



E-ISSN: 2707-7020  
P-ISSN: 2707-7012  
JSSN 2021; 2(1): 42-47  
Received: 25-11-2021  
Accepted: 28-12-2021

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## The effect of twelve weeks plyometric training on selected physical fitness variables of Hadiya zone handball team

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### Abstract

Plyometric training is an important training program to improving physical fitness of handball project trainees. The study was conducted to find out the effect of twelve weeks Plyometric training on selected physical fitness variables of Hadiya zone team. This study consists of 30 project trainees divided into two groups, each groups consists of 15 trainees. Group I (experimental group-15) group II (control group-15) participants were selected through simple random sampling. The participants were engaged in a supervised plyometric program 3 days/weeks for 12 weeks. The physical fitness variables for the study such as flexibility (sit and reach), explosive power (vertical jump), muscular strength (sit-up), speed (50m run), agility (10x4 shuttle run) and coordination (handball throwing accuracy). Source of data, primary and secondary source of data were used. Tests were taken two times at pre training and post training. Data were analyzed by using SPSS software version 16.0 comparison of mean was done by paired T-test. The result obtained in this study indicated that there was significant improvement in selected physical fitness variables due to the effects of plyometric training after 12 weeks plyometric training program in control group there was no much difference mean value and standard deviation comparing with pre and post test of physical fitness variables in study this study recommended the Plyometric training program is easy to manage, coach may be encouraged to use in training session to produce professional handball players for female players, different age group and different level of handball players.

**Keywords:** Handball, plyometric training and physical fitness

### Introduction

Modern handball is a fast and strenuous body contact sport, characterized by incredible athletic performances by athletes. In fact, modern handball players are able to perform many different moves, jumps, running, change of directions and technical movements in very short time and with an order determined by the tactical situation. Team handball is a complex flashing game, which requires players to have well developed aerobic and anaerobic capacities (Delamarce, *et al.*, 1987). Motor ability, sprinting, jumping, flexibility and throwing velocity represent physical activities that are considered as important aspects of the game and contribute to the high performance of the team. Successful performance requires explosive power of the legs and arms, sprint velocity and kinesthetic feeling in ball control (Sibila, 1997).

Plyometric training involves and uses practicing plyometric movements to enhance tissues abilities and train nerve cells to stimulate a specific pattern of [muscle contraction] so the muscle generates as strong a contraction as possible in the shortest amount of time. A plyometric contraction involves first a rapid muscle lengthening movement (eccentric phase), followed by a short resting phase (amortization phase), then an explosive muscle shortening movement (concentric phase), which enables muscles to work together in doing the particular motion (Sibila, 1997).

Physical fitness is the ability to perform vigorous physical activity. It is not measured in terms of achieving specific motor skills, but rather it is assessed in terms of muscle strength, endurance, and flexibility. The circulatory and respiratory systems are also involved because of their role in supplying muscles with blood and oxygen (Corbin & Lindsey 2007).

Physical Preparation is the level of development of the motor possibilities of the player, obtained through the systematic repetition of the physical exercises. It means the improvement of the motor qualities, the domain of a wide variety of abilities and the development of the morphologic and functional indices of the organism in compliance with

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the requirements of the game. Team handball has proved and established itself as one of the most popular team sports (Clanton & Dwight 1997; Marczinka 1993). It has been established that maximal oxygen uptake (VO<sub>2</sub>max), has been considered to be a fundamental basis for team handball on the international level (Platen 1989; Stone & Kilding 2009).

Plyometric training has many advantages for the improvement of athletes overall performance in various sport events including handball. Plyometric training exercise improve explosive power, muscular strength, speed and quickness, agility, coordination, vertical jump performance, leg strength, muscular power, increase joint awareness and enhance handball skill performances of the athletes.

Plyometric training is widely used in conditioning, power training and in prevention and rehabilitation of injuries in some sports (Roopchand-Martin and Lue-Chin, 2010). Thus, this scientific study had provided practical information that can be used by all handball project players to develop physical fitness through plyometric exercise training. The purpose of the study was to investigate the effects of twelve weeks of plyometric training on selected physical fitness variables of Hadeya Zone handball Team.

