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EFFECTS OF PLYOMETRIC TRAINING ON LOWER LIMBS FOR PRE-UNIVERSITY COLLEGE BOYS

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Abstract:-This study was designed to investigate the effects of plyometric training to lower limbs for Pre-University college boys. For this purpose, forty men students studying various section in Mount carnal college Bangalore, were selected as subjects at random and they were divided randomly into two groups of twenty each, namely plyometric training to lower limbs group and control group.

Keywords: The following variables:- Leg strength, Explosive Strength in vertical direction, Explosive Strength in Horizontal direction.

INTRODUCTION

Sports as an activity offers an opportunity for self-knowledge, self expression, and fulfillment: personal achievement, skill acquisition and demonstration of ability; social interaction, enjoyment, good health and well-being. It promotes involvement, integration of society, especially when sports activities have accepted as a integral part of the culture of every society in every nation .

The sports depending upon the aim to be achieved can be classified in to various areas: PU College sports, rehabilitations sports, recreation and fitness sports, industry sports and performance sports. Each area of sports caters to different section of the society and has different aims. The sports area which has gained immense importance in recent times, and has made sports more popular and has contributed much towards the development of organized sports science I the performance sports.

Performances outcomes are more likely to be achieved when what is done prior to and during a competition. They have been planned; practiced and shown to be successful. In contests, an athlete should never use new approaches techniques, or strategies, without first being tested, refined and practiced .

Over the years physical fitness has become the well-built foundation of a structure that supports many concrete blocks on it which represents all the activities that make life worth living: intellectual life, spiritual life, love, life and social life.

The world training has been a part of human language since ancient times. It denotes the process of preparation for some task. This process invariably extents to a number of days and even months and years. The term 'Training' is widely used in sports. There is however, some disagreement among sports coaches and among science scientists regarding the exact meaning of this word. Some exports, exceptionally belonging to sports medicine, understand sports training as basically doing physical exercises. Several terms used in training. Ex strength training, interval training technical training reflects this line of thinking .

The major objective in training is to cause biological adaptations in any to improve performance in a specific task, to enhance physiological improvement effectively and bring about a change. Specific exercise and overload must be followed, by exercising at a level above normal a variety of training adaptations take place in the body that makes it to function more efficiently. Numerous training procedures are in practice to improve each and every physical and motor fitness.

Plyometric training may improve physiological performance in the following ways. Elastic strengthening loads the elastic components of the muscular system and thereby increase in the tension of the resulted .

Explosive strength (or) power is seen in quick movement when body weight is propelled either upward (or)

forward it is characterized by one short burst of energy and is seen in such tests as the standing long jump and vertical jump. It has been known for a long time that the amount of energy transformed exercise is proportional to the oxygen consumption.

STATEMENT OF THE PROBLEM

The present study was designed to investigate the effect of plyometric Training on lower limbs of Pre-University College boys.

HYPOTHESIS

It has been scientifically accepted that any systemic training over a continuous period of time would produce changes in athletic qualities.

Based in this concept, the following Hypothesis was drawn.

- 1) There would be significant improvement on selected variables due effect of Polymeric Training on lower limbs for Pre-University College boys.
- 2) There would significant differences on the selected variables due effect of polymeric Training on lower limbs for Pre-University College boys.

DELIMITATIONS

The study was delimited to the following factors.

- 1) To achieve the purpose of the study, forty boys' students studying Mount Carmel Pre-University college, Bangalore, Karnataka, India during the year 2014-15 were selected as subjects.
- 2) The age of the subjects ranged from 17 to 19 years.
- 3) The subjects were divided at random into two groups of twenty each (N=20). Group I underwent plyometric training on lower limbs and group acted as control.
- 4) The duration of the training period was restricted to twelve weeks and the number of the sessions per week as confined to three.
- 5) The dependent variables leg strength, Explosive strength in vertical direction Explosive strength in Horizontal direction, Elastic power and Anaerobic were selected for this study.
- 6) The data were collected prior to and immediately, after the training period.

