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Dr. Amandeep Singh

Assistant Professor, Guru Nanak
Dev University, Amritsar,
Punjab, India

Vikesh Kumar

Physical Director, Government
Degree College Jindrah, Jammu,
Jammu and Kashmir, India

Relationship of anthropometric and physiological parameters with performance among Indian national high jumpers

Dr. Amandeep Singh and Vikesh Kumar

Abstract

The intention of present study was to assess anthropometric and physiological parameters of high jumpers and to ascertain relationship of anthropometric and physiological parameters with performance. The data were collected during All India Interuniversity Athletics Championship 2018-2019 held at Mangalore University, Karnataka, India. Total 25 High jumpers were selected. The age of athletes were ranged from 19 to 25 years. A written consent was signed from all the athletes. Pearson correlation of coefficient was utilized to ascertain association of anthropometric and physiological parameters with performance. Level of significance was set at 0.05.

Keywords: Anthropometric, physiological, high jumper

Introduction

The jumps are the fundamental activities of human beings which had catered the food gathering and safety need of mankind right from the ancient times. Competitive jumps had come a long way in the development of technique and style. They are included in the modern Olympic Games right from their very start in Athens (1896). The physique which includes the evaluation of size, shape and form of an individual is of prime importance as to know how far an individual can succeed in becoming a top athlete. The Competitive sports demand event specific physique and body composition to achieve the success. De Garay *et al.* (1974) ^[1] concluded that top-level performance in a particular event demands a particular type of body size and shape, if other aspects are being similar. They showed high correlation between the body profile of an athlete and specific task (event) in which he/she excelled. Various other studies also suggest that different body sizes, shapes and proportions are beneficial in different physical activities. Hirata (1966) ^[2] suggested that a nation with people whose general physique is limited to the characteristics of champions in certain events must concentrate their sports training on those specific events only. He also concluded that Japanese with small body-builds are best for gymnastics, long-distance running, boxing and weight lifting etc. whereas the Americans who are large and lean are best for basketball, volleyball, swimming, long jump, short and middle distance running. Carter (1982) ^[7] suggested that the athletes who wish to achieve success in sports at a high level should compare their physique with Olympic athletes. If the athlete's bodily structure is within the limit of the Olympians, he/she may achieve high performance subjected to the optimization of other factors. Behnke and Royce (1996) ^[4] concluded that long distance runners are characterized by excessive leanness, relatively small body size and a deficiency of arm girth compared to chest size and leg length. The anthropometric and compositional study on cross-country runners revealed that runners are characterized by a relatively large calf and small biceps and abdominal girths. Mc Ardle *et al.* (1981) ^[5] pointed out that athletes generally have physique characteristics unique to their specific sports. For example field event athletes have relatively large quantities of lean tissues and a high percentage of body fat whereas long distance runners have the least amount of lean tissue and fat mass. He also pointed out that football players are amongst the heaviest and leanest of all sports men. Sharma and Dixit (1985) ^[6] investigated that physique is one of the most important factors, which becomes pre-requisite for better performance in games and

Correspondence

Dr. Amandeep Singh

Assistant Professor, Guru Nanak
Dev University, Amritsar,
Punjab, India

sports. They compared jumpers with throwers and found that the jumpers were less meso-morphic and more ecto-morphic. The physical educationists have designed test procedure for evaluating the fitness of young children. The performance structure for different games and events is being worked out. The general physical fitness of top-ranking athletes has been evaluated. Proposals are coming for the selection of potential athletes with the design of tests and body size predictions. The idea is to put the interested individual in a game or event in such a way so that one gives out the best of one's abilities. In this connection, the role of physique is of utmost importance.

Material and Methods

Subjects

Twenty five jumpers selected during All India Interuniversity Athletics Championship 2018-19, age between 19-25 yrs. The aim and methodology of the study informed to all the subjects and they voluntarily to participate in this study

Criterion Measure

Weight measured in Kilograms Anthropometrical characteristics measured in Centimeter and m.m. Proportionality (indices) Ratios Somatotype Ratings Body Fat measured in % (percents) Blood pressure measured in mm. /Hg Vital capacity measured in liters Heart rate measured in

Beats/minute Respiratory rates measured in Breathings / minute

Procedure

The detail protocol of the study intimated to all the subjects and signed written consent form. The measurements of the subjects were taken within two days. On first day all anthropometric measurements was taken and physiological assessments was done on second day.

