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EFFICACY OF PLYOMETRIC AND RESISTANCE TRAINING ON THE PLAYING ABILITY OF MALE BASKETBALL PLAYERS

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Abstract

The purpose of study is to evaluate the effect of plyometric and resistance training on the playing ability of male basketball players. 30 young male basketball players were divided randomly into training groups 10 subjects for each group. Experimental group no-1has received 6 weeks of plyometric training, experimental group-2 has received 6 weeks resistance training and control group has been kept their regular sports practice. After the completion of six week plyometric and resistance training program the researcher has again administer the same Fitness Tests for Basketballers, which were previously administered. For testing the statistical significance of each variable of basketball playing ability Analysis of co-variance (ANCOVA) Test has been employed and further to access the significant improvement for each parameter. The level of significance was set at 0.05 level. From the results it was found that the plyometric training is more effective than resistance training.

Keywords: *plyometric training, experimental group, basketball 1.*

CHAPTER-I

THEORETICAL ORIENTATION OF THE PROBLEM

The modern era has brought for many blessings in the form of technological advancements, high standards of living, and dream world of comforts, high achievements and new challenges. It has also brought along the curses like frustration, exploitation, unemployment, poverty, greed, lust, and fall in physical fitness standards, decrease of mental and moral strength. The modern man is compelled to fight many pressures posed by social, political, and economic life. He is faced with a tremendous rise of inner and outer forces that affect deeper layers of his personality. This makes him obese, fatty, agitated, anxious, tense and frustrated. His physical state is affected adversely.

Fitness has been a concern of man from pre-historic time. Primitive man was either fit for fighting or was subdued by others. Long back Darwin had noticed that it was survival of the fittest, may it be the question of man, plant, insect, animals. Nature selected the fittest for

survival and ejected the weaklings who were made to perish. The word 'fit' assumed importance and its significance increased day by day. Every person has different level of fitness which may change with time, place, work or situation. So fitness got "relativity" attached to it. One major field of fitness is sports and games. It is to the human body what tuning is to engine. It enables us to perform up to our potential. Fitness can be described as a condition that helps us look, feel and do our best. More specifically it is "The ability to perform daily tasks vigorously and alertly, with energy left over for enjoying leisure time's activities and meeting emergency demands". It is the ability to endure, to bear up, to withstand stress to carry on its circumstances, where an unfit person couldn't continue and is a major basic for good health and well being. Physical fitness involves the performances of the heart, lungs and the muscles of the body. Since what we do with our bodies also affects what we can do with our minds. Fitness influences to some degree qualities such as mental alertness and emotional stability. These are the tendencies to act towards these items in various ways.

Fitness is important at all levels of the game, whilst being essential for top level players; it is beneficial for beginners who will improve both their effectiveness and enjoyment through good standards of fitness. The aim of fitness training in football is to enable a player to cope with the physical demands of the game as well as allowing the efficient use of his various technical and tactical competencies throughout the match. Fitness may be described as a set of attributes that an individual has or has acquired which help in their ability to perform physical activity. The diagram below outlines the general components which make up and are required for physical fitness in sport. Mental fitness and diet could be included but the diagram refers to the main components of fitness which require physical activity and which bring about physiological changes in the body.

A physical fit and active lifestyle is not only being widely recognized but is also becoming one of the most vital health prescriptions for both young and old individuals. Research studies (Antunes, 2007) have convincingly shown that staying physically active and fit substantially reduces the risk of death due to heart related illnesses.

The high level of physical fitness is most important for achieving a higher level of efficiency in technique and tactics in most of the sports. In the words of Brownell and Hayman (1991), physical fitness can be described as, "The total functional capacity of the individual to perform a given task. The ultimate aim of physical fitness is the ability of the individual to carry desired tasks to successful completion without undue fatigue. Physical fitness is the ability to make an adequate and emotional adjustment to the demands of everyday living"

A fit person is one who has well adjusted to his environment, whose mind and body are in harmony, and who can meet the normal demands made on him both mentally and physically without undue fatigue. Physical fitness implies that the body systems are capable of carrying on their activities satisfactorily. It is one of the basic elements which are essential for better performance. The athlete must be in top physical condition. In the word of Vc Rossum Rax (1986), Physical fitness for track and field event consists of a number of interrelated qualities or components".