LIMITATIONS

The following limitations were considered while interpreting the results of the study.

- 1) The previous experience of the subjects in the field of sports and games, which might influence the training and data, was not considered,
- 2) Psychological factors, food habits, rest period, life style etc., Could not be controlled.
- 3) The weather condition such as atmospheric temperature, humidity and meteorological factors during testing and training periods were also not considered.
- 4) Though the subjects were motivated verbally no attempt was made to differentiate the motivations levels during the period of training and testing.

DEFINITION OF OPERATIONAL TERMS

TRAINING

Training is a systemic process of repetitive progressive exercise or workout involving the learning process and acclimatization.

PLYOMETRIC TRAINING

Plyometric Training refers to exercises that enable a muscle to reach maximal strength in as short a time as possible.

LEG STRENGTH

Leg Strength is the maximum force that can be generated with the legs.

EXPLOSIVE POWER

Explosive power (Vertical and Horizontal) are the capacities of the leg to release maximum muscular force in the shortest time as in executing a vertical jump and broad jump.

SIGNIFICANCE OF THE STUDY

Physical education and sports scientists have been constantly examining sports performances in relation to the individual's skill and fitness standards. Then try to discover those factors that contribute to high performance so that they could be utilized in the practical aspects and training.

- 1) The ultimate goal of research in physical education is to help coaches and physical education train their athletes and players based on new concepts to improve their performance.
- 2) The study would add new knowledge in the area of sports Training.
- 3) The study would provide guidance to physical education and Coaches to prepare training schedules.

REVIEW OF RELATED LITERATURE

The purpose of the study was to investigate the effects of plyometric training to lower limbs for Pre-University college boys. The large numbers of studies were pursued and some of the most important and latest review presented in this chapter for a clear understanding.

Miller investigated the contention that a programme of plyometric exercise would improve the vertical jump performance of adult females. For this purpose 24 female physical education students acted as subjects and performed a standardized vertical jump test prior to being assigned to one of the two groups. Group I trained with plyometric exercise and group II acted as control. Subjects in the plyometric group were trained once a week for eight weeks. They performed five sets of 10 repetitions of depth jumps from a height of 50 cm. All subjects were retested at the end of the eight week period. Results showed that one group had improved their vertical jump performance while more than 5 cm ($d=2.898$, $df=22$, $p<1/01$). While group II should know significant changes. The investigator concluded that a gradual introduction to the plyometric likely to cause injuries.

According to Jeffrey changes in muscles power output and fiber characteristics following a 3 d.wk, 8 week plyometric and aerobic exercise programme. Where specified in male subjects ($n=19$) were randomly assigned to the either group 1 (plyometric training) or group 2 (plyometric training and aerobic exercise). The plyometric training consisted of vertical jumping and bounding, depth jumping. Aerobic exercise (at 70% maximum heart rate) was formed for 20 minutes immediately following the plyometric work outs. Muscle biopsies were collected from the laterals before and after training. Type 1 and Type 2 fibers were identified and cross-sectional areas calculated. Peak muscle power output measured using countermovement vertical jump significantly increased from pre training to post training for group 1 (2.8%) and Group 2 (2.5%). Each group demonstrated a significant increase in fiber area from pertaining to post training for type 1 (group 1, 4.4%; group 2, 6.1%) and type II (group 1, 7.8%; group II 6.8%). Following plyometric training there is an increased power output that may in part be related to muscle fiber size.

METHODOLOGY

In this chapter, procedures and methods applied in selection of subjects, selection of variables selection of tests competence of the tester, reliability of the instruments, reliability of the data, orientation to the subjects, pilot study, training programme, collection of data, administration of the tests, experimental design and statistical technique are presented.

Selection of Variables:

The following variables were selected for the study.

