. The effect can be seen from the average increase in strokes from the initial test to the final test of 14.35. While the control group had a significant effect on the increase in forehand stroke, it can be seen from the initial and final test scores of only 4.50.
***Keywords**: Multiball; Forehand; Robotic Peeling; Disability; Table tennis*

INTRODUCTION

Table tennis is one of the sports that does not use high intensity but prioritizes aspects of physical components such as speed, accuracy, power and hand-eye coordination in order to be able to control the ball well by using forehand or backhand punches (Walinga, 2024). In the game of table tennis, the most important thing to master is the forehand and backhand shots. To train these two strokes requires a program of special training methods such as multiball exercises. Multiball exercises performed continuously can improve forehand shots (Masjaya et al., 2023). The application and development of multiball method training programs using throwing robots is very beneficial for all athletes.

In general, both people with disabilities and non-disabled people. The potential obtained by using multiball exercises is that the movement reflexes will get better. Therefore, in long-term coaching with the goal of achievement, a multiball training model program for people with disabilities in South Sulawesi is needed (Prestasi & Meja, 2021). However, the reality is that multiball training

using a throwing robot has never been applied to people with disabilities in South Sulawesi, this is marked by the trial of the throwing mat in which only non-disabled athletes (Kes, M & Murniati, 2020), (Rudiansyah & Allo, 2023), (Erlangga et al., 2022). This problem is a big challenge that needs to be followed up to improve the achievement of athletes with disabilities.

Peparnas 2024 which will be held in Solo, Central Java 2024, South Sulawesi with only 40 athletes and 20 officials and coaches (Peparnas-2024-South Sulawesi-Follow-Delapan-Branch-Olah-Sport, n.d.), looking at the number of South Sulawesi athletes, of course, there are factors that cause the lack of participation of people with disabilities, including: lack of sports facilities for people with disabilities (Kiuppis, 2018). Therefore, the multiball training method program using a throwing robot directly becomes a special need in table tennis to improve achievement (Indah et al., 2021). With the occurrence of discrimination among the community against people with disabilities, creating a training method program by conducting coaching that can accommodate diversity by considering the urgency of the special needs of individuals (Gurgis et al., 2022). The involvement of the government, coaches and the community to respond positively to the diversity that occurred (Hollomotz, 2023). This is one of the characteristics of South Sulawesi based on Pancasila bhinneka Tunggal Ika. In depth program the table tennis multiball training method on forehand shots against people with disabilities to be successful.

In the game of table tennis there are two basic strokes that must be mastered, one of which is the forehand shot, the forehand shot is the most often used stroke to start a match, control the ball even to generate points. Forehand shots are very important in table tennis because forehand shots are one of the most powerful and accurate shots because the position of the hands and body is free of swing resistance (Fazli, 2023). To train good forehand shots, the most effective training method is the multiball training method by concocting into a training program to improve the forehand hitting skills of athletes with disabilities in South Sulwesi (Asep Pitro Mahyudi, 2007). Through the treatment of the multiball training method, it is hoped that people with disabilities can improve their forehand shots

even though they are constrained by their physical limitations. The success of the training methods that have been formulated into a program is of course expected to have collaboration with coaches, the community and the government to provide support to athletes with disabilities based on equal rights (Waluyo, 2019), (WAHONO, 2018). Physical limitations will certainly

influence on the analysis of forehand stroke movements in athletes with disabilities. With the results of initial observations to dig deeper into the physical condition and abilities of table tennis athletes with disabilities in South Sulawesi will make a constructive contribution to recognizing, understanding the challenges and obstacles faced by athletes with disabilities in improving forehand hitting skills through the multiball training method using throwing robots. The Training Method program using robots is the main key in improving forehand shots in athletes with disabilities in South Sulawesi. The formulation of the objectives in this study is to develop a multiball training method program using a ping-pong ball throwing robot in improving forehand strokes and analyze the influence of multiball training method programs

