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Kinanthropometric Variance of Different Intensity Running Events of University Level Female Athletes of West Bengal

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Abstract- Kinanthropometry is an emerging scientific specialization concerned with the application of measurement to appraise human size, shape, proportion, composition, maturation and gross function. It is the application of anthropometry in sports and Physical Education field to find out performance of human being having the body of different shapes and sizes. At the same time, it is a scientific fact that different games and sports need different types of body-build. These research findings have changed the overall human performance capacity in the modern sports field. The purpose of the present study is to find out the difference between the body-build of different levels of female Track & Field runners in respect of their respective kinanthropometric variables.

Index Terms- Body types, Female runners, Kinanthropometric measurement, Track & Field.

I. INTRODUCTION

Kinanthropometric components, including common measures like age, stature, body mass, skinfolds etc. and aspects like proportionality, somatotype and body composition are important role players in sporting performance. Although various researchers have already investigated the relationship between morphological characteristics (kinanthropometry) and performance in different sports, but investigation of kinanthropometric characteristics of different athletes always become a new topic of research, because there characteristics or profile are changing with time. The purpose of this study was therefore to describe the body composition of University level female athletes and identify the variance of these kinanthropometric variables according to different intensity running events. Anthropometry consists of making external measurements of human body. The results can be used to apprise body build, nutritional status and posture.

Kinanthropometry is an emerging scientific specialization concerned with the application of measurement to appraise human size, shape, proportion, composition, maturation and gross function. It is a basic discipline for problem-solving in matters related to growth, exercise, performance and nutrition. Various anthropometric measurements and persons with different body types and motor skill performance have been extensively studied. Thus, sports anthropometry has developed as a special branch, not only as a parameter of selective diagnostic procedure but also as a performance prediction tool.

William et al. (1981) reported differences within male of female junior Olympic samples. Additional structural differences, generally of a lesser magnitude, also existed between other groups of junior Olympians. Differences in body composition characteristics were also noted when Junior Olympians were compared with other adolescent athletes or non-athletes.

DeGarry, Levine and Carter (1974) after intensive study of anthropometric measurements of athletes, concluded that the top level performance in a particular type of body size and shape, other aspects are being similar. They established a strong relationship between the structure of an athlete and specific task (event) of an athlete for high level of performance.

Biomechanical and physiological demands in sprinting, middle and long distance track events are different. There is a great importance of Kinanthropometry in sports performance. It is found worthwhile to compare female athletes of West Bengal, who participate different University level track events such as 100 mts, 200 mts, 400 mts, 800 mts, 1500 mts, 300mts, 500mts, 4x100 and 4x400 mts relay to provide information about their some Kinanthropometric speciality for participating in their respective events.

Track and field events are marked by an exceptional variety of duration of a single event, energetic demands and the tempo of energy release. The fact that runners need to carry their body weight, which means they need to overcome the force of gravity on different distances, stipulates a specific (lean) body composition as a prerequisite for more efficient and economic performance in a single event. Athletes who have (or) acquired the optimal physique for a particular event are more likely to succeed than those who lack the general characteristics **(Carter, 1984**). Studies on somatotype of athletes, elite athletes and Olympic athletes have generally shown that strength and speed dependent athletes tended to be basically mesomorphic while distance dependant athletes were found to be more ectomorphic with limited amount of mesomorphic muscularity **(Battinelli, 2000**).

II. METHODS

Subjects:

31 female runners who were participating in Kalyani University, West Bengal Inter College Athletic Meet, 2012 were chosen as subjects. The subjects were categorised into three groups namely,

1. Short Distance Group (SDG): Who participated 100 mts, 200 mts. and 400 mts. Run and n=15,
2. Middle Distance Group (MDG): Who participated 800 mts, and 1500 mts. Run and n=8,
3. Long Distance Group (LDG): Who participated 3000 mts, and 5000 mts. Run and n=8.

Standardized kinanthropometric measurement procedure was used with the help of requisite equipment available i.e. Stadiometer, Steel tape, Skinfold calliper and Weighing machine. The following kinanthropometric measurements were taken: Weight[Kg.], Height[cm.], Arm length[cm.], Leg length[cm.], Biceps skin fold[mm.], Triceps skin fold[mm.], Sub-scapular skin fold[mm.] and Height/leg ratio.

One way ANOVA was computed to compare among three groups on the selected kinanthropometric variables and for significance of 'F' then Tukey HSD method was applied for post HOC difference between two separate means.

III. Results and Discussion

Mean, S.D. and S.E. of Height, Weight, Arm length, Leg length, Biceps skin fold, Triceps skin fold, Sub-scapular skin fold and Height/leg ratio is presented in Table No.1,2,3,4,5,6,7 and 8 respectively.

Table :- 1 Mean, S.D. and S.E. of Height of three groups.

	SDG	MDG	LDG	Total
N	15	8	8	31
Mean	156.972	156.0513	157.1625	156.7835
S.D.	3.2838	3.2156	2.1197	2.9483
S.E.	0.8479	1.1369	0.7494	0.5295

Table :- 2 Mean, S.D. and S.E. of Weight of three groups.