- 1) Leg strength
- 2) Explosive Strength in vertical direction
- 3) Explosive Strength in Horizontal direction

Selection of Tests

The present study was under taken to find the effects of plyometric training to lower limbs on leg strength, explosive power in vertical direction, explosive power in Horizontal direction elastic power. As per the available literature the following standardized tests were used to collect relevant data on the following standardized tests were used to collect relevant data on the selected dependent variables and they are presented in table 1.

**TABLE – 1
TESTS SELECTION**

Sl No	Criterion variables	Test Items	Unit of Measurement
1	Leg Strength	Leg Strength Test (Leg Dynamometer)	In Kilograms
2	Explosive power in Vertical Direction	Vertical Jump test	In Meters

Reliability of the instruments

Before the commence of experiment the reliability of the data was established. To same testing personal by using the same equipment under indented conditions, tested all the variables selected in the present investigation twice for the same subject. The coefficient of correlations computed from each variable was found to be significant at 0.1 levels.

**TABLE – 2
INTRA CLASS CO-EFFICIENT OF CORRELATION ON
SELECTED DEPENDENT VARIABLES**

Sl No	Criterion Variables	'R' Value
1	Leg Strength	0.87*
2	Explosive power in vertical Direction	0.91*
3	Explosive power in Horizontal Direction	0.94*

•Significant at 0.01 level of confidence.
(Table value required for significance at 0.01 level of confidence is 0.767)

Since the obtained 'R' values were much higher than the required value, the data were accepted as reliable in term of instrument, tester and the subjects.

ANALYSIS AND INTERPRETATION OF THE DATA

This study was designed to investigate the effects of plyometric training to lower limbs for Pre-University college boys. For this purpose, forty men students studying various section in Mount carnal college Bangalore, were selected as subjects at random and they were divided randomly into two groups of twenty each, namely plyometric training to lower limbs group and control group.

The data obtained from the experimental group before and after the experimental period were statistical analyzed with analysis of covariance (ANCOVA). The level of confidence was fixed at 0.05 level for all the cases.

ANALYSIS OF THE DATA

The influence of independent variables on each criterion variables are analyzed and presented below.

LEG STRENGTH

The Analysis of Covariance (ANCOVA) on leg strength of plyometric training to lower limbs group and control group have been analyzed and presented in Table – 3

TABLE – 3
ANALYSIS OF COVARIANCE ON LEG STRENGTH OF PLYOMETRIC TRAINING TO LOWER LIMBS GROUP AND CONTROL GROUP.

Adjusted post test Means		Source of Variance	Sum of Squares	df	Mean Squares	'F' Ratio
Plyometric Training to lower limbs group	Control group					
69.61	66.69	Between with in	84.65 29.62	1 37	84.65 0.8	105.73*

•Significant at 0.05 level of confidence
 (Leg Strength Scores in Kilograms)
 (The table value required for significance at 0.05 level with df 1 and 37 is 4.11)

Table 4 shows that the adjusted post test mean value of leg strength for plyometric training to lower limbs group and control group are 69.61 and 66.69 respectively. The obtained F – ratio of 105.73 for adjusted post test mean is more than the table value of 4.11 for df 1 and 37 required for significant at 0.05 level of confidence.

The result of the study indicate the there are significant differences among the adjusted post test means of plyometric Training to lower limbs groups on the development of leg strength.

It may be concluded that plyometric training to lower limbs group is better control group and improving leg strength.

The mean values of plyometric Training to lower limbs group and control group on leg strength are graphically represented in the figure – 1.

The adjusted post test mean values of plyometric Training to lower limbs group and control group on leg strength are graphically represented in the figure – 2.