Brownell and Hayman (1991) conveyed that "physical fitness is the total functional capacity of the individual to perform a given task". The ultimate aim of physical fitness is the ability of the individual to carry desired tasks to successful completion without undue fatigue. It is the ability to make an adequate emotional adjustment to the demands of the everyday living. As viewed by Trank, Robert and Lewis (1993), Physical fitness can be defined as a "quantitative expression of the physical condition of an individual". The development of the body to a state or condition which permits the performance of a given amount of physical work, when desired, with a minimum of physical efforts. The efficiency of physical efforts depends upon the mutual development of the muscular respiratory and circulatory system integrated and co-ordinate by the activity of the central nervous systems.

The performance in most of the sports is determined by three factors namely physical fitness, technique and tactics. Lack of the knowledge about physical fitness is an important cause of relatively poor performance of our sports men in the international competitions. Strength is one such component which influences the performances and special attention has to be paid to it. There are three main forms of strength viz. Maximum strength, explosive strength and

strength endurance. Strength can be developed in many ways such as weight lifting, bounding with or without resistance, various jumping drills, and of course depth jumping or plyometrics.

During the last few decades, athletics particularly long jumping has gained tremendous popularity all over the world with the improvement in the quality of performance in competitions and increasing awareness of the significance of athletics and games for the development and welfare of the human being after its introduction in modern Olympic Games. The improvement in jumping records in various International competitions (Asian and Olympic) in the past thirty years has witnessed a dramatic change in the positive direction. This has attracted the attention of the various educationists and sports scientist to analyze the causes for this bloom. The participants are very much ambitious to achieve the peak performance in competitions. The cause of this performance is the introduction of scientific approach, tremendous advancement of technique and extensive research in the field of athletics. Of the various components of physical and motor fitness involved in the horizontal jumping, strength and power are of utmost importance. With the rapid advisement of strength training methods, horizontal jumping has attained peak achievement. The most valuable assess, which can be derived from strength training, are the improvement of strength and explosiveness. As the performances in jumping events is also largely determined by ones muscular strength and many other related strength factors. The training of athletics, therefore, is mainly directed to improve the strength ability of the athlete. Old traditional techniques includes weight training and run jumps. These training techniques are no doubt very effective methods used world over for the training of the athletes but with the recent advent of the plyometric exercises which is based on the principles of overload, an improvement of the much greater magnitude in the jumping performance has been reported by the research as is also reflected in the improvement of the much greater magnitude in the jumping records of the athletes in the past 30-40 years. The term plyometric has been derived from the Greek word “Pleythyein”, meaning to “augment” or to “increase” and the shorter Greek words Plio “more and plyo to move’. Metrics means “to measure” or ‘length’. The spelling pliometric is also accepted in referring to eccentric contraction or muscle lengthening. The word

plyometric originally appeared in Russian sports literature in 1996 in work completed by V.M. Zaciorskij. A few other terms have been associated with plyometrics as well including shock training, speed strength, bounce training and elastic reactivity.

A quantitative interpretation of this last category is indeed difficult in that it can be accomplished only through the adoption of reference models which are not as easily standardized as those of the other categories and therefore, tend to be arbitrary. At the time when Zaciorskij's work was published, sports training methodology was in great need of indications based on practical, easy to evaluated parameters and so this inconsistency was overlooked and the work was accepted without criticism. The influence of this exclusively quantitative approach to motor performance evaluation went even beyond the world of sports. No one took time to think that the expression of each one of these so called physical "qualities" involved a certain amount of skill, in other words coordination, so that without a quantitative analysis even the evaluation of the strength, speed, flexibility of a given movement, became extremely arbitrary.

