Comparative effect of different types of resistance training on body composition

SANJEEV KUMAR AND JAI PRAKASH BHUKAR

See end of the article for authors' affiliations

Correspondence to:

SANJEEV KUMAR
Department of Physical Education Pedagogy, Lakshmibai National University of Physical Education, GWALIOR (M.P.) INDIA
sanjeev_mundair@yahoo.com

ABSTRACT

The purpose of the study was to investigate the comparative effect of Akhada training and Free weight and Machine training on body composition. Ninety male B.P.Ed. students in the age group of 18-24 years studying in Lakshmibai National University of Physical Education, Gwalior were randomly selected as subjects for the study. All the subjects were divided randomly into two experimental groups and a control group and each group had equal number of subjects. The Akhada group was trained with the Akhada style training and Free weight and Machine group was trained with modern free weight and machine training programme prepared by the investigator himself whereas control group did not participate in any training program for 12 weeks. Data collected were analyzed using the analysis of co-variance (ANCOVA) at 0.05 level of significance and showed significant change in body composition. Post hoc mean comparison showed that experimental groups (Free weight and Machine and Akhada group) had significant difference with control group in body composition but no significant difference between Akhada group and Free weight and Machine group. The results of the study showed that both type of trainings *i.e*. Akhada training and Free weight and Machine training produced significant improvement in body composition.

Since ancient times, people in India believed that the human body is indeed an instrument of Dharma (shareera madhyam khalu dharma sâdhanam). Hence, the body is to be properly nourished, and maintained. In medieval India, people gave as much importance to physical exercise as to literary education. The principle of "a sound mind in a sound body" was not only accepted but also faithfully practiced. India has a tradition of physical culture that goes back at least 6000 years. In that time, the Indian warriors and wrestlers devised many unusual training methods and pieces of equipment to increase their strength, stamina, and flexibility. (Encyclopedia of Indian Physical Culture, 1950).Weight 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.

Ancient Greek sculptures also depict lifting feats. The weights were generally stones, but later gave way to dumbbells. The dumbbell was joined by the barbell in the later 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 commonly used today (Amhem Daniel, 1985). Physical training or conditioning of the body needs individualized training as per the capability and capacity of a person. The modern physical training programme was, therefore, developed after reviewing the latest literature and techniques available on conditioning of the body with regard to physical and physiological fitness. Modern training was imparted on the progressive overload principle keeping in view the basic load components like intensity, density, duration, frequency, repetition, load and recovery. All the load components were used while imparting different types of conditioning programmes for the development of endurance, strength, speed, flexibility, other co-coordinative abilities and internal systems of the body.

Weight training can be defined as those exercises that are designed to strengthen a specific muscle by causing them to become fixed resistance usually in the form of a barbell or dumb-bell. Weight training is a means of training to develop certain parts of the body for specific purposes. Free weights include dumbbells, barbells, medicine balls, sandbells, and kettlebells. Unlike weight machines, they do not constrain users to specific, fixed movements, and therefore require more effort from the

individual's stabilizer muscles (Patterson, 1989). Now-a-days specific training has been playing a predominant role with emergence of different methods having sustained scientific knowledge for outstanding achievements in various levels of competition. The sportsman is able to achieve a high level of performance by concentrating on major areas like physical power, physiological efficiencies, psychological development, application of biomechanics and environmental adjustments.(Amhem Daniel, 1985).Weight training is a complex process of preparing the sports person for higher performance. Basically weight training is aimed to improve the fitness level of people and tone up their body for the adverse conditions. Weight training also make muscles, tendons and ligaments stronger and reduces the chances of injury. We can classify the exercises into two broad categories *i.e.* the traditional training and the modern training. In traditional training people perform, *Dands, Baithaks, Surya Namaskar* and Yogic exercises and on the other hand, in modern training they perform the Isokinetic, Isometric and Isotonic exercises with weights and machines (Belbert and Caleste, 1962).

In India Akhara training, Vyayam or Physical training is meant to build strength and develop muscle bulk and flexibility exercise that employ the wrestlers on body weight include *Surya Namaskar* and the *Dand*, which are also found in *Hatha yoga*, as well as the *Baithak*. Sawari (passenger) is the practice of using another persons body weight to add resistance to such exercises. Exercise regiments may also include dhakulis, which involve twisting, rotations, rope climbing, log pulling and running. Massage is regarded as an integral part of a Pahalwani's exercise regimen. It is evident that wrestlers in India mainly perform the traditional types of exercises even today while some of them have started performing the isometric and isotonic exercises also. But in our country there is no such work which has been done on this aspect which could indicate the types of exercises which are most economical and efficient for wrestlers to improve their efficiency. Since the world today has progressed to the greater extent and the field of games and sports are no exception. Wrestling is one of the most prestigious sports in the olympic programmes since ancient

olympics. Therefore, the leading countries probably pay much more attention to their wrestlers. And the main cause of our poor performance in the international competitions is probably the lack of scientific training. (Chandra ,1986).Therefore, the purpose of the study was to investigate the comparative effect of *Akhada* style training and training with free weight and machines on body composition.

