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Effect of Plyometric Training on agility and vertical Jump U- 15 Male Handball Project in kembata tambaro Zone

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Abstract

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Keywords: *Handball, physical fitness and Plyometric training.*

The purpose of the study was to examine the effects of plyometric exercise in improving explosive power, speed, flexibility and agility performance .To achieve the purpose of the study 25 male handball project were selected as target group and their age was U-15 years. They were assigned in two groups Experimental and control group and the selected exercises were given for 12 weeks. The variables which were selected for this study 35m sprint, pro-agility (T-'test), V sit and reach test, and vertical jump were measured. Pre and post tests were conducted for all 25 male study target group and the test results were recorded. The collected data were analyzed by paired sample t-test and independent t-test using SPSS version twenty one (V.21). Descriptive statistics concerns the development of certain measures from the raw data. Under the descriptive statistics, the study encompasses that the Mean, Standard deviation, percentages, and Correlation was used for this study. Charts/graphs were employed to illustrate and elaborate on the results of records. Pearson product-moment correlation was also employed to associate the relationship between the plyometric exercise effects on player's physical fitness. Plyometric training program have shown significant improvement on agility, power and flexibility performance of Kembata tambaro zone handball project players.

INTRODUCTION

Physical health is the normal functioning of the body. Representing one dimension of total well-being. Maintaining good physical health decreases your risk of developing conditions such as heart disease, stroke and some cancers [7]. Being physically healthy also helps you to manage life's challenges by protecting you against fatigue, injury and illness. Physical health is closely linked to mental health and an integral part of leading a healthy lifestyle and enjoying life. [6]. Plyometric is a form of exercise based on making quick, powerful movements.

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Both competitive athletes and people who train for enjoyment and general health can use plyometric to increase their overall power. Plyometric exercises help train a person's muscles to respond with power and efficiency. Benefits Plyometric Increased power output in the muscles, increased force in muscle contractions with less energy consumption, faster speed of muscle contractions or speed in general, improved ability to change directions quickly, overall better control when stopping and starting movements, increased jumping height and decreased risk of injury to the joints and muscles[9]. Benefits of exercise and fitness are improved quality of life, improved quality of sleep, improved mood and memory, and slowed progression of diseases. Further benefits include improved insulin sensitivity, improved heart and lung health, improved range of motion and physical performance, improved sex drive and appetite, improved skin texture, and reduced risks of injury [8].

Statement of the Problem

Team handball is classified as a high intensity, body-contact sport that demands a high level of aerobic and anaerobic fitness. For handball players, successful match performance requires several physical attributes such as speed, power, strength and agility, plus the ability to maintain performance during repeated sprints [3].

The researcher observed that in kembeta tambaro zone handball project, proper plyometric training is not emphasized to include in their training schedule. Therefore, this leads the players towards physically not fit especially, in explosive power, speed, flexibility and agility. If players lack of this training, they cannot perform their volleyball skill properly. The coaches may give more attention for ball contact drill rather than the essential physical fitness development in their training session.

OBJECTIVES

• To examine the effect of plyometric training on explosive power of handball project players,

• To assess the effect of plyometric training on speed of handball project players,

• To identify the effect of plyometric training on agility and flexibility of handball project players

Hypotheses of the study

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https://ejss-esa.edu.et/index.php/ejss

Plyometric training has no significant effect on explosive power of handball players.

Plyometric training has no significant effect on speed of handball players.

Plyometric training has no significant effect on agility and flexibility of handball players.

Plyometric training has significant effect on explosive power of handball players.

Plyometric training has significant effect on speed of handball players.

Plyometric training has significant effect on agility and flexibility of handball players.

Significance of the Study

The significance of this study was to examine the effects of twelve weeks plyometric training on selected physical fitness among male U-15 kembeta tambaro zone handball project players. This study was created an opportunity for male handball players to improve their physical fitness in kembeta tambaro handball project and motivate the players to engage in plyometric exercises regularly for the improvement of physical fitness. It also creates the awareness for volleyball coaches to incorporate plyometric training when they design training program to develop handball player's physical fitness. Based on the study findings the direction should recommend to coaches, sports managers, and the practitioners of the study in the handball players physical fitness.