However, in a very short time, such strictly quantitative categories were accepted and it was commonly thought that they perfectly described motor performances in the context of sports and in particular

Components of fitness in basket ball

Strength

Strength is the extent to which muscles can exert force by contracting against resistance (e.g. holding or restraining an object or person). Vertical jump ability is very critical for basketball. The technique for the test may be changed to incorporate a step to be similar to the jumping technique used in the game. Strength and power tests should also be done to determine strength levels and to monitor strength changes in conjunction with training programs. Speed Acceleration is very important in basketball. Most running is conducted over a short distance.

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Speed

Speed is the quickness of movement of a limb, whether this is the legs of a runner or the arm of the shot putter. Speed is an integral part of every sport and can be expressed as any one of, or combination of, the following: maximum speed, elastic strength and speed endurance**.** Speed is the rapidity with which one repeat successive movements of the same pattern. It may also define as the ability of a person to move quickly through short distances, 50 meters and 100 meters dashes. Individuals with greater speed usually also have superior reaction time.

Endurance

Endurance is the ability of a muscles or muscle group to perform repeated contractions against a resistance, load or to sustain contraction for an extended period of time with less discomfort and more rapid recovery. Endurance is the ability to main and repeat and moderate level of muscular effort such as shoveling snow. In this particular case shoulder and arms muscles might tire and aches well before Cardio respiratory endurance reaches its limits. Muscular strength can be considered as a smaller ratio of your maximum muscular strength. In order to develop the max range of muscle capabilities need to increase the muscle strength as well. Let's take the example that if person are able to lift a max of 50kg with his right arm and lift 25kg 15 times. Developing cardio endurance together with weigh training will increase the overall weight they can lift 15 times as well as help increase the number of reps at the 25kg level.

Coordinative Ability

Coordinative Ability is the ability to perform a series of explosive power movements in rapid succession in opposing directions. Coordinative ability is the most valuable athletic component for basket ballers. Coordinative ability has to do with change of direction, the ability to stop and accelerate very quickly. Speed, on the other hand has two components, stride length and stride frequency. It requires athletes to regulate shifts in the body's center of gravity while maintaining balance. Most players must decelerate considerably in order to gain control prior to a quick change of direction. With proper training, they can maintain your

speed and change direction at the same time.

Flexibility

Flexibility is the ability to achieve an extended range of motion without being impeded by excess tissue, i.e. fat or muscle. Flexibility is important in terms of being injury free and being able to move freely around the court. Flexibility tests of other body areas that used in the game would also be suitable. Flexibility is a part of the major components of physical fitness with more importance then is sometimes believed. Not all people have the same flexibility requirements depending on whether you are an athlete or not and the various sporting disciplines that are practiced. But everyone needs a degree of flexibility to be able to cope with daily lives and activities. So, flexibility in its purest form is defined as the ability to move the body joints and articulations through their full range of motion.

Cardiovascular endurance

Cardiovascular endurance is the most important aspect of fitness. It is basically how strong our heart is, which can potentially add years to our life. The heart is the most important muscle in the human body and if it is kept healthy then it can avoid numerous health problems. Another reason that cardiovascular endurance is important is because our heart controls the oxygen flow to all our muscles - meaning cardiovascular health has a direct impact on our performance, both endurance and strength wise.

Reaction Time

Reaction time is the interval time between the presentation of a stimulus and the initiation of the muscular response to that stimulus. A primary factor affecting a response is the number of possible stimuli, each requiring their own response, that are presented.

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Playing ability

The quality or state of being able; power to perform, whether physical, moral, intellectual, conventional, or legal; capacity; skill or competence in doing; sufficiency of strength, skill, resources, etc.; in the plural, faculty, talent.

Plyometric training for basketball

Pyometric training is one of the most popular & sometimes misunderstood forms of training by athletes. Plyometrics originated as a training method in the secretive eastern block countries where it was referred to as 'jump training". As the eastern bloc countries rose to become powerhouses in sports, plyometric training was credited for much of their success. By the 1970s this method of power & speed development was being used by many sports that required explosive power for the winning edge stretch, not the amount of stretch, is the key to training the muscle plyometrically.

