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Comparative effect of isometric, isotonic exercises on the performance of selected field events

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Abstract

Fitness which may be defined as the successful adaptation to the stressors of one's life style is a desirable human condition and is based on a scientific and systematic training programme and those who are enamored of practice without science, are like a pilot who goes to the ship without rudder. As pointed out earlier and out of the latest scientific progress in the field of physical education and sports, it is a fact that strength is the most indispensable factor of physical prowess and the best way to develop strength is through an organized programme of weight training and all the empirical evidence available shows conclusively that through the judicious use of weight training, we effectively improve strength, muscular endurance and power, all of which are vital to the athlete. Based on the analysis and findings of the study, the hypothesis formulated earlier that there would be no difference in the effect of isometric and isotonic exercises on the performance of selected field events, is rejected in the case of putting the shot and running broad jump. With regard to the performance in putting the shot, both isotonic exercises and isometric exercises produced equal training effect in this event. All the two methods of strength training namely isometric, isotonic proved to be superior as compared to the control group in improving performance in running broad jump and putting the shot.

Keywords: Isometric, Isotonic, Selected field events.

Introduction

In athletics, some amount of resistance has to be overcome and the greater the resistance, stronger should be the sportsman. A high level of speed, endurance, technique, and other coordinated abilities are impossible if the sportsman lacks the requisite amount of strength, which is regarded as the ability of the sportsman to overcome resistance or to act against it. The strength can be dynamic or static. The static (isometric) and dynamic (isotonic) strength are two principal types of strength which we come across in athletics. A more accurate measure of strength can be obtained by using dynamometers or tensiometers – instrument which measure force. The maximum strength which is the highest possible resistance, a sportsman can overcome through voluntary contractions of the muscles, the explosive strength which is the ability of the sportsman to overcome resistance with high speed, and the strength endurance which is the ability to act against resistance under conditions of fatigue can be developed through different weight training exercises. The maximum strength, strength endurance can be dynamic or static and the explosive strength can be dynamic.

There is no short cut to strength development as there is none for the development of skill, agility or endurance in an athlete. No amount of fancy gimmicks or equipment or adoption of alleged time saving fads will substitute for a long term programme of hard work that is required to develop the quality of strength, needed by an athlete for optimum performance in his specialty. Greater progress in track and field performance during the past few years has been the result of harder work by the athlete, not by resorting to short cuts and less work.

Since isotonic and isometric exercises are backbone of building the strength which is the pre-requisite for better result, it is mostly indispensable to have the better knowledge about the two types of strength builders. It further tempts the researcher to know as to which type is better than the other since so far the differentiation is not available. The two type of exercises must be taken up after warm up, for no one has yet disapproved that a warm, stretched muscle gives a greater response to a stimulus than a cold, unscratched one. At the same time to guard against stiffness, the cooling down at the end of each weight training session is necessary.

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Much of the evidence on the structure of a weight training schedule is empirical, based on experience rather than scientific evidence.

Since track and field involves running, jumping and throwing events which need tremendous strength for good performance, it would be better to find out the same through isometric and isotonic exercises. The vital need of all sprinters is tremendous leg power, necessary for a fast, explosive start, and the capacity to maintain the fastest possible leg speed. Power is the rate of doing work

Methodology

From the list of 70 athletes (jumpers and throwers) of East zone intervarsity level of Deendayal Upadhyay Gorakhpur University, Gorakhpur, U.P during academic year 2014 – 15, twenty athletes were eliminated and from the remaining, Fifty four athletes were chosen at random as subject for this study. The average age of the athletes was 24 years, ranging between 18 – 36 years.

Experimental design

Random group design was adopted for this study and equal numbers of subjects were assigned at random to three groups of ten subjects each. For the purpose of the study, the isometric exercise group, isotonic exercise group and the control group were named as group A, B, C respectively.

