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Comparison of Relative Strength among Different Athletes of Throwing Events

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Abstract
The purpose of the study was to compare the relative strength among the different athletes of throwers. The subjects were selected from the male throwers of All India Inter University Athletic Championship (India). Thirty (30) male throwers were divided into three groups of ten (10) each was selected as the subject for the study. The throwers performance or scores in respective body weight were presented to compare the relative strength among the different throwing events of throwers. The relative strength of throwers can be obtained by dividing recorded performance or score with body weight of the subjects. To see the significant difference of relative strength among the different throwing events of throwers the analysis of variance "F-ratio" was applied at.05 level of significance. For further analysis "Post-Hoc Test" (LSD Test) was applied. The obtained value of "F-ratio" (3.35) was greater than the tabulated value (2.51). The analysis of data reveals that there is a significant difference in the two groups out of three groups in their relative strength, however group I had shown highest relative strength as its mean value is highest among all groups.
Keywords: Relative strength, Body weight, Lifting score, Throwers

1. Introduction

Games were the part of the daily life of the people, or any important event.(2) Games and sports can play an important part in developing physical fitness and skills for use in leisure time, now and perhaps more important, in later years. Many of the skill developed thought games and sports may be used in years to come to help keep physically fit (1). Today a sport has become a form of mass participation. It attracts the masses either for recreation or physical fitness or as a profession; furthermore, to some, if not all, to investigate the causing phenomenon to achieve excellent sport performance (7). Sports can improve the components of fitness namely: Strength, Speed, endurance, flexibility and suppleness. Sports can burn calories. Sports can affect ones appetite. Strength is needed not only for competition but also for successfully carrying out the training programmes (4). To enhance your relative strength, your goal over the next four weeks must be to recruit as many fibers as possible. Research indicates that for untrained individuals not engaged in heavy manual labor or exercise, maximum muscles strength is reached between the ages of eighteen and twenty, after which it decreases gradually. With increased age and disuse of muscle there can be marked reduction in muscular strength (6). Strength training is not only limited to competitive sports, but also for training for prevention and rehabilitation, as well as strength training as a leisure time activity in gym is now quite common, strength training was, still is a major part of athletic training with the aim to improve performance (9). Strength is also one of key to success in modem games and sports. Such as a statement may sound extreme but nevertheless it is true strength, however is the key element because it is more improved than other elements? It is in fact the only element that can only be improved with one hundred percent success (5).

2. Materials and methods

2.1 Subjects

Subject: Thirty students were divided into three groups. i.e., shot putters, discus throwers and hammer throwers. Each group comprised of 10 subjects. The average age of the students ranged between 20 to 25 years volunteered to participate in the study from L.N.I.P.E, India.

2.2 Methodology

In order to measure the relative strength of various throwers of different groups, the data was collected from the best lift of the three parameters i.e. bench press, full squat and dead lift along with the body weight of individual

thrower. The subjects were given three chances for each of the parameter with sufficient resting phase in between. The sum of the best 3 lifts of respective parameter has been divided with the body weight of the subject to get the relative strength.

3. Data Analysis

For testing the statistical significance of the difference between the group means in relative strength, the data may subjected to one way analysis of variance 'f' – ratio. To further analyze "which group is better" pair wise mean comparison analysis was done by using post-HOC test. The selected level of significance was 0.05.

4. Results

The study was conducted to determine the comparison of relative strength male athletes selected to participate in "All India Inter University Athletic Competition" in the throwing events for the year 2008-09. The level of significance was selected at 0.05.

The total subjects were 30, which were divided into three groups of 10 each. The sum of the best 3 lifts of respective parameters was considered as the scores of the subjects. The data were further subjected to one way analysis of variance. The results of one way analysis of variance (ANOVA) of the data of subjects in relative strength are presented in table 1.

Table 1. Analysis of variance (ANOVA) for the data of relative strength of different events in throwing

Source of Variation	SS	Df	MS	F	P-value	F crit
Between Groups	2.219326	2	1.109663	5.710093	0.008548	3.354131
Within Groups	5.247007	27	0.194334			
Total	7.466333	29				

Tab. F.05 (2, 27) = 2.51

Table-1 shown that the obtained value of 'F' ratio were 3.35 greater than the tabulated value of 2.51 for the selected degree of freedom and level of significance which indicates that the subjects of all the groups differ significantly in relative strength.

The mean values of the entire three groups are given in table –2.

Table-2 Mean of scores of the relative strength of throwers from different events in throwing

Groups	Count	Sum	Average	Variance
Shot Putters	10	48.814	4.8814	0.19576
Discus Throwers	10	55.185	5.5185	0.106882
Hammer Throwers	10	53.687	5.3687	0.280359

M = Mean value of relative strength in kilograms.

To further analyses which group is better; pairwise mean comparison analysis was done by using "Post Hoc Test" in table 3.

Table-3 Post Hoc Test for the comparison of relative strength among the throwers of different events in throwing

Mean of different group			Mean difference	Critical difference
I	II	III		
4.881	5.518		**0.637***	**0.399**
4.881		5.368	**0.487***	
	5.518	5.368	**0.15**	

Table-3 indicates that there were significant differences in the shot putters and discus throwers. After applying the Post Hoc Test it was found that there was significant difference in the first and second group in their relative strength. However group I (shot putters) had higher relative strength.

5. Discussion

The analysis of data reveals that there is a significant difference in relative strength of various categories events of throwers was found at the selected level of significance which establishes that various categories of throwers possesses different level of relative strength. After applying the Post hoc test it was found that there was significant difference in two groups out of three groups in their relative strength. However group-I had highest relative strength as its mean value is highest among all the groups. A study tested that a women college students in toe strength, ankle strength and leg strength toe and ankle flexibility and running special prior to and immediately following a four week exercise programme. There was significant gain in four of the strength test and running speed and significant loss in leg strength, toe and ankle flexibility (8). A study conducted to compare two progressive strength training protocols, a plyometric exercise protocol and two flexibility protocols, for improving the strength and flexibility of the quadriceps and hamstrings muscular complex of high school

weight training students. All training protocols significantly increased left quadriceps and left hamstrings strength; however, the flexibility protocol static stretching was more effective in producing strength of the hamstrings (3). In this study after applying the Post hoc test it was found that there was significant difference in two groups out of three groups in their relative strength its may be probably due to the different nature of training and pre-requisite components for lifters. Such results may be due to small size of sample and other factors such as different body types, difference in the body compositions etc.

6. Conclusions

Within the limitations of the study the conclusions were drawn that the throwers participated in various categories showed a significant difference in their relative strength except third group. Group-I had the highest relative strength as its mean value is highest among all the three groups.

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