METHODOLOGY

Ninety male B.P.Ed. students of Lakshmibai National University of Physical Education, Gwalior, Madhya Pradesh were randomly selected as subjects for this study. All subjects have undergone the medical checkup before the start of the training programme. The age of subjects were ranging from 18-24 years, according to the institute records. The subjects were divided randomly into three groups, each consisting of 30 subjects. The group named, Akhada was chosen to perform the exercise like *Dands*, *Baithaks*, *Surya Namaskar*, Rope climbing, log pulling etc. and the Free weight and machine group were chosen to perform the modern exercises like isotonic (weight training) and isometric exercises, control group did not participate in any exercise programme of the study except their daily routine activity programme. Measurements of body composition were taken at the beginning and after the experimental period of twelve weeks. The experiment was conducted during 2009-10 academic session of B.P.Ed. Students of Lakshmibai National University of Physical Education, Gwalior.

OBSERVATIONS AND DISCUSSION

To find out the significant difference of two types of training programme on body composition , the analysis of co-variance (ANCOVA), f-ratio was employed at 0.05 level of significance.The result pertaining to the analysis of co-variance done for two experimental groups and control group of body weight performance are presented in Table 1.

From Table 1 it is evident that the adjusted F-ratio value was 10.72 which was found greater than tabulated F-ratio value (3.11), significant at 0.05 level. It indicates that mean score of body weight of subjects belonging to experimental groups and control group differed

Table 1: Analysis of convariance for the experimental and control groups of body weight					
Source of variance	d.f.	SS	MSS	F value	Remarks
Training	2	142.42	71.21	10.72	(P<0.05)
Error	86	571.09	6.64		

 * indicates significance of value at P=0.05, Tabulated value of (2,86) is 3.11

 SS = Sum square due to error, MSS = Mean sum of square, F = F-ratio value

significantly. Thus, the Null hypothesis (H$_0$) that the adjusted mean scores of body weight of subject belonging to experimental groups and control group differed significantly by considering pre body weight as covariate so Null hypothesis is rejected. As the F-ratio was found significant in the case of body weight, the significant difference (LSD) post-hoc test was applied to test the

Fig. 1: Graphical representation on paired adjusted means of experimental and control group of body weight, fat percentage and lean body mass

significant difference between paired means on body composition which has been presented in Table 2 and Fig. 1.

It is evident from Table 2 that mean differences of control group and experimental group were found to be significant whereas the mean difference of Akhada group

and free weight and machine group was not found statistically significant at 0.05 levels. It reveals from the above table that Akhada group and free weight and machine group were equally effective.

The result pertaining to the analysis of co-variance done for two experimental groups and control group of fat percentage performance are presented in Table 3.

From Table 3 it is evident that the adjusted F-ratio value was 7.76 which was found greater than tabulated F-ratio value (3.11), significant at 0.05 level. It indicates that mean score of fat percentage of subjects belonging to experimental groups and control group differed significantly. Thus, the Null hypothesis (H$_0$) that the adjusted mean scores of fat percentage of subject belonging to experimental groups and control group differed significantly by considering pre fat percentage as covariate, so Null hypothesis is rejected. As the F-ratio was found significant in the case of fat percentage, the significant difference (LSD) post-hoc test was applied to test the significant difference between paired means on body composition has been presented in Table 4 (Fig. 1).

It is evident from Table 4 that mean differences of control group and experimental group were found to be significant whereas the mean difference of Akhada group and free weight and machine group was not found statistically significant at 0.05 level. It reveals from the
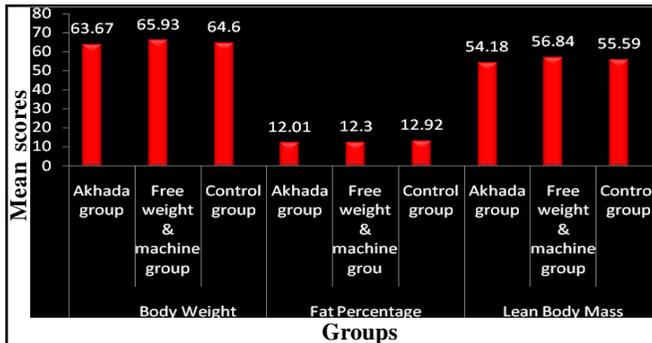
Table 2: Paired adjusted final means and differences between means among the experimental and control groups of body weight

Group means			Mean difference	Critical difference at 5% level
Akhada group	Free weight and machine group	Control group		
63.67	65.93		0.182	
63.67		64.60	2.86*	0.26
	65.93	64.60	2.68*	

* indicates significance of value at P=0.05

Table 3: Analysis of co-variance for the two experimental and control groups of fat percentage

Source of variance	d.f.	SS	MSS	F value	Remarks
Training	2	20.18	10.09	7.76	(P<0.05)
Error	86	111.75	1.29		

* indicates significance of value at P=0.05, Tabulated value of (2,86) is 3.11
SS = Sum of square due to error, MSS = Mean sum of square, F = F-ratio value

Table 4: Paired adjusted final means and differences between means among the experimental and control groups of fat percentage