- To investigate the effect of plyometric training in Hadeya zone handball team.
- To improve flexibility of Hadeya Zone handball team.
- To improve explosive power of Hadeya Zone handball team.
- To investigate muscular strength and endurance of Hadeya Zone handball team.
- To improve speed of Hadeya Zone handball team.
- To improve agility of Zone handball team.
- To investigate coordination of Hadeya Zone handball team.

### Hypotheses

It was Hypotheses that there would be significant deference between the pre and post test on selected physical fitness variables.

It was Hypotheses that there would be significant deference between the pre and post test on flexibility.

It was Hypotheses that there would be significant deference between the pre and post test on explosive power.

It was Hypotheses that there would be significant deference between the pre and post test on muscular strength and endurance.

1. It was Hypotheses Hypo theses that there would be significant deference between the pre and post test on speed.
2. It was Hypotheses that there would be significant deference between the pre and post test on agility.
3. It was Hypotheses that there would be significant deference between the pre and post test on coordination.
4. It may helps to identify their physical fitness level of Handball team.
5. It may helps to the coaches to identify their physical fitness level of Handball team to coach.
6. It may helps to improve the performance of Handball team for coach.
7. It may help coaches to identify which teams physical fitness level to manage game situation.

### Methods

Total 30 players were selected as the subject for this study. The main purpose of this study is to examine the effect of plyometric training on selected physical fitness variables of handball Team in Hadya zone. The researchers given the training for 12 weeks, 3 days in a week in the evening session for the trainers. The researchers collect the data from the subject before the training and after the training twelve weeks the post-test were taken to observe the changes. Total population of the study is 30 players used in Hadya zone handball team players.

In The total samples selected for this study were 30 handball team. Order to select the samples for this experimental study, purposive sampling techniques was used. The health history and physical readiness questionnaire was prepared with the aim of identifying their health and to know how much they were active in training.

### Reliability

Variables	Correlation coefficient
Flexibility	0.89*
Explosive power	0.76*
Muscular strength and endurance	0.95*
Speed	0.89*
Agility	0.81*
coordination	0.91*

Quantitative data was collected through the appropriate physical fitness test measures.

The physical fitness tests used for this study were:

- Sit-up test (seconds) to measure agility,
- Vertical jump (centimeters reached) to measure explosive power,
- 50 meter acceleration test (seconds) to measure speed,
- Sit and reach box (cm) to measure flexibility,
- Push up (second) to measure muscular strength and endurance and
- Handball throwing accuracy to measure coordination.

The data was recorded by the researcher and they received training for three days about which data and information were collected from the participants. The researcher used the handball field as study area. Handball ball, cones, stopwatch, whistles, and sit and reach box were the facilities used in the training session as well as during the tests.

The study focused on experimental study within 12 weeks of plyometric training exercises to examine effects of plyometric training on selected physical fitness variables in handball team. For this study informal design was used. The study had 30 participants in total. The training program was given to the participants for 12 weeks 3 days per week for 40 – 60 minutes per session. The pre-test was given to check their initial level and after 12 weeks training the post-test were taken to check final performance.

Statistical analysis was completed using the statistical package for the social sciences (SPSS, 16.0 version), collecting data were analysis by using paired T-test to compare the deference between the pre and post test of physical fitness variables of handball players in Hadeya zone handball team. The level of significance was fixed at 0.05 level.