Plyometrics can best be described as a reflexive form of power training. This type of training involves powerful muscular contractions in response to a rapid stretching of the involved musculature. These powerful contractions are not a pure muscular event. In fact they primarily involve & augment the nervous system. It is a combination of an involuntary reflex, which is then followed by a fast voluntary muscular contraction. This is the basic idea behind plyos. Sprinting & jumping are good examples of pure plyometric events. It's not very ironic at all that most elite sprinters are good jumpers & vies-versa! This stretching of the muscles, prior to the explosive contraction that follows, is often called a loading phase. The faster and greater the load, the more powerful the reflex and subsequent contraction. A good example of this is watching any basketball player jump. They jump higher when they can take a few steps & create velocity before the jump. The reason for this is that the few steps create momentum. This momentum creates a greater loading phase on the planted leg(s) prior to the leap. The response to this greater load is a greater/faster contraction by the legs and more significant jump height. The same phenomenon exists with all explosive actions.

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Basketball Plyometrics training is an explosive reaction geared to athletics. Powerful muscle contractions are essential for this method of training but it takes more than muscle power to achieve the optimal results. The brains' nervous system plays a large role. Plyometrics is the combined reaction of, first a neural event followed quickly with a muscular contraction. So first man have an involuntary reflex then an intentional action Plyometrics originated in eastern countries where it was referred to as jump training. When competitors from these more secretive regions began to consistently excel at sports the rest of the world took notice and plyometrics was given credit for the results.

Resistance training

Resistance training is a form of strength training in which each effort is performed against a specific opposing force generated by resistance (i.e. resistance to being pushed, squeezed, stretched or bent). Exercises are isotonic if a body part is moving against the force. Exercises are isometric if a body part is holding still against the force. Resistance exercise is used to develop the strength and size of skeletal muscles. Properly performed, resistance training can provide significant functional benefits and improvement in overall health and well-being.

The goal of resistance training, according to the American Sports Medicine Institute (ASMI), is to "gradually and progressively overload the musculoskeletal system so it gets stronger." Research shows that regular resistance training will strengthen and tone muscles and increase bone mass. Resistance training should not be confused with weightlifting, power lifting or bodybuilding, which are competitive sports involving different types of strength training with non-elastic forces such as gravity (weight training or plyometrics) rather an immovable resistance (isometrics, usually the body's own muscles or a structural feature such as a doorframe). Full range of motion is important in resistance training because muscle overload occurs only at the specific joint angles where the muscle is worked. The history of resistance training started with the ancient Greeks. Hippocrates eloquently explained the principle behind weight training when he wrote "that which is used develops, and that which is not used wastes away." Progressive resistance training dates back to at least the 6th century BC, when legend has it that wrestler Milo of Croton trained by carrying a newborn calf on his

back every day until the calf was fully grown. Another Greek, the physician Galen, described strength training exercises using the halters (an early form of dumbbell) in the 2nd century AD.

The dumbbell was joined by the barbell in the latter half of the 19th century. Early barbells had hollow globes that could be filled with sand or lead shot, but by the end of the century these were replaced by the plate-loading barbell we use today. Strength training using isometric exercises was popularized by Charles Atlas from the 1930s onwards. The 1960s saw the gradual introduction of exercise machines into the still-rare strength training gyms of the time. Weight training became increasingly popular in the 1980s, following the release of the bodybuilding movie Pumping Iron and the subsequent popularity of Arnold Schwarzenegger. Since the late 1990s increasing numbers of women have taken up weight training, influenced by programs like Body for Life Resistance training is a common type of strength training for developing the strength and size of skeletal muscles. It uses the force of gravity (in the form of weighted bars, dumbbells or weight stacks) to oppose the force generated by muscle through concentric or eccentric contraction. Weight training uses a variety of specialized equipment to target specific muscle groups and types of movement. Body building, Olympic weightlifting, power lifting and strongman, are sports rather than forms of exercise. Weight training however, is often part of the athlete's training regimen. Weight training differs from Resistance training is all methods adapted to improve the resistance and size of the skeletal muscles. Weight training involves the application of a variety of equipments to target specific muscle groups and types of movement, such as weighted bars, dumbbells, Kettle bells, and weight stacks. Though weight training differs from body building and weightlifting, it forms a vital component of any well rounded fitness routine.