	SDG	MDG	LDG	Total
N	15	8	8	31
Mean	47.2233	46.1523	43.3625	45.9506
S.D.	2.0716	3.3964	2.0896	2.8845
S.E.	0.5349	1.2008	0.7388	0.5181

Table :- 3 Mean, S.D. and S.E. of Arm length of three groups.

	SDG	MDG	LDG	Total
N	15	8	8	31
Mean	72.3867	71.85	72.5438	72.2887
S.D.	0.9674	0.8852	1.33	1.0516
S.E.	0.2498	0.313	0.4702	0.1889

Table :- 4 Mean, S.D. and S.E. of Leg length of three groups.

	SDG	MDG	LDG	Total
N	15	8	8	31
Mean	93.3873	93.345	95.4088	93.8981
S.D.	3.7756	2.6291	2.5794	3.2616
S.E.	0.9748	0.9295	0.9119	0.5858

Table :- 5 Mean, S.D. and S.E. of Biceps skinfold of three groups.

	SDG	MDG	LDG	Total
N	15	8	8	31
Mean	3.562	3.9825	3.8688	3.7497
S.D.	0.2499	0.1391	0.2155	0.02834
S.E.	0.0645	0.0492	0.0762	0.0509

Table :- 6 Mean, S.D. and S.E. of Triceps skinfold of three groups.

	SDG	MDG	LDG	Total
N	15	8	8	31
Mean	7.0947	7.25	6.8863	7.081
S.D.	0.1981	0.355	0.1025	0.02608
S.E.	0.0511	0.1255	0.0362	0.0468

Table :- 7 Mean, S.D. and S.E. of Subscapular skinfold of three groups.

	SDG	MDG	LDG	Total
N	15	8	8	31
Mean	7.388	8.3188	8.3238	7.8697
S.D.	0.2006	0.1638	0.2402	0.5131
S.E.	0.0518	0.0579	0.0849	0.0922

Table :- 8 Mean, S.D. and S.E. of Height/leg ratio of three groups.

	SDG	MDG	LDG	Total
N	15	8	8	31
Mean	1.677	1.666	1.643	1.665
S.D.	0.0384	0.0206	0.0250	0.0336
S.E.	0.009927	0.0579	0.0849	0.0922

The ANOVA table for different Kinanthropometric variables are presented in Table No.9. Here between group (BG) variance is calculated with degrees of freedom =2 and error variance is calculated with degrees of freedom =28.

Table:-9 Analysis of variance of Kinanthropometric Variables of three groups.

Variables	$(SS)_b$	$(SS)_e$	$(MS)_b$	$(MS)_e$	F	p
Height	5.9716	254.7979	2.9858	9.0999	0.33*	0.721682
Weight	78.21	171.3934	39.105	6.1212	6.39**	0.005175
Arm-length	2.204	30.9695	1.102	1.1061	1*	0.380640

Leg-length	24.6171	294.529	12.3086	10.5189	1.17*	0.325083
Biceps SF	1.0754	1.3345	0.5377	0.0477	11.28**	0.000255
Triceps SF	0.5347	1.5054	0.2674	0.0538	4.97**	0.014218
Sub-scapular SF	6.743	1.1551	3.3715	0.0413	81.72**	0.0001
H/L ratio	0.005887	0.028068	0.002943	0.001002	2.94*	0.069343

*Not-Significant,**Significant.

Table:-10 Post HOC Test For Weight

M_{sdg} Vs M_{mdg}	NS	HSD[0.05] = 2.81, HSD[0.01]= 3.6
M_{sdg} Vs M_{ldg}	P<0.01	
M_{mdg} Vs M_{ldg}	NS	

Table:-11 Post HOC Test For Biceps SF

M_{sdg} Vs M_{mdg}	P<0.01	HSD[0.05] = 0.25, HSD[0.01]= 0.32
M_{sdg} Vs M_{ldg}	P<0.05	
M_{mdg} Vs M_{ldg}	NS	

Table:-12 Post HOC Test For Triceps SF

M_{sdg} Vs M_{mdg}	NS	HSD[0.05] = 0.26, HSD[0.01]= 0.34
M_{sdg} Vs M_{ldg}	NS	
M_{mdg} Vs M_{ldg}	P<0.01	

Table:-13 Post HOC Test For Subscapular SF

M_{sdg} Vs M_{mdg}	P<0.01	HSD[0.05] = 0.23, HSD[0.01]= 0.30
M_{sdg} Vs M_{ldg}	P<0.01	
M_{mdg} Vs M_{ldg}	NS	