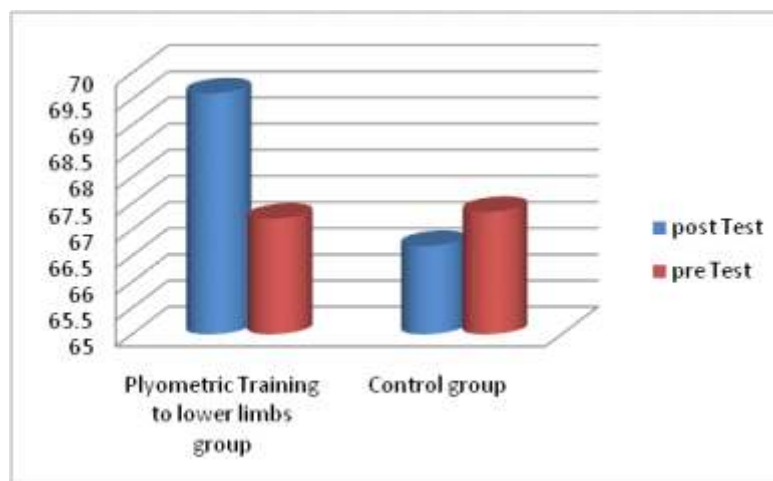


FIGURE – 1 : MEAN VALUES OF PLYOMETRIC TRAINING ON LOWER LIMBS GROUP AND CONTROL GROUP ON LEG STRENGTH.

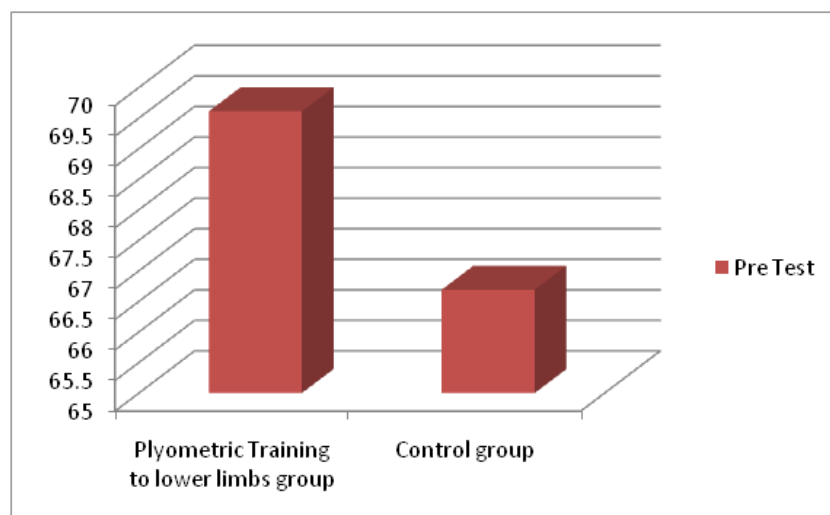


FIGURE – 2 : ADJUSTED POST TEST MEAN VALUES OF PLYOMETRIC TRAINING ON LOWER LIMBS AND CONTROL GROUP ON LEG STRENGTH.

EXPLOSIVE POWER IN VERTICAL DIRECTION

The analysis of covariance (ANCOVA) on explosive power in vertical direction of plyometric training to lower limbs group and control group have been analyzed and presented in table – 4

**TABLE – 4
ANALYSIS OF COVARIANCE ON EXPLOSIVE POWER IN VERTICAL DIRECTION OF PLYOMETRIC TRAINING TO LOWER LIMBS GROUP AND CONTROL GROUP**

Adjusted post test Means		Source of Variance	Sum of Squares	df	Mean Squares	'F' Ratio
Plyometric Training to lower limbs group	Control group					
0.43	0.39	Between within	0.01 0.01	1 37	0.01 0.00027	37.04*

•Significant at 0.05 level of confidence
(Explosive power in vertical Direction scores in meters)
(The table value required for significance at 0.05 levels with df 1 and 37 is 4.11)

Table V show that the adjusted post test mean value of explosive power in vertical direction for plyometric training to lower limbs group and control group are 0.43 and 0.39 respectively. The obtained F-ratio of 37.04 for adjust post test mean is more than the table value of 4.11 for df 1 and 37 required for significant at 0.05 level of confidence.

The results of the study indicate that there are significant differences among the adjusted post test means of plyometric Training to lower limbs group on the development of explosive power in vertical direction.