Significance of the study

1. The study may check the effect of plyometric exercises and resistance training on the performance of basketball players.

2. The study may check the effect of plyometric exercises and resistance training on the fitness of basketball players.

3. The finding of the study may help the coaches and physical educationists to construct on plyometric training modules for basketball players.

4. The study may help to improve upon the training plan of a team.

5. The finding may provide a source of guidance to the coaches to plan the future program for training with relation to player's performance.

6. The study may help in highlighting the strong fact and figures that are helpful for the enhancement of the playing ability of the basketball players.

Statement of the problem

The purpose of the study will be to find out the efficacy of plyometric and resistance training on the playing ability of male basket ball players.

Objectives

1. To observe the plyometric and resistance training modules for basket ball players.

2. To observe the effect of the plyometric and resistance training on the playing ability of male basket ball players.

3. To determine the other factors those are responsible for the playing ability of basketball players.

Delimitations

1. The study will be delimited only to Basketball players (men's) of15 to 18 years of age.

2. The study will be further delimited to sports school jalandhar players only.

3. The study will be again delimited to duration of six weeks training programme.

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CHAPTER-II

REVIEW OF THE RELATED LITERATURE

Studies Pertaining To Plyometric Training

Sharma (1984) compared the effect of squat jump and stair climbing, on the vertical jump ability of school basket ball players. The 30 boys were randomly selected from 8th and 9th standard of central school. The average age of the subjects was 13.8 years. The data were collected before and after 6-weeks of experiments. The subjects were divided into two groups by using of random numbers. The finding of the study showed the mean gain in group A and group B significant at 0.5 level of confidence. It was further conduced that performance in vertical jump could be improved by jumps squat and stair climbing. No evidence regarding the preference of one method over the other was found.

Adams (1992) The purpose of this study was to compare the effectiveness of three training programs - squat, plyometric and squat-plyometric in increasing hip and thigh power production as measured by vertical jump. Forty-eight subjects were divided equally into four groups: squat, plyometric and squat-plyometric or control. The subjects trained two days a week for a total of seven weeks, which consisted of a one-week technique learning period followed by a six- week periodized squat, plyometric and squat-plyometric training program. Hip and thigh power were tested before and after training using the vertical jump test, and the alpha level was set at 0.05. Statistical analysis of the data revealed a significant increase in hip and thigh power production, as measured by vertical jump, within all three treatment groups. The squat-plyometric group achieved a statistically greater improvement than the squat or plyometric groups alone. Examination of the mean scores shows that the squat group increased 3.30 centimeters in vertical jump, the plyometric group increased 3.81 centimetres and the squat-plyometric group increased 10.67 centimeters. The results indicate that both squat and plyometric training are necessary for improving hip and thigh power production as measured by vertical jumping ability.

GI Eddie and Marshall (1996) conducted 14 week plyometric programmers for basketball player with a view to see. If they would enhance power performance by vertical jump and 20 m and 40 m sprint. Athletics significantly improved their vertical jump by an average of 21.4 cm and their 20 m and 40 m. sprint by an average of 0.47 sec. and 0.115 sec. respectively some increased their vertical jump by as much as 5 cm and improved their sprint time by as much as 0.15 sec. and 0.33 sec. for the 20m and 40m sprint, respectively. Further more, regardless of the obvious results, many of the athletic felt they were faster, quicker, or could jump higher after the plyometrics program.

Hypothesis

There would be an insignificant effect of plyometric and resistance training on the playing ability of male adolescent basketball players.

CHAPTER-III

METHODS AND PROCEDURE

Research Method

In this chapter Sample Size, Sample Area, Sampling Technique, Instrument Reliability, Tester's Competency and Reliability of Data, Procedure and Statistical technique employed in the study are described.