Group means			Mean difference	Critical difference at 5% level
Akhada group	Free weight and machine group	Control group		
12.01	12.30		0.46	
12.01		12.92	1.16*	0.49
	12.30	12.92	0.59*	

* indicates significance of value at P=0.05

Table 5: Analysis of co-variance for the experimental and control groups of lean body mass

Source of variance	d.f.	SS	MSS	F value	Remarks
Training	2	116.52	58.26	15.55	(P<0.05)
Error	86	322.23	3.74		

* indicates significance of value at P=0.05, Tabulated value of (2,86) is 3.11
SS = Sum of square due to error, MSS = Mean sum of square, F = F-ratio value

Table 6: Paired adjusted final means and differences between means among the experimental groups and control group of lean body mass

Group means			Mean difference	Critical difference at 5% level
Akhada group	Free weight and machine group	Control group		
54.18	56.84		0.308	
54.18		55.59	2.317*	0.835
	56.84	55.59	2.625*	

* indicates significance of value at P=0.05

table that Akhada group and free weight and machine group were equally effective.

The result pertaining to the analysis of co-variance done for two experimental groups and control group of Lean Body Mass performance are presented in Table 5.

From Table 5 it is evident that the adjusted F-ratio value was 15.55 which was found greater than tabulated F-ratio value (3.11), significant at 0.05 level. It indicates that mean score of lean body mass of subjects belonging to experimental groups and control group differed significantly. Thus, the Null hypothesis (H_0) that the adjusted mean scores of lean body mass of subject belonging to experimental groups and control group differed significantly by considering pre-lean body mass as covariate, so Null hypothesis is rejected. As the F-ratio was found significant in the case of lean body mass, the significant difference (LSD) post-hoc test was applied to test the significant difference between paired means on body composition has been presented in (Table 6 and Fig. 1).

It is evident from Table 6 that mean differences of control group and experimental group were found to be significant whereas the mean difference of Akhada group and Free weight and Machine group was not found statistically significant at 0.05 level. It reveals from the table that Akhada group and free weight and machine group were equally effective.

The purpose of the study was to investigate the comparative effect of Akhada training and Free weight and Machine training on body composition of physical education students. The finding of the study showed that there was a significant difference in body composition between Akhada group, free weight and machine group and control group at 0.05 level of significance. Price and Fisher (1975) studied the effects of three weeks weight

training programme on strength, endurance, girth measurements and body composition and resulted that there was a significant increase in the girth measures, all skin fold measurements and per cent body fat in comparison to the control group. The finding of this study is in agreement of the study conducted by Sanders (1985) that reported that programme of progressive resistance exercise produced marked increase in strength and brought significant change in body composition. In case of Total body weight, Lean body mass and fat percentage, free weight and machine group and Akhada group had significant difference with control group. There was no significant difference between Free weight and Machine group and Akhada group. It may be attributed to the fact that Akhada style training and Free weight and Machine training are similar in nature in terms of the exercise pattern which is leading to strength endurance and strength endurance workout which leads to the burnout of more calories and resulting into the fat reduction with a result body weight may be reduced initially due to the higher metabolic rate and hence, it resulted in fat reduction and later on body weight increased due to the increase of lean body mass in both the training groups. It may be concluded that by participating in regular exercise programme, decreased the body fat and enhanced the lean body mass.

Post hoc test body composition showed no significant difference between Akhada group and Free weight and Machine group. The finding of this study is in congruent with the study conducted by Brown (1986), who reported that no changes in body composition were obtained. The results of the study showed that both types of training *i.e.* Akhada training and Free weight and Machine training produced significant improvement in body composition. In body composition, both training programme increased

body weight and Lean body mass but decreased the fat percentage where as both programme were equally effective because there was no significant difference between Akhada training and free weight and machine training programme. The results of this study will help the coaches and physical education teachers may suitably modify their training programme to attain high level of strength and to get success in their sports.

Authors' affiliations:

JAI PRAKASH BHUKAR, Department of Physical Education Pedagogy, Lakshmibai National University of Physical Education, GWALIOR (M.P.) INDIA

REFERENCES

Amhem Daniel, A. (1985). *Modern principles of athletic training*. Santaclara, Mosby College Publishing , (6th Ed.).

Belbert, Oberteuffer and Caleste, **Ulrich (1962).** *Physical education*, A text book of principles for professional students (3rd Ed.) Harper and Row, New York.

Brown, Rebecca D. (1986). Effects of strength training programme on strength, body composition and self-concept of females, *Dissertation Abstracts Internat.,* **49**:9

Dubey, Chandra (1986). Effect of traditional and modern exercises on selected physical and physiological variables of wrestlers in India. (Thesis, 1986).

Patterson, Lombardi V. (1989). *Beginning weight training*, W.M.C. Brown Publishers.

Price, Sandra and Fisher, Garth (1975). The effects of weight training on strength, endurance, girth and body composition in college women, *Research Quarterly,* **46.** (March 1975).

Sanders, Ross Thomas (1985). The effects of programme of progressive resistance exercise on strength, muscle girth and body composition of college women, *Dissertation Abstracts Internat.*

The Encyclopedia of Indian Physical Culture (1950).

*****