METHOD

The research is designed to ensure that all important aspects are clearly structured including processes, outputs, targeted achievement indicators, and the team members and partners who will be involved are responsible for each stage of the research. This study is quantitative using an experimental method in the form of One Group Pretest-Posttest Design (Oktavia et al., 2019). Where this study will conduct an initial test to find out the initial skills before and after being given treatment to table tennis athletes with disabilities in South Sulawesi. The design of this research is relevant to the focus of research by looking at the increase in the extent of the effectiveness of the program that will be provided by the researcher. The data collection method begins with a pretest and ends with a posttest. This research will be carried out in Makassar City as the capital city of South Sulawesi by considering the support of the local government as a position holder and policy decision-maker for athletes with disabilities in South Sulawesi. Makassar City was chosen to be the research location because it is the central point of all districts in

South Sulawesi, making it easier for researchers and athletes to carry out training method programs. In addition, there are several advantages in fostering athletes with disabilities in the future, such as the availability of sports buildings and guesthouses specifically for people with disabilities and government support which is very welcoming and believes that through the multiball training method program that uses throwing robots, it can boost the achievements of table tennis athletes with disabilities in South Sulawesi.

RESULT AND DISCUSSION

From the entire series of activities of this study, The Effect of Multiball Exercises Using Throwing Robots on Forehand Strokes in Athletes with Disabilities in Table Tennis Athletes in South Sulawesi, all the data needed in this study can be obtained. The data in question is data on Forehand Strokes in Table Tennis Athletes with Disabilities before treatment and after treatment in a systematic program for 16 meetings with details 3 times a week. To answer the problem and to achieve the goals and to test the hypothesis of this research, all the data is processed using descriptive and inferential statistical tests with a t-test technique using SPSS version 20.00.

Based on the data management of variables consisting of 2 groups, namely the experimental group that was given multiball training treatment using a throwing robot and the control group that did not receive the treatment, the data was analyzed descriptively to find out the general picture of the research data. The presentation of the results of data analysis is a summary of the results of the analysis, while the results of the complete statistical calculation **Test Results**

Multiball Training Data Using Throwing Robots before treatment, with a total score of 199.00. The average score obtained was 10.93 with a standard deviation (sd) of 1.23. The value of the range of 4.00 is obtained from the difference in data between the maximum value (max.) of 12.00 and the minimum value (min.) 8,00.

Control Group data, with a total value of 198.00. The average value obtained was 9.95 with a standard deviation (sd) result of 1.16 For the range value of 4.00 was obtained from the difference in data between the maximum value

(max.) 16.00 and the minimum value (min.) 12.00

Post-treatment or posttest group

Multiball Training Data Using Throwing Robots before treatment, with a total value of 486.00. The average score obtained was 24.30 with a standard deviation (sd) result of 1.26. The value of the range of 4.00 was obtained from the difference in data between the maximum value (max.) of 26.00 and the minimum value (min.) 22,00.

The control group data without treatment, with a total value of 288.00. The average value obtained was 14.40 with the result of standard deviation (sd) 1.18 For the range value of 3.00 was obtained from the difference in data between the maximum value (max.) of 16.00 and the minimum value (min.) 13.00. On this basis, the difference between the initial test and the final test after treatment was seen for 16 meetings with details 3 times a week, where in the Multiball Training group Using a Throwing Robot with an average test score of 199.00 and an increase of 486.00 there was an increase of 287.00. Meanwhile, the control group without treatment with an average test score of 198.00 and a final test score of 288, there was an increase of 90.00.

The conclusion of the 2 groups that the Multiball Training Group Using a Throwing Robot with an average score of 99.00 and the carioca-plyo push up exercise group with an increase in the mean score was 287.00, meaning that the multiball exercise group using a throwing robot was better when compared to the control group with an average score of 14.40 with an increase of 90.00.

Data Prerequisite Test Results

A research data that will be discussed statistically must meet the analysis requirements, namely the normality test and the homogeneity test. For this reason, after the initial test data and the final test of the experimental group and the control group in this study are collected, before statistical analysis is carried out for hypothesis testing, a prerequisite test is first carried out.

Data Normality Test Results

The normality test is used to find out whether the data of each variable to be

analyzed is normally distributed or not. The technique used in the normality test is to use the Kolmogrov-SmirnovZ test with a significance level of 95% or α = 0.05. From the results of the Kolmogrov-Smirnov test carried out, the results as attached were obtained. Meanwhile, the complete analysis for the normality test, and the data from the forehand stroke test of the initial test and the final test of the experimental group and the control group, are summarized in the following table.

