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Relationship between Anthropometric and Physiological Variables of College Level Female Sprinters and Long Jumpers

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Abstract: The aim of this study was to find out the relationship between selected anthropometric and physiological variables of college level female long jumpers and sprinters. Fifteen female sprinters and fifteen female long jumpers of Post Graduate Government college sector-11 Chandigarh were tested. The range of age for all female sportspersons lies from 20 to 25 years. The selected anthropometric measurements like height, body weight and leg length and physiological variables like resting heart rate, blood pressure and Vo2 max were taken. In order to ascertain significance of correlation between the anthropometric and physiological variables, pearson's coefficient of correlation (r) test was employed and the level of significance was recorded at 5% and 1% level. Results revealed that female long jumpers were found taller for height, heavier for body weight and longer for leg length with respect to female sprinters. In physiological variables, female sprinters were investigated for more resting heart rate, similar blood pressure (systolic) and slightly lesser V (o_2) max with respect to long jumpers. In female sprinters, highly significant correlation values were observed at 1% level between height & body weight (0.66), height & leg length (o.88), body weight & leg length (0.78), resting heart rate & blood pressure (systolic) (0.799), resting heart rate & Vo_2 max (-0.996)and blood pressure & Vo_2max(-0.81) respectively. Height has shown significant correlation at 5% level with resting heart rate (-0.38) and Vo_2 max (0.38). In female long jumpers, highly significant correlation values were observed at 1% level between height & leg length (0.62), resting heart rate & blood pressure (systolic) (0.813), resting heart rate & Vo_2max(-0.992) and blood pressure & Vo_2 max (-0.81) respectively. Leg length has shown significant correlation at 5% level with resting heart rate (0.39) and Vo_2max (-0.38).

Keywords: *Height, Weight, Leg Length, Blood Pressure, Resting Heart Rate and V(O_2).*

Introduction:

It is well known fact that there are no two bodies exactly alike in physical characteristics. In addition to a long history of research studies that have attempted to classify body types and body structure, presently referred to as somatotyping; there has been interest in noting the personality associated with certain body types. An understanding of the physical capabilities related to certain body types and structures should be of value to the scientists and physical

educationists in perceiving the individual problems of the sports children with whom he deals. Recognizing the limitations as well as the potentialities of his youngsters, the scientists and physical educationists are able to develop a scientific programme that will better suit the needs of those youngsters.

Measurements of body include such descriptive information as height, weight and surface area, while measure of body proportion describes the relation between the height and weight among length, widths and circumference of various body segments. It has been found that the top athletes in some sports tend to have those proportions that biomechanically aid the particular performance required (Zeigler, 1982).

Sodhi (1991) & Sidhu et al (1990) studied that the long, high and triple jumpers were taller but lighter in weight with proportionately longer lower extremities and shorter trunks than those of other field athletes. However the Indian athletes were proportionately slender in hip width with narrow acromial diameter and smaller chests. They had smaller bicondylar diameters with less of lean tissue area as well as the total body- fat than other athletes.

Morphological characteristics are most important factor because to a great extent these are genetically determined (Sodhi, 1980; Norton and Olds, 2001).The anthropometric parameters are used to determine the morphological status, that is, body constitution and body structure of an athlete. It is well known fact that a general relationship exists between morphology and performance. Several studies on various body characteristics of different sports activities have been carried out by many researchers and they concluded that strong relationship exist between structure and performance (Gualdi-Russo & Graziani, 1993; Rienzi, 2000; Tanner 1964, Carter 1984; Morrow et al., 1982; Singh et al, 1987; Guennadi, 1990; Bell & Rhodes, 1975; Toriloa, 1987).

The main aim of this study is to explore the selected anthropometric and physiological variables of female long jumpers and sprinters and also to find out relationship between anthropometric and physiological variables of both groups under study, which helps us to select female long jumpers and sprinters at early ages for talent identification and to make guidelines and counseling about their body morphological and physiological characteristics.

Material & Methods:

The present anthropometric and physiological data have been taken on thirty female athletes (sprinters & long jumpers) of Post graduate government college Sector-11, Chandigarh. The age of female sportspersons were ranging between 20 to 25 years.

Table-1: Sample Size of College level Female Long Jumpers and Sprinters

S. No.	Sports Event	Sample Size
1.	Sprinters	15
2.	Long jumpers	15
	Total	30

For the purpose of this study, following anthropometric and physiolo gical measurements were taken by using standard instruments and following standard techniques (Weiner and Lourie, 1969 & Kansal, 2008 and Mcardle & Katch, 1996).

- **Anthropometric variables:-**Height (cm), Body weight(kg), Lower leg length (cm) Physiological variables
- **Resting heart rate (beats/minutes):** Resting heart rate has been taken two times early in the morning before any activity.
- **Blood pressure (systolic) (mm of Hg):** The blood pressure has been measured with help of qualified medical person.
- **V(o_2) max (ml/kg/minutes):**With the help of standard calculation,

  $= Vo_2max = 15 \times \frac{\text{Maximum heart rate}}{\text{Resting heart rate}}$ Maximum heart rate = 220 – age

  Appropriate statistic (Mean, SD, SE, and correlation) was used to analyze the data (Nelson and Johnson, 1970).

Results and Discussion:

Table-2 depicts that long jumper females were found taller with respect to female sprinters. Mean values of the height (cm) of the sprinters and long jumpers were 159.2cm and 168.26cm and S.D were 6.54 and 13.88 respectively.