MATERLIS AND METHODS

A research design is the 'procedures for collecting, analyzing, interpreting and reporting data in research studies [4]. Experimental and control group were incorporated of male volleyball players from kembeta tambaro zone u-15 handball project players. The study subjects were taken 25 players in the age category of U-13 years of old handball players. In this study the researcher was intended to use the materials which are Cones, ball, long wall, sit and reach mat, meter, whistle and stop watch, handball court and football field as well. For the experimental group exercise time scheduled per week 3 days for 60 minutes was designed. The pretest was taken and the data was recorded and the testing protocol procedures were kept until the post-test measurement. Before directly engage to the test the participants were requested to warm up for 10- 15 minutes prior to the test program and cool down at the end of activity. The tests were vertical jump for explosive power, 35-meter sprint for speed, agility T-test for

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agility and V-sit and reach test for flexibility was applied to test player's pre- and post-selected physical fitness variables with field test. Paired sample T test was used to compare the main difference between pre- and post-field test of explosive leg power, speed, flexibility and agility

Figure 1. Pre-Post Experimental research lay out

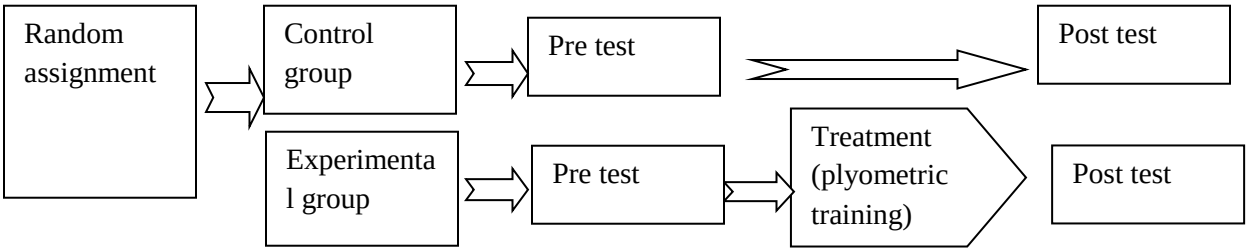

Table 1. The study design layout

Treatment	Plyometric training
Frequency	Three
Total duration	Twelve week
Duration per day	60 minutes
Intensity	Low to high
Exercise day	Monday, Wednesday, Friday
Time of training	Morning 1:00-2:00 Monday and Friday, afternoon 11:00-12:00 Wednesday.

THE FOUR PILLARS OF HEALTH

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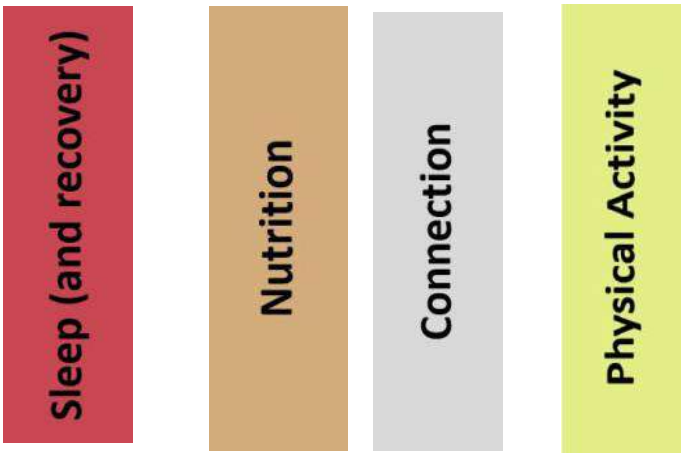

Among the kembata tambaro U-15 handball project trainees among the 25 male handball players 10 of them assigned to control group and the left 15 of them assigned to experimental group by random sampling system.