**Data Analysis**

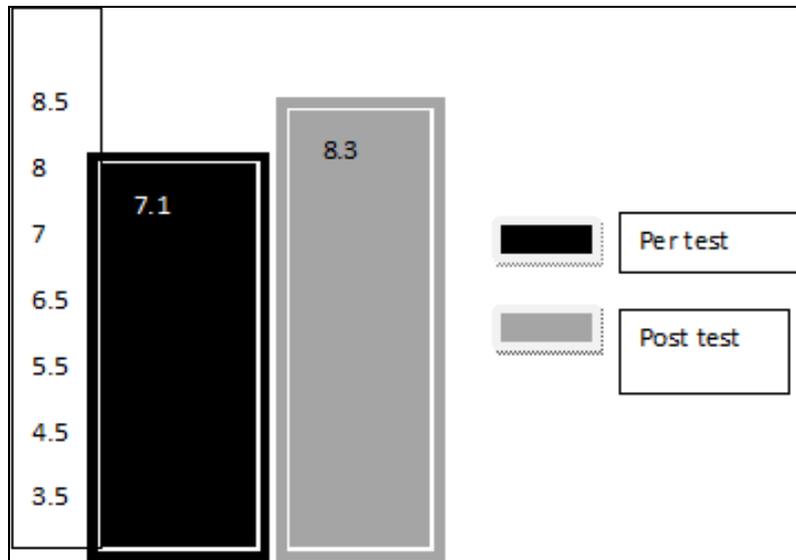
**Table 4.1:** Difference in mean of pre and post test on flexibility (centimeter)

12 week plyometric training	Number of participants	Pre test mean	Post test mean	Mean difference	Std. deviation	Std. error of mean difference	DF	"t" ratio
Hadya zone handball team	30	7.1733	8.3867	1.21333	.24162	.06239	14	19.449*

\*significant was fixed at 0.05 level with 14 degree of freedom= 2.145

Table 1 shows that the pre test and post test mean of the flexibility were 7.1733 and 8.3867 respectively. The calculated "t" value was 19.449 which was higher than the table value of 0.05 level. This indicated that there was

significant difference in the pre test when comparing to post test on flexibility. The level of flexibility increasing after the plyometric training. The research hypothesis has been accepted.



**Fig 4.1:** Flexibility

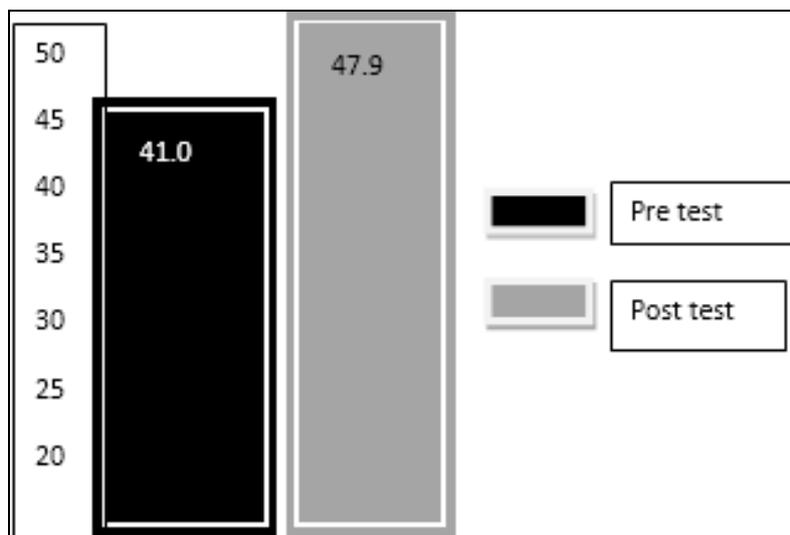
**Table 4.2:** Difference in mean of pre and post test on Explosive power (centimeter)

12 week plyometric training	Number of participants	Pre test mean	Post test mean	Mean difference	Std. deviation	Std. error of mean difference	DF	"t" ratio
Hadya zone handball team	30	41.000	47.9333	-6.9333	4.4636	1.1525	14	6.016*

\*significant was fixed at 0.05 level with 14 degree of freedom= 2.145

Table 2 shows that the pre test and post test mean of the explosive power were 41.000 and 47.9333 respectively. The calculated "t" value was 6.016 which was higher than the table value of 0.05 level. This indicated that there was

significant difference in the pre test when comparing to post test on explosive power. The level of explosive power increasing after the plyometric training. The research hypothesis has been accepted.