Group A, B and C underwent the pretest on running broad jump and putting the shot events as per the conduct procedure and rules laid down the IAAF. Then the group A and B underwent the training on five exercises each separately for period of twelve weeks on alternative days per week i.e. thrice in a week under the careful supervision of the investigator. The group C served as the control and was not allowed to undergo the exercises.

After the end of the twelve week training program, the three groups underwent posttest in running broad jump and putting the shot, observing the rules and regulations.

Procedure of administering the test

The investigator intended to compare the effectiveness of isometric and isotonic exercises on the performance of the selected athletic events, mentioned below:

1. Running broad jump
2. Putting the shot

Running broad jump

Purpose

To measure the horizontal jumping ability of the individual.

Equipments:

Measuring steel tape

Procedure

As per the specifications of A.A.F.I rules.

Scoring

Maximum horizontal distance jumped using running broad jump and recorded in meters and centimeters.

Putting the shot

Purpose

To measure the horizontal putting ability of the individual.

Equipment:

Two shots (5kg each), measuring steel tape.

Procedure

As per the specifications of A.A.F.I rules.

Scoring

Maximum horizontal distance covered using standing put and recorded in meters and centimeters.

Description of exercises

1. Isometric exercises :
 - a. Two arm curl
 - b. Half squat
 - c. Bench press
 - d. Dead lift
 - e. Abdominal
2. Isotonic exercises :
 - a. Two arm curl
 - b. Half squat
 - c. Bench press
 - d. Dead lift
 - e. Abdominal curl

Objective of the study

The purpose of the study was to compare the effectiveness of isometric and isotonic exercises on the performance of selected field events.

Hypothesis

It was hypothesised that there would be no difference in the effect of isometric and isotonic exercises on the performance of selected field events.

Definition of important terms

Isometric

Isometric exercises consist of contracting a muscles or group of muscles against an improvable resistance. Relatively no movements occur in the joint area as a result of muscular effort in this type of contraction.

Isotonic

Isotonic strength is determined by the greater resistance (weight) a given muscle group can overcome by moving it through the full range of joint motion.

Statistical procedure

To establish the comparative effect of the isometric and isotonic exercises on the performance of the selected field’s events, the data were examined by applying analysis of covariance. The level of significance chosen was five percent.

Findings

For each of the chosen variables, the results pertaining to significant difference, if any, between the pretest and posttest means for the three groups after the twelve week training period which were submitted to analysis of co – variance are given in table 1 and 2.

Table 1: Significance of difference between pre – test and post – test means of the two experimental groups and the control group in running broad jump

Groups	Pre-test mean	Post-test Mean	Difference between means	DM	‘t’ ratio
Isometric	5.42	5.50	0.08	0.02	4.0*
Isotonic	5.09	5.20	0.11	0.02	5.5*
Control	5.21	5.20	- 0.01	0.01	-1.0

*Significant at .05 level of confidence.

t.05 (17) = 2.11

Table 2: Significance of difference between pre – test and post – test means of the two experimental groups and the control group in putting the shot

Groups	Pre-test mean	Post-test Mean	Difference between means	DM	't' ratio
Isometric	6.87	6.97	0.10	0.01	10.0*
Isotonic	6.71	6.85	0.14	0.10	1.4*
Control	6.64	6.63	- 0.01	0.00	-1.0

*Significant at .05 level of confidence.

t.05 (17) = 2.11

Table 3: Analysis of variance and covariance of the means of the means of two experimental groups and the control group in running broad jump

	Isometric	Isotonic	Control	Sum of Squares	DM	Mean Squares	F ratio
Pre-test means	5.42	5.09	5.21	B – 1.03 W – 8.85	3 68	0.34 0.13	2.64
Post-test means	5.50	5.20	5.20	B – 1.34 W – 9.94	3 68	0.45 0.15	3.05*
Adjusted post-test means	5.34	5.36	5.25	B - .20 W - .77	3 68	6.77 1.15	5.88*

* Significant at .05 level of confidence

N = 54

B = between group variance

W = within group variance

F ratio needed for significance at .05 level of confidence = 2.74

The analysis of covariance for running broad jump showed that the resultant F ratio of 2.64 was not significant in case of pre-test means indicating that the initial means differences, among the groups were not significant. The post-test means

In all the above variables, it was noted that the differences between the means existed and the experimental groups improved and no significant change was observed in control group. As the experimental groups showed a significant increase, the data were analyzed by applying analysis of variance and co – variance to find out if there were significant differences among the groups.

and the difference between the adjusted final means yielded the F ratios of 3.05 and 5.88 respectively and were found significant. The F ratio, needed for significance at .05 level of confidence was 2.74.