It may be concluded that plyometric Training to lower limbs group is better control group in improving explosive power in vertical direction.

The mean values of pluometric Training to lower limbs group and control group on explosive power in vertical are graphically represented in the Figure – 3.

The adjusted post test mean values of plyometric Training to lower limbs group and control group on

explosive power in vertical direction are graphically represented in the figure –4.

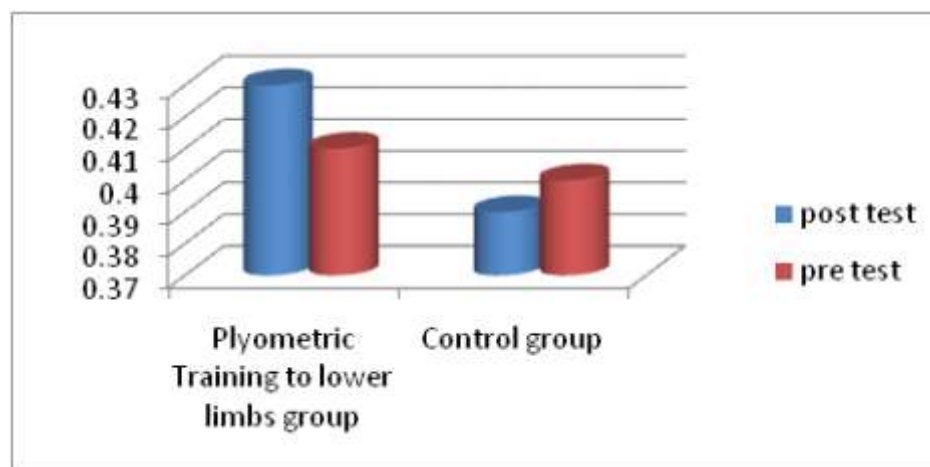


FIGURE – 3 : MEAN VALUES OF PLYOMETRIC TRAINING ON LOWER LIMBS GROUP AND CONTROL GROUP ON EXPLOAIVE POWER IN VERTICAL STRENGTH

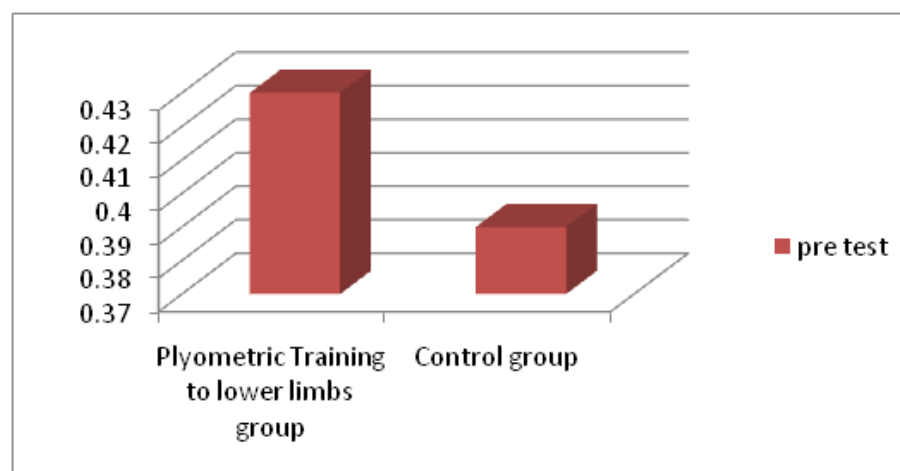


FIGURE –4: ADJUSTED POST TEST MEAN VALUES OF PLYOMETRIC TRAINING ON LOWER LIMBS AND CONTROL GROUP ON EXPLOAIVE POWER IN VERTICAL STRENGTH.