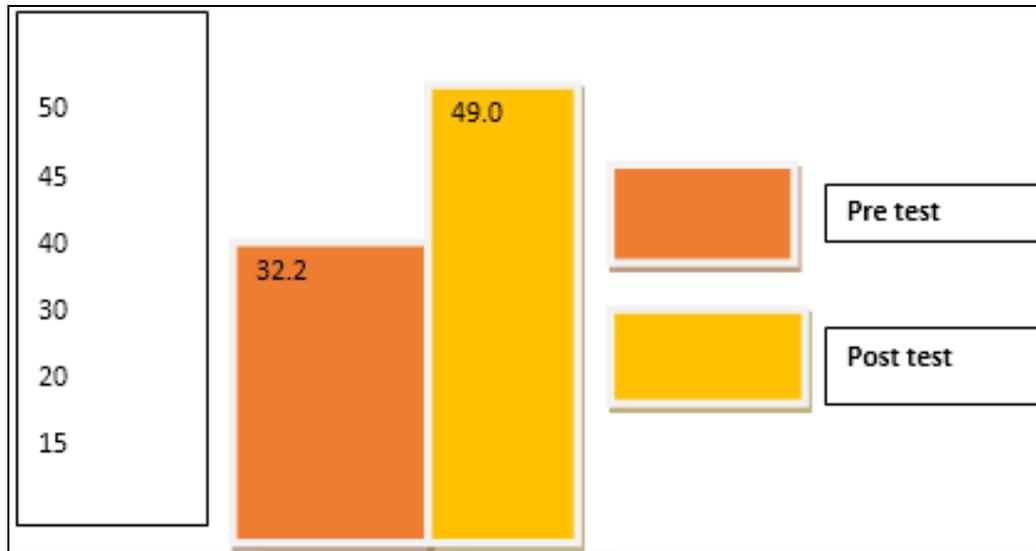
**Fig 4.2:** Explosive power

**Table 4.2:** Difference in mean of pre and post test on muscular strength and Endurance (number)

12 week plyometric training	Number of participants	Pre test mean	Post test mean	Mean difference	Std. deviation	Std. error of mean difference	DF	"t" ratio
Hadya zone handball team	30	32.33	39.00	-6.666	2.2886	.59094	14	11.28*

Table 3 shows that the pre and post test mean of muscular strength and endurance were 32.33 and 39.00 respectively. The calculated "t" value was 11.28 which were higher than the table value 0.05 level. This indicated that there significant difference in the pre test when comparing to post

test on muscular strength and endurance. The level of muscular strength and endurance increasing after the plyometric training. The research hypothesis has been accepted.



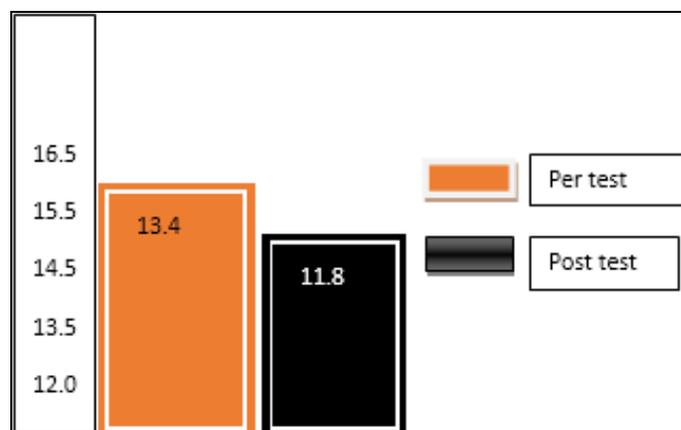
**Fig 4.3:** Muscular strength and endurance

**Table 4.3:** Difference in mean of pre and post on speed (second)

12 week plyometric training	Number of participants	Pre test mean	Post test mean	Mean difference	Std. deviation	Std. error of mean difference	DF	"t" ratio
Hadya zone handball team	30	13.4667	11.800	1.6667	.72375	.18687	14	8.91*

Table 4.4. Shows that the pre test and post test mean of the speed 13.4667 and 11.800. The calculated "t" value was 8.919. Which was higher than the table value of 0.05 level. This indicated that there was a significant difference in the

pre and post test on speed before plyometric training and after plyometric training. The research hypothesis has been accepted.



