CHAPTER - 1
INTRODUCTION

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1.0 INTRODUCTION

Plyometrics: Plyometric training is a form of training that is used to help develop and enhance explosive power, which is a vital component in a number of athletic performances. This training method is meant to be used with other power development methods in a complete training program to improve the relationship between maximum strength and explosive power\(^1\). In order to understand how plyometric training works or why it is so effective, one must understand what is meant by “power.” Power is similar to strength but with the time factor included, meaning speed. So power is relationship between strength and speed and deals with the ability to perform a certain activity or movement the fastest\(^2\). Most explosive movements do not take that long. Therefore the importance is placed on the ability to generate the highest possible force in the shortest period of time, and at the same time, reducing or stopping this force at the end of the action\(^3\). Even though it is not fully understood how plyometric training actually works, it is believed that the basic principle, which is behind it, is based on the idea of the rapid “stretch reflex.” This stretch reflex is the result from the rapid loading (stretching) and unloading (unstretching) of the same muscle fibers. An example of the stretch reflex is when a right-handed golfer begins his/her back swing. In performing

\(^1\) Radcliffe, J.C., and Farentinos R.C., *Plyometrics Explosive Power Training*. 1985, Champaign, IL: Human Kinetics publishers Champaign, IL.
\(^2\) Gambetta Vern- *Plyometrics : Myths and Misconceptions*
\(^3\) *Ibid.*
this movement, the biceps muscles of his/her left arm contracts while the triceps muscles in the same arm are stretched. Then when the forward swing is begun, the triceps contracts in response to its rapid stretching which triggered the stretch reflex. In Plyometrics, training enhances the tolerance of the muscle for increased stretch loads. This increased tolerance develops efficiency in the stretch shortening cycle of muscle action. During the stretching, also known as the eccentric lengthening phase of muscle action, a greater amount of elastic energy is stored in the muscle. This elastic energy is then reused in the following concentric action to make it stronger. The modern history of Plyometrics is somewhat brief but not relatively new. This technique originated in Russia and Eastern Europe in the mid-1960s. The Soviets were very successful in the use of Plyometrics in their training regimes, especially in track and field. Yuri Verhoshansky, a Russian coach whose success with jumpers is legendary, could very well be called the “Father of Plyometrics.” He tried and succeeded in increasing his athletes’ reactive abilities by experimenting with exercises like the depth jump. He has been the leading researcher and coach most recognized with the spread of Plyometrics. He also has been credited with most of the forms of plyometric training that are still used today. It wasn’t until 1975, when Fred Wilt, former Olympic runner, used the term Plyometrics in the United States. The term “plyometrics” itself originates from the Greek words, “plio” and “metric,” which means more and measure, respectively. Here in the U.S., the acceptance of plyometric training was initially slow. Most coaches, until now,

4Radciffe, J C , and Farentinos R C , Plyometrics Explosive Power Training, 1985, Champaign, IL: Human Kinetics publishers Champaign, IL
5Radciffe, J C , and Farentinos R C , Plyometrics Explosive Power Training, 1985, Champaign, IL Human Kinetics publishers Champaign, IL
believed that it hindered, not helped performance. That reasoning could be because they did not understand how to apply it to training. Over the years, Plyometrics has been used more and more by coaches due to its significant increase in speed & explosiveness. Plyometric training exercises are now being used in almost any and every sport which requires power, speed, and/or strength such as football, basketball, weightlifting, soccer, baseball, volleyball, etc. both professionally and at the amateur levels. Even though Plyometrics have a primary role in sports training it is also very widely used in many rehabilitation programs. Despite the increase in knowledge over the years, there is still misunderstanding concerning the application of Plyometrics. There have been a number of exaggerated claims and good amount of undeserved blame for injury and over training. Just as in training with any other training program, there are a number of general guidelines, which should be followed in order to achieve proper and effective performance. The first key aspect of plyometric training is warming up/cooling down by jogging, stretching, and simple calisthenics. This exercise is important because many plyometric exercises involve agility and flexibility. The next key, high intensity, is critical because the quickness of execution in the drill determines the training results. When a muscle is stretched quickly, a faster rate of muscle stretch will provide a quicker reflex response and in turn will provide the maximum training effects. "Performances in sporting activities also require maximal efforts of high quality in order to be effective. It is this level of effort that plyometric training prepares the athlete to perform at on a consistent basis." Next is progressive overload, which is the proper

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overload...regulated by controlling the heights from which athletes drop, the weights used, and the distances covered\textsuperscript{9}. The use of ankle weights, chest and wrist weights are not recommended with Plyometrics as these and other weights will decrease the reaction of the nerve muscle response\textsuperscript{10}. Improper resistance overload is the cause of most injuries in plyometric training.