To conduct this study, the researcher was used primary data sources by administering field tests for experimental and control group as per and post-test before and after twelve weeks plyometric training. To attain the objectives of the study, the researcher was used physical fitness field test and measurements as data gathering instruments to get quantitative data before and after intervention. These quantitative data was collected and recorded as pre and post-test results for experimental and control groups. Based on the availability and feasibility of the instruments, the selected variables were tested by using test measurements.

***Table 2**: Data collection test tools*

No	Measurable variables	Test tool	Unit of measurement
1	Maximum speed	35 meter sprint run	Second
2	Explosive power	Vertical jump	Meter
3	Agility	Agility T test	Second
4	Flexibility	V- sit and reach test	Meter

The researcher was informed to project coach and Zone sport administration to get permission and also all the necessary information about the study was explained for participants. Field tests were administered to collect quantitative data with procedures, equipment, and physical fitness test measurements. These tests were administered in proper sequences on the same time of each day in a way that can accomplish comfortably. Pre-tests was administered at

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the beginning of 12 weeks plyometric training program and post-test was administered at the end of 12 weeks plyometric training program for both control and experimental groups. These tests were conducted with the help of coach and assistant.

Training Procedures

Before plyometric training, the researcher was administered per-tests for control and experimental groups. Then, experimental groups was engaged in plyometric training in addition to the normal handball training which is scheduled by project in which control group was performed. When training protocol was designed it considered the work out intensity, duration and frequency. A training program was three times per week and 60 minute time span per session for three months. The training program was conducted on Monday, Wednesday and Friday at afternoon or morning based on player's school time. All training program was conducted based on recommendations of intensity and volume [5]. by using progressive set, repetitions and duration of exercise. Therefore, the researcher was prepared three-month training plan for experimental group. However, both groups of players engaged in the basic training program of the project that was prepared by the coach.

Plyometric training programs: The experimental group performed plyometric exercises three times a week for 12 weeks. Each plyometric training session started with a warming up exercise with a 5 min jog of low intensity, followed by 5 min of stretching exercises and 5mint aerobic exercise. The control group did not take part in this training program but followed a regular volleyball training program. Training volume, load and intensity ranged from, 3 –5 sets, 5 –15 repetitions with a minimum of 90 and a maximum of 220 ground contacts per session. Finally, all subjects were taken a post-test then differentiated the test results of trained and non-trained subjects. The three-month training plan was prepared in the appendix part and incorporated the following plyometric exercises. Cone Jump, Multiple hops with a Sprint, jumps from different position and direction with cone, frog jump, lateral speed drill, Tuck jumps, sit and reach the foot and Squat jumps.

The techniques of data analysis methods were employed for the relevant variables. Therefore, the data was first collected, structured, and coded in SPSS version 21.

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https://ejss-esa.edu.et/index.php/ejss

The Statistical Package for Social Science (SPSS version 21) was used to compute the collected data. Statistical analysis was used to analyze each of the research inquiries. The study was used in both descriptive and inferential statistical methods. The following statistical procedures were used for numerical interpretation.

Descriptive statistics concerns the development of certain measures from the raw data. Under the descriptive statistics, the study encompasses that the Mean, Standard deviation, percentages, and Correlation was used for this study. Charts/graphs were employed to illustrate and elaborate on the results of records. Pearson product-moment correlation was also employed to associate the relationship between the plyometric exercise effects on player's physical fitness.

The level of statistical significance for the study was set at $p \leq 0.05$. To examine whether significant difference or not in male volleyball player's plyometric training, independent sample t-test was used. In addition, to evaluate the pre-post training effect of each training modality, paired sample t-test was employed. The level of statistical significance for the study was set as $p \leq 0.05$ and 95% confidence interval [6].

The independent sample t-test consists of tests that compare mean values of experimental and control group, which is normally distributed.

The independent samples t-test compares the mean scores of two groups in a given variable, that is, two mean scores of the same variable, whereby one mean represents the average of that characteristic for one group and the other mean represents the average of that specific characteristic in the other group. Generally speaking, the independent samples t-test compares one measured characteristic between two groups of observations or measurements. It tells us whether the difference we see between the two independent samples is a true difference or whether it is just a random effect.