Table:-9 shows that there was no significant difference between height, arm-length, leg-length and height/leg ratio of three groups, but it was found that there was at least two groups were significantly different in respect of their weight, biceps skinfold, triceps skin fold as well as sub-scapular skin fold. Therefore, Tukey post HOC test was conducted for those means i.e. for weight, biceps skinfold, triceps skinfold and sub-scapular skinfold. Post HOC test showed that, in case of weight, there was no significant difference between mean of SDG(M_{sdg}) and mean of MDG (M_{mdg}) and mean of MDG(M_{mdg}) and mean of LDG (M_{ldg}), but significant difference was found between mean of SDG(M_{sdg}) and mean of LDG (M_{ldg}) in 0.01 level of significant. This means that the body weight of SDG was found greater than long distance runners. There was no different between MDG and LDG as well as SDG and MDG in respect of weight. At the same time, significant difference was found between short distance runners and middle distance runners in respect of biceps skinfold (in 0.05 level of sig.). Same result was found between short and long distance runners in respect of biceps SF (in 0.01 level of sig.). This means that SDG were found lower biceps SF in comparison with MDG and LDG. In that case also MDG and LDG were not different. In case of triceps SF opposite result was found i.e. significant difference was found between MDG and LDG, but no significant difference was found between SDG and MDG as well as SDG and LDG. Sub-scapular SF shows similar result like biceps SF i.e. significant difference was found between short distance runners and middle distance runners (in 0.01 level) as well as short distance runners and long distance runners (in 0.01 level). No difference was found between MDG and LDG. In this case also SDG showed lower sub-scapular SF than other groups. Researchers in the past have pointed out that sprinters are highly mesomorphic in nature **(Tanner, 1964; Sodhi, 1984; Vucetic et al., 2005)** i.e. lower fat percentage than middle distance and long distance runners. The present study is very much consistent with those studies.

The results of the a study conducted by **Abraham, G. (2010)** indicates that in comparison to other sports disciplines track and field athletes have lower body fat percentage. The analysis of that study showed that athletes of various track and field events statistically differ in morphological measures, especially in dimensions of body volume and body fat. **Abraham, G. (2010)** also concluded that the lowest value of % body fat was present among sprinters which are reflected in their lower values of skinfold measurement. The present study showed more or less similar results. **Cureton (1941)** stated that in general people with long legs and long arms and relatively short trunks were physically work types in long sustained heavy work but might show great speed and endurance at high levels of athletic activity. **Westlake (1967)** divided 61 female track and field athletes of San Diego County into four groups on the basis of their best event and somatotyped them using **Heath- Carter (1967)** anthropometric method. The mean somatotypes for each group were sprinters 3-3.5-4, jumpers 3-3-4.5, distance runners 3-4-3.5, and throwers 5-4.5-2. Thrower differed from the other groups in being heavier, more endomorphic, more mesomorphic and less ectomorphic. Distance runners were shortest and they were less linear than sprinters and jumpers. **Eiben (1972)** studied 125 women athletes during the Europian athletic championship. He found that in each anthropological character the sprinters had small dimension than all other women athletes.

Muthiah and Venketswarlu (1973) studied the Indian track and field athletes and noticed among the runners, the age increased and height and weight decreased with the increase in distance they run. **De-Garay et al (1974)** examined 1265 Olympic athletes at Mexico Olympics in 1968, from the total number of 6084 competitors and studied the apparent relationship between sports specially and physical structure of the individual. This study clearly supports the hypothesis: (a) there is a strong relationship between structure of athlete and the specific task in which he excels and (b) Clear physical prototypes exists for optional performance at the Olympic level games. **De-Garay et al (1974)** were perhaps the first to report comprehensive anthropometrical data to Olympic women players. Anthropometric study was done by **Sidhu (1990)** on 105 runners specializing in long, middle and short distances, by applying standard techniques. The results indicated that long,

middle and short distance runners have somatotype ratings of 1.5-3.5-3.91. 1.52-3.68-3.56 and 1.61-3.62-3.65 respectively. Percentage of body fat calculated by applying **Brozek et al., (1963)** formula is 7.51, 7.55 and 8.72 in long, middle and short distance runner. Long distance runners are less endomorphic than middle distance runners. Long distance runners are significantly leaner than short distance runners as indicated by 85 percentage of body fat, but do not differ significantly in somatotype components. Similarly middle distance runners have significantly less body fat than the short distance runners, but these two groups do not show significant differences in somatotype components. **Hebbelinck et al., (1973**), studied the somatotypes in a Spanish school-aged population The study showed an evolution in the components of the somatotype with age, and a distribution of somatoplots in the somatochart which presented peculiar characteristics in both sexes.

IV. Conclusion

1. Body weight of University level Short distance runners of West Bengal are found greater than long distance runners of same University. There is no different between Short distance runners and Middle distance runners as well as Middle distance runners and Long distance runners in respect of weight.

2. Short distance runners of Kalyani University of West Bengal have lower biceps skinfold in comparison with Middle distance and Long distance runners. In case of triceps skinfold Middle distance runners are having greater triceps skinfold in comparison to Long distance runners as well as Short distance runners. Short distance runners shows less triceps skinfold in comparison to other two groups. Sub-scapular SF shows similar result like biceps skinfold.

3. Short, middle and long distance runners are not differing significantly in Height, Leg-length, Arm-length and Height-leg ratio.

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