**Fig 4.4:** Speed

**Table 4.4:** Difference in mean of pre and post on agility (second)

12 week plyometric training	Number of participants	Pre test mean	Post test mean	Mean difference	Std. deviation	Std. error of mean difference	DF	"t" ratio
Hadya zone handball team	30	16.833	13.9133	2.9200	2.2922	.5918	14	4.93*

\*significant was fixed at 0.05 level of with 14 degree of freedom=2.145

Table 5 shows that the pre test and post test mean of the agility were 16.833 and 13.9133 respectively. The calculated "t" value was 4.934 which were higher than the table value

of 0.05 levels. This indicated that there was a significant difference in the pre and post test on agility. The research hypothesis has been accepted.

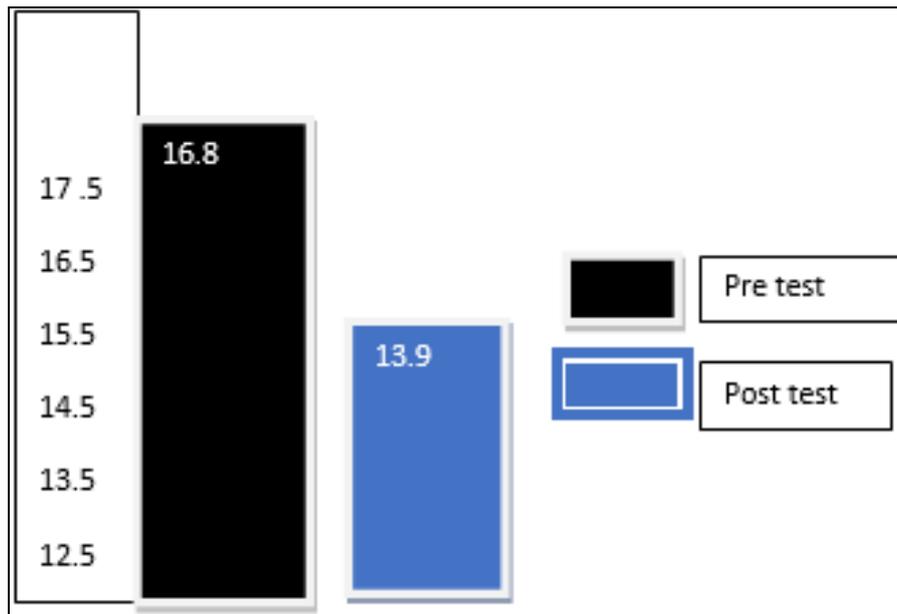


Fig 4.5: Agility

Table 4.5: Coordination difference in mean of pre and post test on coordination (number)

12 week plyometric training	Number of participant	Pre test mean	Post test mean	Mean difference	Std. deviation	Std. error of mean difference	DF	"t" ratio
Hadya zone handball team	30	13.000	16.1333	-3.13333	1.4573	.3762	14	8.32*

\* Significant was fixed at 0.05 level of with 14 degree of freedom=2.145

Table 6 shows that the pre test and post test mean of the coordination were 13.00 and 16.1333 respectively. The calculated "t" value was 8.327 which was higher than the table value of 0.05 level. This indicated that there was a significant difference in the pre and post test on coordination. The research hypothesis has been accepted.

**Conclusion**

The result of the study related that there was significant difference in the pre and post test on selected physical fitness variables such as flexibility, explosive power, agility, muscular strength and endurance, speed and coordination.

**Recommendation**

Based on major findings and conclusions of the study, it is important to state the following points as a recommendation. It is highly expected from sport professionals and related fields to guide and educate on the importance and value of plyometric training programs to achieve physical fitness performance.

Since plyometric training program is easy to manage, coach may be encouraged to use in their training session to produce professional handball players.

Plyometric training should be in all trainings that involve the development of physical fitness for competition or rehabilitation purpose.

Effects should be taken to the benefits of plyometric training exercises Hadya Zone handball project trainees.

Further research on effect of plyometric training program should focus on handball.

project trainees for female and other age group. Further research on effect of plyometric training program should focus on for other games.

Further research on effect of plyometric training program should focus on all the level players.

**Acknowledgements**

The authors would like to acknowledge all of the contributors for their efforts in the process of publishing this article.

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