The independent samples t-test is also called unpaired t-test. It is the t-test to use when two separate independent and identically distributed variables are measured. Independent samples are easiest obtained when selecting the participants by random sampling. A paired t-test is used to compare two population means where you have two samples in which observations in one sample can be paired with observations in the other sample.

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A paired-samples *t*-test compares the mean of two matched groups, or compares the mean of a single group, examined at two different points in time [7].

- Research was designed, reviewed and undertaken to ensure integrity and quality;
- Research staff and subjects were informed fully about the purpose, methods and intended possible uses of the research, what their participation in the research entails and what risks, if any, are involved;
- The confidentiality of information was supplied by research subjects and the anonymity of respondents was respected;
- Research participants were participated in a voluntary way, free from any coercion;
- Harm to research participants was avoided;
- The independence of research was clear, and any conflicts of interest or partiality was explicit;

RESULTS

The valuable data through experimental method such as pretest and posttest of each variable the researcher tabulated, analyzed, and interpreted it. Tabulation is a way of arranging the same data in some kind of concise and logical order [8].The researcher had conducted the task of drawing inferences after analyzed the collected data. Unless this has been done very carefully, misleading conclusions may be drawn and the whole purpose of doing research may reduce the quality. It is only through interpretation that the researcher can expose relations and processes that underlie his findings. Interpretation refers to the task of drawing inferences from the collected facts after analytical study [9]. This chapter reveals results and interpretation of the research undertaken. The data was analyzed by using table and descriptive statements using SPSS version 21.

This chapter dealt with the analysis of data collected from the samples under this study. The purpose of the study was to examine the effects of plyometric exercise in improving explosive power, speed, flexibility and agility performance .To achieve the purpose of the study 25 male volleyball players of handball project were selected as target group and their age was U-13 years. They were assigned in two groups and the selected exercises were given for 12 weeks. The variables which were selected for this study 35m sprint, pro-agility (T-'test), V sit and

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reach test, and vertical jump were measured. Pre and post tests were conducted for all 25 male study target group and the test results were recorded. The collected data were analyzed by paired sample t-test and independent t-test using SPSS version twenty one (V.21). The results for each variable were discussed below.

Consequently, based on the data obtained from the target group, the analysis of the data and discussion of the findings presented as follows:

Table 3: Demographic data (Mean ± SD)

Group Statistics				
	Control and excremental group	**N**	**Mean**	**Std. Deviation**
Age of the players	Control group	10	12.56	0.527
	Experimental group	15	12.53	0.516
Height of the player	Control group	10	1.42	0.69
	Experimental group	15	1.48	0.72
Weight of the player	Control group	10	44.01	0.29
	Experimental group	15	43.5	0.39
Experience of the players	Control group	10	2.6	0.27
	Experimental group	15	2.7	0.17

CG=control group, EG=experimental group, N=number of subject

As shown from above Table: - Descriptive characteristics of 25 male Kembata tambaro zone handball project players. Their mean of age (CG=12.56, EG=12.53year), height (CG=1.42m EG=1.48m), weight (CG=44.01kg, EG=43.5kg) and playing experience (CG=2.6years EG=2.7years). As it indicated above table subjects were relatively had the same age, height, weight and playing experience at the beginning of plyometric training.

Figure 2. Descriptive Statistics of both control & experimental group.