EXPLOSIVE STRENGTH IN HORIZONTAL DIRECTION

The analysis of covariance (ANOCOVA) on explosive power in horizontal direction of Plyometric Training to lower limbs group and control group have been analyzed and presented in table – 5

TABLE – 5
ANALYSIS OF COVARIANCE ON EXPLOSIVE POWER IN VERTICAL HORIZONTAL DIRECTION OF PLYOMETRIC TRAINING TO LOWER LIMBS GROUP AND CONTROL GROUP

Adjusted post test Means		Source of Variance	Sum Squares	df	Mean Squares	'F' Ratio
Plyometric Training to lower limbs group	Control group					
1.94	1.79	Between with in	0.23	1	0.23	76.67*
			0.11	37	0.0003	

EFFECTS OF PLYOMETRIC TRAINING ON LOWER LIMBS FOR PRE-UNIVERSITY COLLEGE BOYS

•Significant at 0.05 level of confidence
 (Explosive power in horizontal direction scores in meters)
 (The table value required for significance at 0.05 levels with df 1 and 37 is 4.11)

Table VI shows that the adjusted post test mean value of explosive power in horizontal Direction for Plyometric training to lower limbs group and control group are 1.94 and 1.79 respectively. The obtained F-ratio of 76.67 for adjusted post test mean is more than the table value of 4.11 for df 1 and 37 required for significant at 0.05 level of confidence.

The result of the study indicate that the there are significant differences among the adjusted post test means of plyometric training to lower labs group on the development of explosive power in horizontal direction,

It may be concluded that plyometric training to lower limbs group of better control group in improving explosive power in horizontal direction.

The mean values of plyometric training to lower limbs group and control group on explosive power in horizontal direction are graphically represented in the Figure – 4.

The adjust post test mean values of Plyometric Training to lower limbs group and control group on explosive power in horizontal direction are graphically represented in the figure - 5

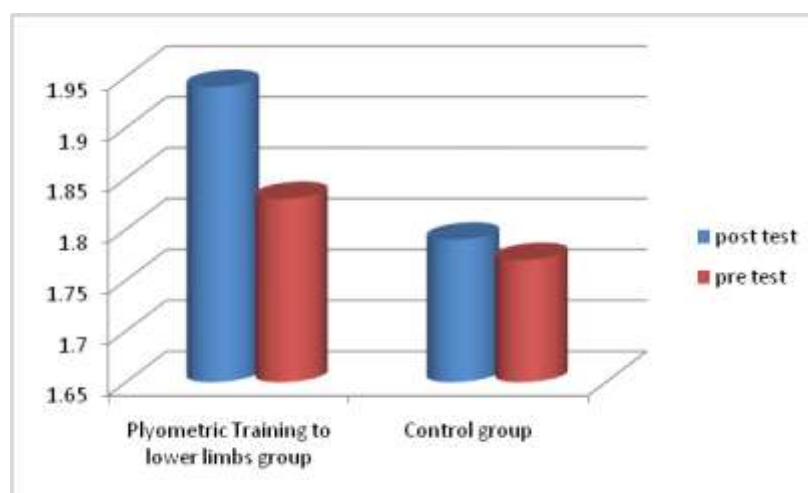


FIGURE – 4 : MEAN VALUES OF PLYOMETRIC TRAINING ON LOWER LIMBS GROUP AND CONTROL GROUP ON EXPLOAIVE POWER IN HORIZONTAL DIRECTION