Another element is maximizing the force while at the same time minimizing the time it takes to perform an activity. The faster a movement is achieved, the more power is generated from that action. Performing the optimal number of repetition and sets is another key guideline. In Plyometrics, most of the exercises can be grouped into either intense single-response or multiple-response drills. As with most training programs, the repetitions range from 8-10 for the more demanding drills, with higher repetitions for the less strenuous exercises. The sets range from 3-6 with more sets for the less demanding drills which focus more on overall speed and stamina, and fewer sets for the drill which emphasize single intense actions such as initial bursts of motion, releases, and take-offs. Resting properly is an aspect that is usually overlooked when performing Plyometrics. Resting 1-2 minutes between sets and 2-3 days is necessary to allow the body's muscles and ligaments to recover and obtain optimal results. Improper rest can overstress the muscles, tendons or ligaments and lead to fatigue, minimal efficiency, and sometimes injury. Building a proper strength base before beginning a Plyometrics training program is another important guideline. Because Plyometrics are meant to be combined with other training programs, it is encouraged that it compliments a weight-training program, which focuses on strength. Novices


\textsuperscript{10}Constello, Frank \textit{Bounding to The Top: The Complex Book on Plyometric Training}. 
should perform moderate drills like ground level jumps and hops. Then as strength and power increase, so should the level of difficulty and intensity. The final major guideline to follow is to personalize the training program to satisfy your goals. The training exercises should be specified to the athlete’s individual sport or activity. Along with this is the monitoring of progression or improvement in power, speed, and/or strength over regular periods. Otherwise, if there is no improvement, then the program needs to be altered by either increasing/decreasing the intensity or overload. Other little but just as important things to consider and focus on include landing properly, following through on movements, maintaining balance and center of gravity, training age, and skill. As with all training programs, Plyometrics has its considerations. Plyometric training has tremendous potential as a training program for all sports that require explosive power, but if improperly introduced and taught it is a high-risk training activity. To achieve the best results it is necessary to follow the general guidelines. One of the most important being that they should never be performed to failure. Training to failure with Plyometrics is counterproductive and very dangerous. Since there are so many exercises, which can be classified as plyometric, some can be considered dangerous. There is a higher risk of injury due to the heavy loads applied to the muscle and tendons when compared to traditional weight training. Finally, one of the biggest cases against Plyometrics is that there are very few well-controlled studies that have been conducted to identify the ideal protocol for plyometric training and its effectiveness as part of a training cycle. Also a number of studies have also produced inconclusive results.


12 Ibid
Because the research on this training program is fairly new, most of the case support for Plyometrics includes testimonials from coaches and athletes and some studies\textsuperscript{13}. Overall, plyometric training had improved tremendously since it was first introduced, and when performed correctly and gradually introduced with other complete training programs, it has shown that it can be productive and done with a small risk of injury.

1.1 SIGNIFICANCE OF THE STUDY:

The study of plyometrics may help the physical education teachers as well as coaches in training their players as well as athletes. This study may also help the coaches to develop the motor qualities of the players and also might provide criteria for selecting the players.

1.2 STATEMENT OF THE PROBLEM:

A Comparative Effect of Plyometrics and Weight Training on Physical Performance.

1.3 DEFINITION OF TERMS:

1) Plyometrics Training:

i) Plyometrics Exercise: An exercise that involves a jumping movement eg. skipping push-ups, etc.

ii) Plyometrics can be defined as a series of exercises that stretches the muscles of body like a rubber-band and then contracts them quickly.

iii) Plyometrics are exercises or drills aimed at linking strength with speed of movement power.

iv) Exercises that are characterized bye powerful muscular contractions in response dynamic loading or stretching of the involved muscles.

\textsuperscript{13}Radciffe, J.C., and RC farentinos \textit{Plyometrics Explosive Power Training}. 1985, Champaign, IL Human Kinetics
2) **Weight Training:**

i) Weight training is a technique for developing muscular strength and endurance by progressively lifting increasing amount of weight.

ii) A physical exercise involving lifting weights to improve muscle performance.

iii) The activity of lifting heavy objects for exercises, especially to improve the strength and the appearance of the body.

3) **Physical performance:**

The physical performance means a sum of the score of the events selected for the study.

4) **Speed**: It is the performance pre-requisite to do motor actions under the given condition in unit time.

5) **Strength**: Strength is the ability to overcome resistance or to act against resistance.

6) **Endurance**: Endurance is the ability to do sports movements, with desired quality and speed, render conditions of fatigue.

7) **Aerobic Capacity**: The aerobic capacity is the maximum amount of oxygen which can be consumed by working muscles in one minute.

8) **Flexibility**: Flexibility can be defined as the ability to execute movements with greater amplitude or range.

9) **Reaction Ability**: It is the ability to react quickly and effectively to various signals and changing situations.

10) **Agility**: The ability of the body or the parts of the organism to change directions rapidly and accurately.
1.4 **OBJECTIVES OF THE STUDY:**

1. To examine the physical performance of pre-test and post-test training programme in selected groups.
2. To study the physical performance of pre-test and post-test in plyometric training programme of Group-A.
3. To study the physical performance of pre-test and post-test in weight training of Group-B.
4. To study the physical performance of pre- and post-test in without any training programme to Group-C and this group is known as control group.
5. To examine the relationship between the plyometric training programme and weight training programme of pre-test and post-test to respondents.
6. To study the impact of training among the groups under study.