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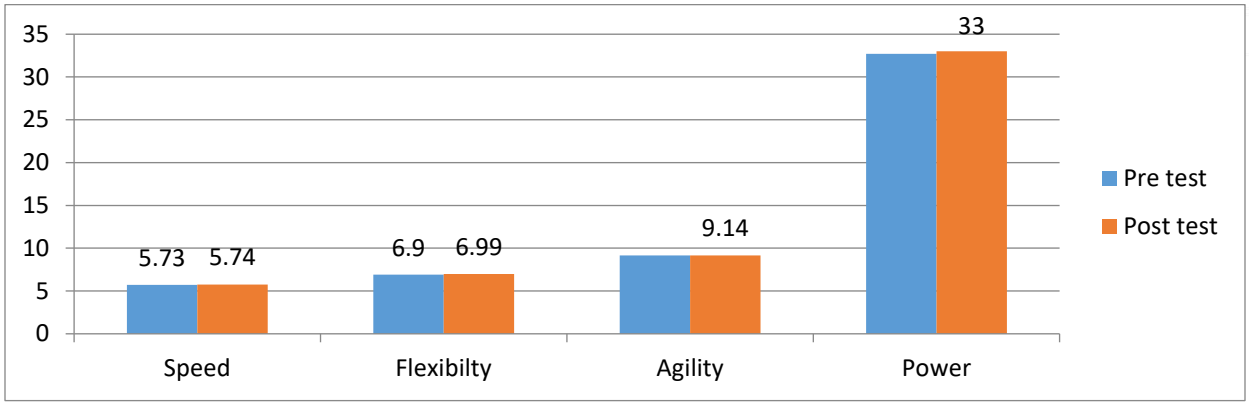
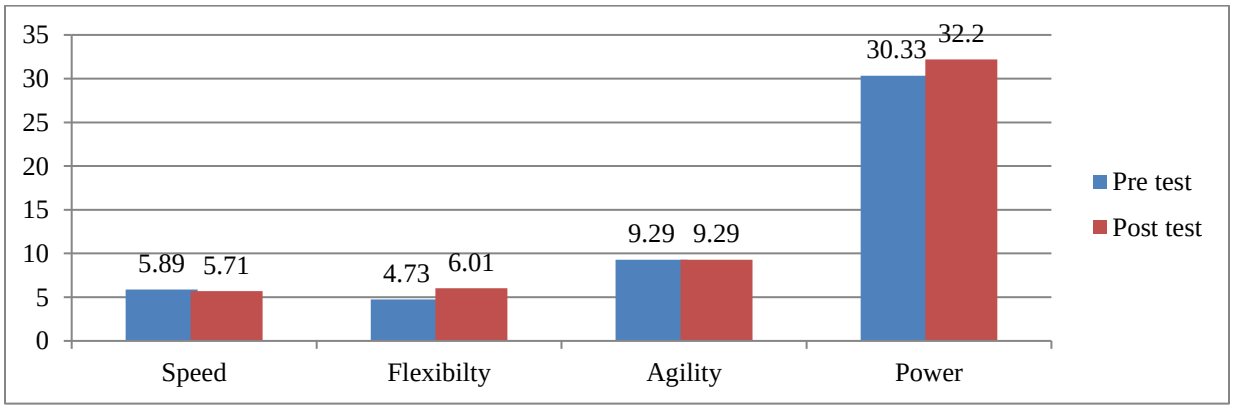


As shown above this figure 3 shows the mean difference of pretest to posttest without polymeric training were deference from pre to post. This difference shows the no improvement of the fitness performance. The figure 2 showed that the participants speed 35m runs, V-sit and reach, agility T test and vertical jump performance. The performance for these four variables had been observed in the little bit improvement of power, flexibility, and there was no change on agility and speed without polymeric training that carried out 3 days per week for 3 months that enabled the participants to perform better from pre to post test. Therefore, without polymeric training was not recommended for volleyball player those who want to develop their speed, agility flexibility and power. The result of this study is supported with the study of Shaikh and Mallick (2012) that conducted the study on the effects of ply metrics training among University male students and found that poly metric training was effective in improving explosive power, agility and muscular endurance.

Associated physical fitness variables of handball players were also improved significantly as a result of selected polymeric training exercises.