Sample

As per the requirement of the study the players have been divided into three groups. i.e., control group and experimental group 1, and, experimental group 2. These subjects will be the players who have participated at National in the sport of Basketball and each group comprised of 10 subjects. The average age of the students ranged from 15 to 18 years.

Sample Area

For the purpose of the study the selections of subjects have been made among the students studying at Sports School Jalandhar who have participated at National level in the sport of Basketball.

Sampling Technique

The selection of the subjects for the study was done on the basis of random sampling technique and further divided into 3 groups on the basis of non-probability sampling technique.

The research scholar established the instrument reliability, tester's competency and reliability of tests, which in tern assured the reliability of data.

Tools

All the instruments to be used in this investigation should be found to be quite precise and reliable.

For plyomeric training the researcher is going to use the following instruments. i.e. medicine ball, skipping ropes and wooden boxes of different size.

For resistance training the researcher is going to use the following instruments. i.e. bar-bell, rubber plates of different weights, fixed bar (for pull-ups), adjustable bench (for bench press) and mats (for sit-ups).

For administering different Physical Fitness Tests for Basketballers the researcher is going to use the following instruments. i.e. marking cones, measuring tape, stop watch, electronic weighing machine, skin-fold callipers, bar-bell, rubber plates of different weights, marked wall, stadiometre, recording sheets, pen, ruler and sit and reach box.

For Johnson skill test for basketballers the researcher is going to use the following instruments. i.e. marking cones, measuring tape, stop watch, marked wall, basketballs, and basketball court.

The instrument reliability will be assumed.

Tester's Competency and Reliability of Data

Test –Retest method was utilized to establish the reliability of the tests as well the teacher's competency. For this purpose five subjects from each groups i.e., control group and experimental group 1, and, experimental group 2 were selected randomly. Testing and retesting was administered by the same tester on the same 15 subjects with on day gap in between under utmost similar conditions on the test of includes Aerobic Fitness (Cooper 12 Min Run/Walk Test), Flexibility (Sit and Reach Test), Explosive Strength (Vertical Jump Test), Speed (50 mtr Dash Test), Body weight, Body Size Measurements (Height, Arm Span and Hand Span Measurements), Coordinative Ability (20 yard shuttle run Test), Agility (Illinois Agility Run Test), Shooting Ability(Johnson Speed goal Test), Throwing Ability(Johnson Go for Accuracy Test) and Dribbling Ability(Johnson Dribble Test) .

The obtained Pearson's Product Moment Co-relation was found to be statistically significant at .01 level of confidence.

RELIABILITY COEFFICEENTS OF TEST-RETEST SCORES

S. No.	Tests	Co-efficient of Reliability
1.	Shuttle Run Fitness Test (Co-ordinative Ability)	0.92
2.	Cooper 12 Min Run/Walk Test (Aerobic Fitness)	0.88
3.	Sit and Reach Test (Flexibility)	0.91
4.	Vertical Jump Test (Strength)	
5.	50M Dash Test (Speed)	0.88
6.	Body Weight (Weight Measurements)	0.95

7	Standing Height Measurements (Body Size Measurements)	0.98
8.	Arm Span (Body Size Measurements)	0.97
9.	Hand Span (Body Size Measurements)	0.96
10.	Illinois Agility Run Test (Agility)	0.89
11.	Johnson field goal speed test (Shooting Ability)	0.88
12.	Johnson basketball throw for accuracy (Throwing Ability)	0.89
13.	Johnson basketball dribble test (Dribbling Ability)	0.83

Procedure for administering the test

The research scholar will make sincere attempt to collect data from the subjects authentically. Therefore, she will try her best to motivate the subjects to get their sincere and all out response for the successful completion of the study. Also they will be asked to put up their best performance as the findings will also help them to know about their performance.