1.5 **HYPOTHESIS OF THE STUDY:**

Plyometric exercise training will not help in development of physical performance of a player as compared to weight training.

**Ho1** There is no significant difference between the mean score of pre-test and post-test of plyometric training group of the total score of physical performance.

**Ho2** : There is no significant difference between the mean score of pre-test and post-test of plyometric training group of the score of physical performance in terms of 6x10 MTS Shuttle Run.

**Ho3** : There is no significant difference between the mean score of pre-test and post-test of plyometric training group of the score of physical performance in terms of Medicine Ball Put.
Ho4: There is no significant difference between the mean score of pre-test and post-test of plyometric training group of the score of physical performance in terms of Zig Zag Run.

Ho5: There is no significant difference between the mean score of pre-test and post-test of plyometric training group of the score of physical performance in terms of Vertical Jump.

Ho6: There is no significant difference between the mean score of pre-test and post-test of plyometric training group of the score of physical performance in terms of Standing Broad Jump.

Ho7: There is no significant difference between the mean score of pre-test and post-test of plyometric training group of the score of physical performance in terms of 800 MTS Run.

Ho8: There is no significant difference between the mean score of pre-test and post-test of weight training group of the total score of physical performance.

Ho9: There is no significant difference between the mean score of pre-test and post-test of weight training group of the score of physical performance in terms of 6x10 MTS Shuttle Run.

Ho10: There is no significant difference between the mean score of pre-test and post-test of weight training group of the score of physical performance in terms of Medicine Ball Put.

Ho11: There is no significant difference between the mean score of pre-test and post-test of weight training group of the score of physical performance in terms of Zig Zag Run.

Ho12: There is no significant difference between the mean score of pre-test and post-test of weight training group of the score of physical performance in terms of Vertical jump.
Ho13 There is no significant difference between the mean score of pre-test and post-test of weight training group of the score of physical performance in terms of Standing Broad Jump

Ho14 There is no significant difference between the mean score of pre-test and post-test of weight training group of the score of physical performance in terms of 800 MTS Run

Ho15 There is no significant difference between the mean score of pre-test and post-test of control group of the total score of physical performance.

Ho16 There is no significant difference between the mean score of pre-test and post-test of control group of the score of physical performance in terms of 6x10 MTS Shuttle Run.

Ho17 There is no significant difference between the mean score of pre-test and post-test of control group of the score of physical performance in terms of Medicine Ball Put

Ho18 There is no significant difference between the mean score of pre-test and post-test of control group of the score of physical performance in terms of Zig Zag Run

Ho19 There is no significant difference between the mean score of pre-test and post-test of control group of the score of physical performance in terms of Vertical Jump

Ho20 There is no significant difference between the mean score of pre-test and post-test of control group of the score of physical performance in terms of Standing Broad Jump
Ho21 There is no significant difference between the mean score of pre-test and post-test of control group of the score of physical performance in terms of 800 MTS Run

Ho22 There is no significant difference between the pre-test of Plyometric training group (Group-A) and Weight training group (Group-B) of the total score of physical performance.

Ho23 There is no significant difference between the pre-test of Plyometric training group (Group-A) and Control group (Group-C) of the total score of physical performance.

Ho24 There is no significant difference between the pre-test of Weight training group (Group-B) and Control group (Group-C) of the total score of physical performance.

Ho25 There is no significant difference between the post-test of Plyometric training group (Group-A) and Weight training group (Group-B) of the total score of physical performance.

Ho26 There is no significant difference between the post-test of Plyometric training group (Group-A) and Control group (Group-C) of the total score of physical performance.

Ho27 There is no significant difference between the post-test of Weight training group (Group-B) and Control group (Group-C) of the total score of physical performance.

1.6 LIMITATION OF THE STUDY:

1) The study has been done by the available information from the coaches, books, journals and manuals available in the library of
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different physical training institutes. Extensive study being undertaken by means of experiments can be considered as limitations.

2) Food, education and the recreation activities of the subjects were kept under control.

3) Socio-economic background of subject is not possible to control.

4) Effect of other training is not controlled.

1.7 SCHEME OF CHAPTERIZATION:

The following scheme of chapterization:

Chapter - II: Review of Related Literature

This chapter presents a review of the previous research studies.

Chapter - III: Methodology

This chapter deals with research method include planning and procedure of the research work, training method, test method, test administration and details of various test method.

Chapter - IV: Analysis of Data

This chapter deals with the procedure of the present test method. The data analysed with each hypothecation. The results established with the help of 't' score. The presentation in the form of tabulation work and chart work.

Chapter - V: Summary, Conclusion and Recommendations

This chapter presented a summary of the whole study. The conclusions presents with the help of hypothecation of the present study and the recommendation for the further research work.