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Note, p < .05, * = Significant *and the data in the form of Mean ± SD*

Figure 4: pre-test and post -test Mean values for Experimental group

As shown above this figure 2 shows the mean difference of pretest to post test on polymeric training were deference from pre to post. This difference shows the improvement of the fitness performance. The figure 2 showed that the participants speed 35m runs, V-sit and reach, agility T test and vertical jump performance. The performance for these four variables had been observed in the improvement of agility, flexibility, agility and power due to polymeric training that carried out 3 days per week for 3 months that enabled the participants to perform better from pre to post test.

Therefore, polymeric training was recommended for those who want to develop their speed, agility flexibility and power.

The result of this study is supported with the study of Shaikh and Mallick (2012) that conducted the study on the effects of ply metrics training among University male students and found that poly metric training was effective in improving explosive power, agility and muscular endurance. Associated physical fitness variables of volleyball players were also improved significantly as a result of selected polymeric training exercises.

The baseline assessment results of experimental group (n=15) were assessed using the independent t-test for speed, power, flexibility and agility of physical fitness of the participants in the study was presented in the following.

Table 6: Summary of independent sample t-test of EG on mean baseline and of speed, agility, flexibility and power.

Table 4. Independent T- test Result for experimental group.

Variables		**Pre-test**				**Post-test**			
		Mean(Sd/0	**mean**	**t-value**	**p**	**Mean**	**SD**	**T-value**	**Sig**
Speed	Control	5.89	0.17	121.19	0.000	5.81	0.19	107.65	0.001
	Intervention								
Flexibility		4.73	2.78	6.149	0.001	6.51	2.27	8.501	0.001
Agility		9.39	0.63	53.76	0.000	9.19	0.64	51.98	0.000

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Volume IV, Issue I (2023)
Ethiopian Journal of Sport Science (EJSS)
https://ejss-esa.edu.et/index.php/ejss

Power	30.33	3.80	28.9	0.001	32.2	3.9	29.87	0.001

Note, p < .05* = *Significant and the data in the form of Mean ± SD*

The above table also displays the pre-test and post test results of the 35m test for the experimental group. As indicates in the table the pre-test mean value was found to be 5.89sec with SD=0.17and the post-test mean value was found to be 5.81sec with SD= 0.19 So, the mean value score of 35m test indicated that there is relatively difference between both test on the fitness speed performance after the plyometric training program.

The table above also indicates the pre-test and post test results of the Pro-agility (T-test) test for experimental group. As indicated in the table the pre-test means value was found to be 9.39 sec with SD= 0.63 and the post-test mean value was found to be 9.19 sec with SD= 0.64. Therefore, the mean value score of the Pro-agility (T-test) test shows there is the difference in the performance between the two tests on the fitness of agility after the polymeric training program.

The above table also displayed that the pre-test and post test results of the V sit and reach test for experimental group. From the data, we can see that in the table the pre-test mean value was found to be 4.73 cm with SD= 2.78 and the post-test mean value was found to be 6.51cm with SD= 2.27. However, the mean value score of the V sit and reach test indicates that there was difference on the performance between the two test on the fitness of flexibility polymetric training program.

The table above also revealed that the pre-test and post test results of the Vertical jump test for the experimental group. As shown in the table the pre-test mean the value was found to be 30.33cm with SD=3.80 and the posttest mean value was found to be 32.2cm with SD= 3.9 So, the mean value score of the Vertical jump test indicates that there was a change on the performance between the two tests on the fitness of explosive power after performing the polymetric training program.

The baseline assessment results of control group (n=10) were assessed using the independent t-test for speed, power, flexibility and agility of physical fitness of the participants in the study was presented in the following.