Measurements

Anthropometric assessment was taken as per instruction issued by International Society for the Advancement of Kinanthropometry (ISAK). Vital capacity was taken by using computerized Spiro-meter. Carter and Heath (1990) [7] utilized for estimation of Somatotype constituents (endomorph, mesomorphy, ectomorphy). The height achieved by the jumpers in the competition regarded as performance.

Tester Competency

The researcher was well versed in Anthropometrical and Physiological measuring technique. and the subjects were also trained to give accurate measurements beforehand. The techniques of Spiro-meter also instructed to the subjects.

Results

Table 1: Coefficient Correlation of High Jumpers' Performance with their Anthropometrical and Physiological parameters

Variables	Mean value	Correlation
Age	22.64	0.46
No. of years in training	4.72	0.65
Standing Height	180.01	0.37
Body Weight	64.47	-0.02
Sitting height	87.87	-0.17
Upper arm length	35.95	0.45
Lower arm length	30.23	0.29
Upper leg length	51.66	0.30
Lower leg length	51.62	0.06
Foot Length	26.62	-0.20
Chest depth	18.34	0.25
Shoulder breadth	41.64	0.14
Hip breadth	27.19	-0.18
Humerus Biepicondyle diameter	6.56	-0.19
Femurs Biepicondyle diameter	8.39	-0.15
Ankle breadth	6.96	0.18
Wrist breadth	5.46	-0.06
Biceps Muscle circumference	29.91	0.02
Calf muscle circumference	34.06	-0.01
Thigh muscle circumference	49.40	-0.002
Biceps Skin folds	2.91	-0.30
Triceps skin folds	5.67	0.05
Supra iliac skin folds	7.64	-0.08
Sub scapular skin folds	8.43	0.11
Calf skin folds	6.46	-0.12
Thigh skin folds	6.89	-0.06
Endomorphy	2.58	-0.02
Mesomorphy	0.60	-0.05
Ectomorphy	4.32	0.37
Resting pulse rate	69.76	-0.13
Systolic blood pressure	112.12	-0.03
Diastolic blood pressure	72.48	0.17
Vital capacity	5760	0.13
Resting respiratory rate	1952	0.41

Table-1 shows that the positive correlations were observed between the high jumpers performance with their age, No. of years in training, standing height, upper arm length, lower

arm length, upper leg length, lower leg length, chest depth, shoulder breadth, ankle breadth, biceps muscle circumference, triceps skin folds, sub-scapular skin folds, ectomorphy,

diastolic blood pressure, vital capacity and resting respiratory rate. Whereas the negative correlations were observed between the performance of high jumpers with their body weight, foot length, hip width, humerus bi-epicondyle diameter, femur bi-epicondyle diameter, wrist width, calf muscle circumference, thigh muscle circumference, biceps skin fold, supra-iliac skin folds, calf skin folds, thigh skin fold, mesomorphy, endomorphy, resting pulse rate and systolic blood pressure.

Discussion

The review of various research studies in light of our finding is leading us to conclude that the observed significant association of various anthropometrical and physiological variables of jumpers are decisive determinants of the performance. This is confirming the fact that competitive sport demands events specific physical structure. A top level performance demands a particular type of body size shape and proportion. Numerous researchers had observed high correlation between the body profile of athletes and performance in specific tasks. Hirata (1966)^[2] had suggested that nation with people whose general physique is limited to the characteristics of champions in certain events must concentrate their training program on those events only. Carter (1982)^[3] had also suggested that the athletes who wish to achieve success in sports at high level must compare their physique with Olympic athletes. Thus our findings are setting guideline for coaches and up-coming athletes for comparing their physical structure with the different group of jumpers of our country. If their structure is in line with the high performers then they may also achieve their status, subject to the optimization of other factors.

Conclusion

Anthropometric characteristics and physiological parameters are important in sports performance. Coaches and physical education teachers must take in account these variables while talent identification and formulation of training schedule in any sports. This study clearly indicates that certain anthropometric and physiological parameters are imperative in high jump. These characteristic provides edge over other athletes in completions.

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