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Abstract

The purpose of the study was to determine the comparison between the selected motor fitness and anthropometric variables profiles of national level gymnasts and non-sportsmen between the age ranges of 19 to 24 years. The data was collected from Inter-university gymnasts taken as subjects of the study by using anthropometric rod, skin fold calipers, vernier calipers and steel tapes. The 't'-test was used as devised by Garret (1981) for calculating comparison between national gymnasts and non-sportsmen. Linear measurements i.e. Height, Sitting height, Trunk length, Total arm length, Upper arm length, Fore arm length, Total leg length, Thigh length, Foot length, girth measurements i.e. abdomen, hip and calf girths, body diameters i.e. biacromial, bitrochantric, femure bicondylayer diameters and skin fold measurements i.e. biceps, triceps, sub-scapular, suprailliac, thigh, calf and sum of skin folds and body composition variables i.e. Body density, fat percentage and fat weight have been found highly significant at one percent level. The comparison of four variables taken together with motor fitness profiles has been found highly significant of national level gymnasts and non-sportsmen.

Keywords: Anthropometric, Variables, Fitness Profiles, Gymnasts

Introduction

In the modern world which is technically for advanced and developing more and more by leaps and bounds in the shortest spans of time, there is great need of considering the personality and characteristics of the individuals and the sportspersons specially to get the surprising and convincing results. These characteristics may include anything pertaining to the need of the game and in the case of gymnastics; the motor fitness and anthropometric variables find no match and are placed much higher among the individual characteristics. Among these characteristics having great chances to improve the performance, the identification of the traits is of key value so as to let it grow or to get it nurture. To the physical educator, coach and sportsman an understanding of physical characteristic and the dynamic of motor fitness are becoming increasingly important because motor fitness is the capacity to do prolonged hard work and recover to the same state of health in the minimum possible short duration of time. This is the reason of the degree of strength, speed, endurance, agility, power and flexibility one possesses. More recently several studies conducted on Olympic

athletes have revealed that various sports events differ from one & another not only in their skill patterns, organization and equipment requirements but also in the requirement of an anatomical structure (Body- build) of the athletes participating in it.

For example Basketballers are generally tall; the weightlifters are stocky while the throwers are more bulky. De Gary. et.al. (1974). Contents that sports events are classified on the basis of the dominant characteristics of each type of event required or developed. Therefore, participants in different games and sports activities possess or require different characteristics to be successful in that particular event. Salmela (1982) observed, though gymnastics is a technical sport in which performance is evaluated on the basis of the technique of different complicated elements on various apparatus, performance of a gymnast depends on technical skill. Gene Wetstone (1938), Cureton (1951), Kjeldsen (1961), Hirata (1966), Sinning and Lindberg (1972), De Gary.et.al (1974), Falls and Humphrey (1978), Fukashina (1987), Singh and Debnath (1989) and many others have conducted the studies on gymnasts either to investigate their motor abilities or motor

fitness, physical, physiological or psychological factors. The factors are height, weight, physical courage, interest, determination, muscles strength, gross motor co-ordination, flexibility, motor educability, body proportions and sizes. They mostly predicted differences of characteristics in comparison with other groups of athletes and even in comparison with population in general.

Method and Material

One thirty national level gymnasts and one thirty non-sportsmen who participated in the various national Championship and non-sportsmen of Northern India between the age range of 19 to 24 years in the session 2002-2005 constituted the subjects of the study. For the collection of the data of the subjects, anthropometric rod, steel tape, vernier calipers and skin fold calipers were used to measure linear segments; girth, body diameters and skin fold variables respectively. The

instructions of Wernier and Lourie were followed in taking the various measurements of the body.

Body composition variables i.e. body density, fat percentage, fat weight and lean body mass were calculated by using Durnin and Rehaman's equation (1961) and Sir's equation (1956). The motor fitness profiles of national gymnasts and non-sportsmen were measured in terms of performance in shot put (8lbs), 50 meter dash, 12 minutes run and walk, bent and reach, shuttle run, standing broad jump and Beam walk. The 't'-test was used as devised by Garret (1981) for calculating comparison between inter-university gymnasts and non-sportsmen of the data respectively.