Table 5: pre and post result of speed, flexibility and power test

PRINT ISSN (2960-1657)
ONLINE ISSN (2958-793X)
Volume IV, Issue I (2023)
Ethiopian Journal of Sport Science (EJSS)
https://ejss-esa.edu.et/index.php/ejss

	Pre-test				Post-test			
Dependent variables	**Mean**	**SD**	**T-value**	**Sig**	**Mean**	**SD**	**T-value**	**Sig**
Speed	5.73	0.29	61.33	0.015	5.745	0.28	61.33	0.014
Flexibility	6.9	4.62	4.719	0.001	6.99	4.58	4.655	0.001
Agility	9.15	0.78	35.8	0.007	9.14	0.78	35.87	0.009
Power	32.7	5.14	20.83	0.001	33	5.19	19.931	0.000

The above table also displays the pre-test and post test results of the 35m test for the experimental group. As indicates in the table the pre-test mean value was found to be 5.73sec with SD=0.29and the post-test mean value was found to be 5.745 sec with SD= 0.28 So, the mean value score of 35m test indicated that there is relatively difference between both test on the fitness speed performance without the plyometric training program. Therefore, polymetric training is essential for volleyball players

The table above also indicates the pre-test and post test results of the Pro-agility (T-test) test for experimental group. As indicated in the table the pre-test means value was found to be 9.15 sec with SD= 0.78 and the post-test mean value was found to be 9.14 sec with SD= 0.78. Therefore, the mean value score of the Pro-agility (T-test) test shows there is the little difference in the performance between the two tests on the fitness of agility without the polymetric training program. Therefore, polymetric training is important for handball trainers.

The above table also displayed that the pre-test and post test results of the V sit and reach test for experimental group. From the data, we can see that in the table the pre-test mean value was found to be 6.9 cm with SD= 4.62 and the post-test mean value was found to be 6.99cm with SD= 4.58. However, the mean value score of the V sit and reach test indicates that there was no change on the performance between the two test on the fitness of flexibility without polymetric training program. Therefore, training without polmetric training is not effective.

The table above also revealed that the pre-test and post test results of the Vertical jump test for the experimental group. As shown in the table the pre-test mean the value was found

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Volume IV, Issue I (2023)
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https://ejss-esa.edu.et/index.php/ejss

to be 32.7cm with SD=5.14 and the post test mean value was found to be 33cm with SD= 5.19 So, the mean value score of the Vertical jump test indicates that there was a little change on the performance between the two tests on the fitness of explosive power without performing the polymetric training program. Therefore, training without polymetric training is not importance.

Table 6: The mean difference value and significance level of each test results

Dependent Variables	Test(J)Mean	Test (I)	Mean Value for(I)	MD Respectively	P P(J-I)
Speed	PoT (J) 5.89	PT (I)	5.81	0.08	0.014
Flexibility	PoT (J) 4.73	PT	6.51	-1.78	0.001
Agility	PoT (J) 9.39	PT	9.19	0.2	0.009
Power	PoT (J) 30.33	PT	32.2	-1.87	0.001

Note: PT= Pre-Test, Test, PoT = Post Test, MD- mean difference

Table 6 showed the overall result of each test. It includes the mean, mean difference from one test to another and the significance of post tests relative to the pre test. In all the parameters there were progressive significantly improvements in performance changes which were observed in speed, flexibility agility and power physical fitness variables; that means health related and skill related physical fitness in three days per a week for 12 weeks improvement was shown. But their degree is varying from one variable to the other. When we compare post result of speed was 0.08, flexibility was 1.78, agility was 0.2 and power was 1.87. From this result we conclude that polymetric training shows more improvement than from pre training session to post training session.

Conclusion

Plyometric training program have shown significant improvement on speed performance of Kembata tambaro zone handball project players.

Plyometric training program have shown significant improvement on flexibility performance of Kembata tambaro zone handball project players.

Plyometric training program have shown significant improvement on power performance of Kembata tambaro zone handball project players.

Plyometric training program have shown significant improvement on agility performance of Kembata tambaro zone handball project players.

To improve male handball player's physical fitness, programmed fundamental training method plays a great roll.

The test can predict the current physical fitness performance (power, speed, flexibility and agility) of male Kembata tambaro zone handball project players.

Concerned on the result of finding, male handball players were interested without losing hop for better improvement of performance.

The program has also shown significant change in improving the selected variables of physical fitness components

Acknowledgments

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PRINT ISSN (2960-1657)
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https://ejss-esa.edu.et/index.php/ejss

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