Table 4: Analysis of variance and covariance of the means of the means of two experimental groups and the control group in putting the shot

	Isometric	Isotonic	Control	Sum of Squares	DM	Mean Squares	F ratio
Pre-test means	6.87	6.71	6.64	B-.73 W-14.22	3 68	0.24 0.21	1.17
Post-test means	6.97	6.85	6.63	B-1.8 W-15.43	3 68	0.6 0.23	2.64
Adjusted post-test means	6.87	6.91	6.76	B-.34 W-.33	3 68	.11 4.96	22.62*

* Significant at .05 level of confidence

N = 54

B = between group variance

W = within group variance

F ratio needed for significance at .05 level of confidence = 2.74

The analysis of covariance for putting the shot showed that resultant F ratios of 1.17 and 2.64 were not significant in case of pre-test and post-test means indicating that the initial and final means differences among the groups were not significant. The difference between the adjusted final means showed the F ratio of 22.62 and which was found significant. The F ratio, needed for significance at .05 level of confidence was 2.74.

Discussion of findings

The analysis of data revealed that two experimental groups trained by isometric exercises and isotonic weight training exercises, showed significant gains in performance of field events (Running Broad Jump and Putting the Shot). The mean gain achieved by isometric was higher as compared to isotonic group in both the events. The control group did not show any significant increase in the performance of field events.

The results of the study confirm the notion that any kind of resistance training programme with weights, particularly improves strength, when administered according to the set principles of training in a progressive manner and probably in

the case of all experimental groups, the expected improvement has taken place due to the above said notion.

Discussion of hypothesis

Based on the analysis and findings of the study, the hypothesis formulated earlier that there would be no difference in the effect of isometric and isotonic exercises on the performance of selected field events, is rejected in the case of putting the shot and running broad jump.

Summary

There has been a tremendous improvement in the quality and quantity of performance in competitive sports with rapidly increasing awareness of the significance of sports for the development and welfare of the human being after the revival of Modern Olympic Games. In the case of Track and Field particularly as the performance depends upon individual effort, there has been a tremendous advancement in the technique and training methods and achievement levels in this field.

The subjects were equally assigned using random sampling

procedure to three groups (two experimental and one control group). The two experimental groups participated in the training programme for a period of twelve weeks.

Quantitative measurements by qualified individuals with standard equipments of the selected variables for each of the subjects were taken at the beginning and at the conclusion of an experimental period of twelve weeks. Training was carried out thrice a week i.e. on Mondays, Wednesdays and Fridays.

Conclusion

On the basis of analysis and within the limitations imposed and the experimental conditions, the following conclusions may be drawn:

- 1) With regard to the performance in putting the shot, both isotonic exercises and isometric exercises produced equal training effect in this event.
- 2) All the two methods of strength training namely isometric, isotonic proved to be superior as compared to the control group in improving performance in running broad jump and putting the shot.

Recommendations

In the light of the conclusions drawn, the following recommendation may be made:

- 1) Both methods of strength training used in the study may be used by teachers of physical education and coaches for improving performance in Track and Field events.
- 2) The present study may be replicated with subjects of age and sex other than those employed in this study.
- 3) To arrive at significant finding for judging the superiority of different strength methods employed in this study, the investigator may be carried out over a longer period than what is employed in this study.
- 4) Similar study may be undertaken by employing other methods of strength training, namely isokinetic and plyometric methods etc.

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