All the subjects will be assembled on one fine morning in the basketball court of Kendriya Vidyalaya, Suranussi and Sports School Jalandhar. They will be informed with the requirements of the study and the testing procedure. Then the researcher will administer the Fitness Tests For Basketballers which includes Aerobic Fitness (Cooper 12 Min Run/Walk Test), Flexibility (Sit and Reach Test), Explosive Strength (Vertical Jump Test), Speed (50 mtr Dash Test), Body weight, Body Size Measurements (Height, Arm Span and Hand Span Measurements), Coordinative Ability (20 yard shuttle run Test), Agility (Illinois Agility Run Test), Shooting Ability(Johnson Speed goal Test), Throwing Ability(Johnson Go for Accuracy Test) and Dribbling Ability(Johnson Dribble Test) in two days and two seasons to collect the data.

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Then the researcher will divide the subjects into three different groups i.e. experimental group no 1, Experimental group no 2 and Control group. Further the experimental group will receive six week plyometric and resistance training along with the normal training schedule.

The experimental group will undergo through a six week plyometric and resistance training program as per the following schedule. All of the training sessions will be supervised. The training programs are shown in Tables 1 and 2.

TABLE-1

PLYOMETRIC TRAINING SHEDULE FOR EXPERMENTAL GROUP-1

Plyometric Training	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Medicine Ball (Sit-Ups with Ball Toss)	† 3*20 (90)	† 3*25 (90)	† 3*30 (90)	† 3*30 (80)	† 3*30 (75)	† 3*30 (70)
Double Stair Jumps	† 3*15 (50)60	† 3*20 (50)60	† 3*25 (50)60	† 3*30 (50)60	† 3*30 (50)55	† 3*30 (50)50
Alternate Box Jump	† 4* 6(40)60	† 4* 8(40)60	† 5* 8(40)60	† 5* 10(40)90	† 5* 10(40)70	† 6* 10(40)70
Skipping	† 3*70 (90)	† 3*75 (90)	† 3*80 (90)	† 3*80 (80)	† 3*85 (80)	† 3*85 (75)

†Sets*reps (times rest between sets) in seconds (for Sit-Ups with Ball Toss and Trunk Twist)

†Sets*reps/ at (box / stair height (cm)) times rest between sets (for Double Stair Jumps and Alternate Box Jump)

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TABLE-2

RESISTANCE TRAINING SHEDULE FOR EXPERMENTAL GROUP-2

Resistance Training	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Sit-Ups	† 3*30 (120)	† 3*35 (120)	† 3*40 (120)	† 3*40 (110)	† 3*45 (110)	† 3*45 (100)
Pull-Ups	† 3*10 (120)	† 3*12 (120)	† 3*14 (120)	† 3*14 (110)	† 3*15 (110)	† 3*15 (100)
Bench Press	† 3*10 (120)	† 3*12 (120)	† 3*14 (120)	† 3*16 (120)	† 3*18 (110)	† 3*20 (100)
Squat	† 3*20 (120)	† 3*22 (120)	† 3*24 (120)	† 3*26 (120)	† 3*28 (110)	† 3*30 (100)

†Sets*reps (times rest between sets) in seconds / in bench press and squat resistance will be sub-maximal

Soon after the completion of six week plyometric and resistance training program the researcher will again administer the same Fitness Tests for Basketballers, which were previously administered.

Statistical technique

For testing the statistical significance of the difference between the group means in Aerobic Fitness (Cooper 12 Min Run/Walk Test), Flexibility (Sit and Reach Test), Explosive Strength (Vertical Jump Test), Speed (50 mtr Dash Test), Body weight, Body Size Measurements (Height, Arm Span and Hand Span Measurements), Coordinative Ability (20 yard shuttle run Test), Agility (Illinois Agility Run Test), Shooting Ability(Johnson Speed goal Test), Throwing Ability(Johnson Go for Accuracy Test) and Dribbling Ability(Johnson Dribble Test) Analysis of co-variance(ANCOVA) test was employed and further to access

the significant improvement Level of Significant Difference(LSD) Test has been employed. To test the proposed hypothesis the level confidence chosen was at .05 level of significance.