Table-2: Mean, SD and S.E. values of Anthropometric Variables of College Level Female Sprinters and Long Jumpers

S. No	Anthropometric Variables	SPRINTERS (N=15)			LONG JUMPERS (N=15)		
		MEAN	S.D	S.E	MEAN	S.D	S.E
1	Body Height (cm)	159.2	6.54	1.68	168.26	13.88	3.58
2	Body weight (kg)	55.2	9.26	2.39	62.8	7.23	1.86
3	Lower limb(cm)	91.46	4.51	1.16	98.26	3.27	0.84

Table-2 reveals that female long jumpers were reported heavier with respect to female sprinters. Mean values of the body weight (kg) of the sprinters and long jumpers were 55.2kg

and 62.8kg and S.D were 9.26 and 7.23 respectively. Table-3 reveals that, Mean values of the lower limb (cm) of the sprinters and long jumpers were 91.46cm and 98.26cm and S.D were 4.51 and 3.27 respectively. Female jumpers were recorded larger leg length with respect to female sprinter.

Table-3 reveals that, Mean values of the resting heart rate of the sprinters and long jumpers were 77.53 and 75.26 beats per minutes and S.D values were 4.92 and 4.59 respectively. Mean values of the blood pressure (systolic) of the sprinters and long jumpers were 124.2 and 124.13 mm of Hg and S.D values were 4.08 and 5.73 respectively as shown in table-3. Table-3 reveals that, Mean values of the Vo_2max of the sprinters and long jumpers were 38.23 and 39.08 ml/kg/minute and S.D is 2.44 and 2.36 respectively.

Table-3: Mean, SD and S.E. values of Physiological variables of College Level Female Sprinters and Long Jumpers

S.No	Physiological variables	SPRINTERS			LONG JUMPERS		
		MEAN	S.D	S.E	MEAN	S.D	S.E
1	Resting heart rate (beats/minute)	77.53	4.92	1.27	75.26	4.59	1.18
2	Blood pressure (systolic)(mm of Hg)	124.2	4.08	1.05	124.13	5.73	1.48
3	Vo_2max	38.23	2.44	0.63	39.08	2.36	0.60

Table-4: Correlation Matrix between Anthropometric and Physiological Variables of College level Female Sprinters

Correlation Matrix	Height	Body Weight	Leg Length	Resting Heart rate	Blood Pressure (systolic)	Vo_2 max
Height	1	0.66**	0.88**	-0.38*	0.20	0.38*
Body Weight		1	0.78**	-0.34	0.27	0.34
Leg Length			1	-0.31	0.13	0.32
Resting heart rate				1	0.799**	-0.996**
Blood Pressure(systolic)					1	-0.81**
Vo_2max						1

* Significant at 5% Level (29) = 0.355,

* * Significant at 1% Level (29) = 0.456

Table-4 has shown correlation matrix between anthropometric and physiological variables for female sprinters. It was found that height has shown highly significant person's coefficient of correlation(r value) with body weight (0.66) & leg length (0.88) at 1% level and a t 5% level with Resting heart rate (0.38) & Vo_2 max (0.38). No correlation was observed with blood pressure. Body weight has shown highly significant correlation with leg length at 1% level and there was found non-significant correlation of body weight with all physiological variables. Non-significant correlations were recorded between leg length and all physiological variables. Resting heart rate has shown highly significant correlation with blood pressure (systolic) and Vo_2max at 1% level. There was found highly significant correlation between blood pressure (systolic) and Vo_2 max at 1% level for female sprinters.

Table-5: Correlation Matrix between Anthropometric and Physiological Variables of College level Female Long Jumpers

Correlation Matrix	Height	Body Weight	Leg Length	Resting heart rate	Blood Pressure	Vo_2 max
Height	1	0.01	0.62**	0.21	0.23	-0.20
Body Weight		1	0.09	0.17	-0.01	-0.18
Leg Length			1	0.39*	0.31	-0.38*
Resting heart rate				1	0.81**	-0.998**
Blood Pressure					1	-0.81**
Vo_2max						1

* Significant at 5% Level (29) = 0.355,

* * Significant at 1% Level (29) = 0.456

Table -5 has shown correlation matrix between anthropometric and physiological variables for female long jumpers. It was found that height has shown highly significant person's coefficient of correlation(r value) with leg length (0.88) at 1% level. No correlation was observed with body weight, resting heart rate, blood pressure and Vo_2 max. Body weight has shown non-significant correlation with all anthropometric and physiological variables. Leg length of female jumpers has shown highly significant correlation with resting heart rate & Vo_2max at 1% level. Resting heart rate has shown highly significant correlation with blood pressure (systolic) and Vo_2 max at 1% level. There was found highly significant correlation between blood pressure (systolic) and Vo_2max at 1% level for female long jumpers.

Conclusions:

From this study, it was concluded that:

- In anthropometric variables, female long jumpers were found taller in height, heavier in body weight and longer in leg length with respect to female sprinters.
- In physiological variables, female sprinters were investigated for more resting heart rate, similar blood pressure systolic and slightly lesser V (o_2) max with respect to long jumpers.
- In female sprinters, highly significant correlation values were observed at 1% level between height & body weight, height & leg length, body weight & leg length, Resting heart rate & blood pressure (systolic), Resting heart rate & Vo_2max and blood pressure & Vo_2max respectively. Height has shown significant correlation at 5% level with Resting heart rate and Vo_2max.
- In female long jumpers, highly significant correlation values were observed at 1% level between height & leg length, Resting heart rate & blood pressure (systolic), Resting heart rate & Vo_2max and blood pressure & Vo_2max respectively. Leg length has shown significant correlation at 5% level with Resting heart rate and Vo_2max.

Recommendations:

On the basis of anthropometric measurements and the body composition, the players should select the activities according to their suitability.

A similar study can be conducted on higher level of long jumpers and sprinters (National or International level).

Similar study may be repeated by employing a larger sample.

Study may be conducted to determine the body image, body type, and body concepts of the players participating in different games.

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