Results

The results of the study are presented in the following tables as under--

Table -1

Significant difference in the motor fitness variables of national levels gymnasts and non- sportsmen

S. No.	Variables	<i>National Level</i>		<i>Non-Sportsmen</i>		't'-ratio
		M	S.D	M	S.D	
1.	Strength	9.311	.719	6.859	1.346	17.82**
2.	Speed	7.80	.517	8.79	.711	13.10**
3.	Endurance	1958.81	59.74	1486.38	247.60	21.24**
4.	Flexibility	22.054	3.28	10.346	2.85	33.41**
5.	Agility	11.87	.519	18.60	1.261	57.55**
6.	Power	2.379	.353	1.737	.271	16.27**
7.	Balance	2.947	.418	5.1771	1.73	14.15**

****Significant at 0.01 level**

N = 260

d.f. = 258

The table-1 shows that t- ratio of motor fitness variables i.e. strength, speed, endurance, flexibility, agility, power and balance between national level gymnasts and non-sportsmen are significant at 0.01% level. Further the mean scores of inter-university level gymnast have higher in

strength, endurance, flexibility and power than the non-sportsmen. So it is shown that inter-university gymnasts have more motor fitness than the non-sportsmen whereas in variables like speed, agility and balance non-sportsmen have more mean scores than the inter-university level gymnast

Table -2

Significant difference in the selected anthropometric variables of national levels gymnasts and non-sportsmen

S. No.	Variables	<i>National Level</i>		<i>Non-Sportsmen</i>		't'-ratio
		M	S.D	M	S.D	
1.	Age	21.48	1.92	20.77	1.83	3.30**
2.	Weight	60.108	3.87	62.531	4.995	4.34**
3.	Height	166.452	4.62	169.928	6.21	5.33**
4.	Sitting Height	82.65	3.63	85.29	4.61	5.19**
5.	Trunk length	53.99	2.72	55.30	3.29	3.61**

6.	Total Arm Length	74.042	2.57	75.301	3.64	3.20**
7.	Upper Arm Length	30.91	1.36	31.52	1.97	2.90**
8.	Fore Arm Length	25.019	1.24	25.46	1.49	2.70**
9.	Hand length	18.295	.805	18.304	.837	.08
10.	Total Leg Length	85.43	4.09	87.36	4.36	3.86**
11.	Thigh Length	40.10	2.87	43.04	3.30	5.53**
12.	Fore Leg Length	44.42	2.56	44.295	2.27	.43
13.	Foot Length	24.455	1.291	25.015	1.097	3.73**

****Significant at 0.01 level N = 260 *Significant 0.05 level d.f. = 258**

Table-2 shows the t-ratio of age, weight and linear measurements i.e. height, sitting height, trunk height, total arm length, upper arm length, total leg length, upper leg length and foot length between inter-university levels gymnasts and non-sportsmen are significant at 0.01% level whereas the t-ratio of fore arm length of same measurement is significant at 0.05% levels. But the variables

like hand length and fore leg length between above two groups are not significantly difference at any level. Further the mean scores of all variables of linear measurement of non-sportsmen are higher than the national levels gymnasts. It indicates that the non-sportsmen have possessed more linear measurements than the national level gymnasts.

Table –3

Significant difference in the Diameters of National level levels gymnasts and non- sportsmen

S. No.	Variables	National Level		Non-Sportsmen		't'-ratio
		M	S.D	M	S.D	
14.	Wrist	5.731	.298	5.699	.300	.91
15.	Elbow	6.711	.410	6.772	.401	1.20
16.	Shoulder	38.85	1.664	39.68	1.933	3.87**
17.	Hip	27.83	1.397	28.36	1.681	3.03**
18.	Knee	8.92	.579	9.19	.482	4.05**
19.	Ankle	6.84	.440	6.885	.269	.92

****Significant at 0.01 level N = 260 d.f. = 258**

The table also revealed the t-ratio of shoulder, hip and knee diameters between national levels gymnasts and non-sportsmen are significant at 0.01% levels and wrist, elbow and ankle diameters are not significant at any levels. Further the mean

scores of diameters of non-sportsmen are higher than the national levels gymnasts. It implies that non-sportsmen have more diameters than that of the inter-university levels gymnasts.