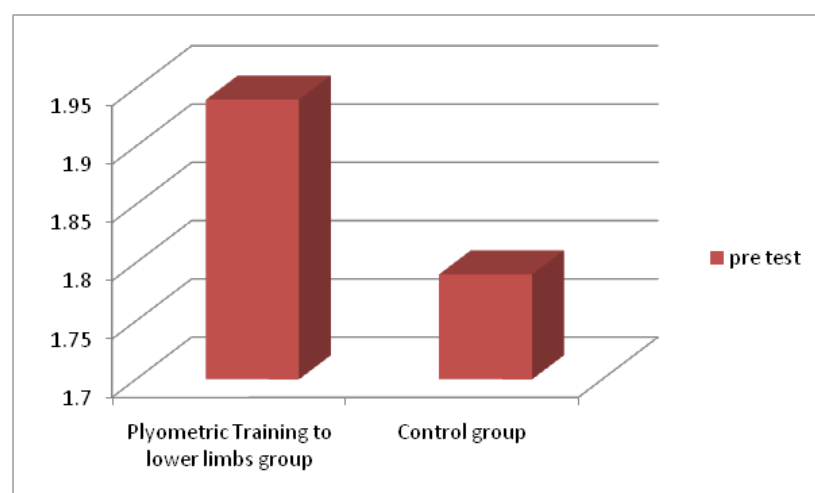


FIGURE –5: ADJUSTED POST TEST MEAN VALUES OF PLYOMETRIC TRAINING ON LOWER LIMBS AND CONTROL GROUP ON EXPLOAIVE POWER IN HORIZONTAL DIRECTION.

DISCUSSION ON FINDINGS

The result of the study showed that there was a significant difference exists between plyometric training to lower limbs group and control group on leg strength, explosive power in vertical direction, explosive power in Horizontal Direction. These findings of the study are confirming the results with studies by pholthemus, Burkhand, Blattner.

DISCUSSION ON HYPOTHESIS

All earlier the researcher had formulated and following hypotheses.

In first it was hypothesized that there would be significant improvement on selected variables due effect of plyometric Training on lower limbs for Pre-University College boys.

The result of the study showed that there was a significant improvement on leg strength, explosive power in vertical direction, explosive power in Horizontal Direction. Hence the first research hypothesis was accepted.

In second, it was hypothesized that there would be significant differences on selected variables due effect of plyometric training on lower limbs for Pre-University College Boys.

The result of the study also showed that there was a significant difference on leg strength, explosive power in vertical direction, explosive power in horizontal direction. Hence the second research hypothesis was accepted.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

SUMMARY

Training is a systematic athletic of long duration, progressively and individually graded aiming at modeling the human physiological functions to meet demanding tasks. The purpose of this study was to investigate the effects of plyometric training to lower limbs for Pre-university College boys. To achieve this purpose, forty students studying in mount Carmel college, Bangalore, were selected as subjects at random. The selected subjects were randomly divided into two groups and each group consisted of twenty subjects. Group – I underwent plyometric training to lower limbs and group II acted as control.

The criterion variables such as leg strength, explosive power in vertical direction, and explosive power in Horizontal Direction, were assessed by leg dynamometer, vertical jump test, standing broad Jump respectively.

The experimental group was trained in their respective training programme three days in a week for twelve weeks. However they were regularly participated in their regular programme as per the college curriculum. The subjects were tested for leg strength, explosive power in vertical direction, explosive power in horizontal direction. The pre and post test data of the two groups were statically examined separately to find significant difference, if any, by applying analysis of covariance. In all cases 0.05 level of confidence was used.

CONCLUSIONS

Based on the result of the study the following conclusion was drawn:

1. There was a significant difference between plyometric training to lower limbs group when compared to the control group on leg strength, Explosive power in vertical Direction, Explosive power in horizontal Direction due to plyometric training lower limbs.
2. There was a significant improvement in plyometric training to lower limbs when compared to the control group on leg strength, explosive power in vertical direction, explosive power in Horizontal direction to plyometric training to lower limbs.
3. Plyometric training to lower limbs group was found to be better than the control group in developing leg strength, explosive power in vertical direction, explosive power in Horizontal direction.

RECOMMENDATIONS

1. From the present study, it may be concluded that leg strength explosive power in vertical direction, explosive power in Horizontal direction, were improved by plyometric training to lower limbs group. Hence trainer and physical educators cloud adopt theses training to improve leg strength, explosive power in vertical direction, explosive power in horizontal direction, among their athletes.
2. A similar study may be conducted by selecting physiological variables as criterion variables.
3. A similar study may be attempted by selecting the state or national level athletes or players as subjects.
4. A Similar study may be conducted on female subjects.
5. Similar study may be undertaken to analyze the psychological and Hematological parameters.

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