Table 1. Results of the Data Normality Test of the Experimental and Control Group

Variable	N	Sig.	Ket
Initial tests of the experimental group	20	0,639	Usual
Final test of the experimental group	20	0,680	Usual
Initial test of the control group	20	0,536	Usual
Final test of the control group	20	0,523	Usual

Based on the table above, which is a summary of the results of data normality testing in the multiball training group using the throwing robot and the contrrok group, it can be described as follows:

The results of the normality test of the initial test data of the experimental group used mutiball exercises with a sample of 20 athletes, with a significance value of 0.639 > 0.05. This shows that the initial test data of the experimental group with multiball training treatment using a normally distributed throwing robot. For the results of testing the normality of the final test data of the experimental group with multiball training treatment using a prlontar robot with a sample of 20 athletes with a significance value of 0.680 > 0.05. Thus the final test data of the experimental group was distributed normally.

Meanwhile, the results of the normality test of the initial test data of the forehand stroke of the control group with a sample of 20 athletes, with a significance value of 0.536 > 0.05. This shows that the initial test data of the control group is normally distributed. For the results of the normality testing of the final test data of the group with a sample of 20 athletes, with a significance value of 0.523 > 0.05. Thus, the final test data of the control group is normally distributed.

Data Homogeneity Test Results

The Homogeneity Test is carried out to find out whether the research

departs from the same conditions (homogeneous) or not. To conduct the homogeneity test, the Levene Statistic test was 95% significance or α = 0.05.

From the results of the sample homogeneity test, the results as attached were obtained. For the results of the calculation, it can be seen in the following summary of table 4.3:

Table 2. Homogeneity Test Results Data Speed Combination Movement of Mawashi Kick Front Leg-Gyaku Tzuki Athlete Inkanas Branch UNM

Group	Life	Statistic	df1	df2	Sig.	Ket.
Experimental exercise groups		784	3	15	0,544	Homogeneous
control group	551	3	16	0,940	Homogeneous	

Based on the table above, the results of the homogeneity test of multiball training data using throwing robots in athletes with disabilities in South Sulawesi with a significance value greater than α 0.05, then the experimental and control data are homogeneous or come from the same skill.

Results of Inferential Data Analysis Test (t-test)

The results of the t-test were used to test the effect of treatment during 16 meetings with details 3 times per week of the experimental group of multiball training using a throwing robot and a control group of athletes with disabilities in South Sulawesi. For conclusions in hypothesis testing, it can be done by comparing the tcount with the ttable with the provisions of the tcount > t table, in addition, hypothesis testing can be done by looking at the significance value with a sig < 0.05 determination. The following is a summary of the results of the t-test analysis of athletes with disabilities in South Sulawesi: There is a significant influence of multiball training using throwing robots.

Based on the results of data analysis using the t-test of the two variables, a significance value of 0.000 was obtained, where the average value of the initial test was 9,950 and the average value of the final test was 24,300. So it can be said that there was an average increase before and after being given the multiball training treatment using a throwing robot of 14.35.

Based on the results of data analysis using the t-test, a significance value of 0.000 was obtained with an average value of the initial test of 9,900 and an

average value of the final test of 14,400. So it can be said that there is an initial test and a final test of 4.50. Thus, it can be argued that multiball exercises using a throwing robot can improve forehand shots if done effectively and efficiently. So it would be better for an athlete if he wanted to get a good and accurate forehand shot. perform multiball exercises using a throwing robot. This shows that the treatment group experienced a greater improvement than the control group that did not receive treatment. This proves that there is a significant influence of multiball training using throwing robots on athletes with disabilities in South Sulawesi.

CONCLUSION

Experimental groups trained with multiball exercises using a throwing robot had a significant effect on the improvement of forehand strokes in South Sulawesi Table Tennis Athletes with Disabilities compared to the control group. The development of a multiball training program with a throwing robot is carried out through the identification of athletes' needs, the determination of training goals, the selection of suitable robots, the preparation of structured training schedules, variations of techniques, and periodic evaluations. With a systematic approach, these exercises can improve engineering skills effectively and efficiently.

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