CHAPTER- IV

RESULTS AND DISCUSSIONS

The statistical analysis and data of effect of plyometric training, resistance training on playing ability of male basketball players of sports school, jalandhar, who have played at national level, has been presented in this chapter.

For testing the statistical significance of each variables of basketball playing ability Analysis of co-variance (ANCOVA) Test has been employed and further to access the significant improvement for each parameter i.e. Weight, Height, Arm Span, Hand Span, Explosive strength, Acceleration speed, Coordinative ability, Agility, Flexibility, Aerobic Capacity, Shooting Ability, Throwing Ability and Dribbling Ability, Level of Significance Difference (LSD) test was applied. The level of significance was set at 0.05 level.

DISCUSSIONS

A critical analysis of table 3, 4. 5, 6, brings into light the findings that there were insignificant difference on weight, height, arm span and hand span between plyometric group, resistance group and control group. these factors are normally governed by the heredity of an individual and training shows a very little effect on these parameters.

The subjects constituting all the groups were sportsmen and residing in their respective hostels. Therefore they had been regular in their physical activity program and also undergoing significant differences on some variables as mentioned above.

Thus the purposed hypothesis that “there would be insignificant effect of plyometric training and resistance training on the playing ability of male basketball player” is rejected in case of explosive strength of lower extremities, acceleration speed, agility and aerobic capacity along

with shooting and throwing performance, whereas it has been accepted in case of weight, height, arm span and hand span along with dribbling performance.

CHAPTER – V

CONCLUSION

Under the conditions that prevailed and within the limitations imposed by the type of subjects and the variables selected for this study, the following conclusion may be drawn.

1. Through statistical analysis shows insignificant difference on Weight, Height, Arm Span and Hand Span variables of all the three groups but, by calculating the mean differences we come to know that the sports persons who had undergone six weeks plyometric training program were better than the other groups in Weight, Height, Arm Span and Hand Span where as resistance training program has shown better result in case of height variables than other groups.

2. In case of Explosive Strength of Lower Extremities both plyometric training group and resistance training group are effective, but plyometric group is seems to be more effective than other groups.

3. In case of acceleration speed both plyometric training group and resistance training group are effective, but plyometric group is seems to be more effective than other groups.

4. Through statistical analysis shows insignificant difference on Coordinative Ability variables of basketball players, but by calculating the mean difference we come to know that resistance training is better than the other groups.

5. In case of Agility both of plyometric training group and resistance training group are effective.

6. In case of Aerobic capacity of both plyometric training group and resistance training group are effective.

7. In case of flexibility of both plyometric training group and resistance training group are equally effective.

8. In case of shooting ability of both plyometric training group and resistance training group are effective.

9. In case of throwing ability of both plyometric training group and resistance training group are effective, but plyometric group is seems to be more effective than other groups.

10. In case of dribbling ability of both plyometric training group and resistance training group are effective, but plyometric group is seems to be more effective than other groups.

In the light of conclusion drawn and with in the limitations of the study, it can be revealed that our body systems have been gifted by nature to accommodate and adopt themselves and change the functions according within the physiological limits.

After giving a deep view to all the tables it can be observed that the sports persons who had undergone six weeks plyometric training have shown better results in many aspects of the performance.

CHAPTER –VI

LIMITATIONS, SUGGESTIONS AND RECOMMENDATIONS

Limitations

1. The certain parameters of the subjects belonging to different groups could not be controlled in as much as the diet, living conditions, amount of physical activity, genetic endowment etc.

2. Certain psychological parameters like interest, motivation, attitude etc, could not be controlled with such a less time of interaction with the subjects.

Suggestions and Recommendations

1. A study may be undertaken by employing both plyometric and resistance training on another experimental group.
2. A study may be undertaken by monitoring other variables like strength, speed, endurance etc.
3. A similar study may be under taken for other games and sports like volleyball, football etc,
4. A similar study may be undertaken on female sports persons.
5. A study may be undertaken by including either other exercises or by varying intensity of exercises.
6. Better results may be gain by comparing the study with another one having more weeks of training session.

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