Table –4

Significant difference in the Circumference of national levels gymnasts and non- sportsmen

S. No.	Variables	National Level		Non-Sportsmen		't'-ratio
		M	S.D	M	S.D	
20.	Shoulder	108.80	4.82	106.14	4.44	4.67**
21.	Upper Arm	28.996	2.48	27.946	2.43	3.56**
22.	Chest	88.41	3.44	85.92	5.22	4.70**
23.	Abdomen	73.862	3.298	75.700	5.980	3.16**
24.	Hip	87.162	3.92	88.369	3.998	2.47*
25.	Thigh	52.22	3.991	52.662	3.326	.75
26.	Calf	32.904	1.604	33.362	2.14	2.06*

****Significant at 0.01 level N = 260 d.f. = 258**

Table-4 shows that the t-ratio of shoulder, upper arm chest and abdomen girth between national levels gymnasts and non-sportsmen are significant at 0.01% level whereas the t-ratio of variables like hip and calf

girths between above two groups are significant at 0.05% level. But thigh girth has not significant at any levels.

Table –5

Significant difference in the Skin folds of national levels gymnasts and non- sportsmen

S. No.	Variables	National		Non-Sportsmen		't'-ratio
		M	S.D	M	S.D	
27.	Biceps	3.38	.759	4.24	1.08	7.45**
28.	Triceps	5.413	1.78	8.96	3.62	10.41**
29.	Sub-Scapular	8.34	1.998	10.712	2.79	8.28**
30.	Suprailiac	7.64	2.27	10.74	3.91	8.09**
31.	Thigh	8.18	2.79	12.84	4.23	10.29**
32.	Calf	8.42	2.75	11.77	2.96	9.02**
33.	Sum of Skin folds	41.30	10.23	59.11	14.72	11.39**

****Significant at 0.01 level**

N = 260

d.f. = 258

It is indicated from the same table that the t-ratio of biceps, triceps, sub-scapular, suparailiac, thigh, calf and sum of skin folds thickness between inter-university level gymnasts and non-sportsmen are

significant at 0.01% level. But according to their mean scores above two groups, it shows that non-sportsmen have more skin folds thickness than that of national levels gymnasts.

Table –6

Significant difference in the Body composition of national levels gymnasts and non- sportsmen

S. No.	Variables	National Level		Non-Sportsmen		't'-ratio
		M	S.D	M	S.D	
34.	Body density	1.0641	.007	1.0552	.007	10.97**
35.	Fat percentage	15.19	2.94	19.14	3.12	10.96**
36.	Fat weight	9.16	1.95	11.895	2.47	10.30**
37.	Lean Body Mass	51.0268	3.419	50.0262	2.328	2.61**

****Significant at 0.01 level**

N = 260

***Significant 0.05 level d.f. = 258**

The t-ratio of body composition i.e. body density, fat percentage, fat weight and lean body mass between national level gymnasts and non-sportsmen are significant at 0.01% level. So it is clearly indicated that non-sportsmen have more fat percentage and fat weight than that of national level gymnasts.

(1954),Cumming (1967),Kaur (1977),Rani (1978), Harre (1979) and Bawa (1981), Singh.N. (1983).

Discussion of the Results

According to results the significant difference of motor fitness components i.e. strength, speed, endurance, flexibility, agility, power and balance of national level gymnasts have been found to be more than those of the non-sportsmen and the differences are statistically significant (as shown in the table-1). The results reveled that inter-university gymnasts are superior in the motor fitness variables because national level gymnasts have done more technical training. These results are agreement with those of Larson (1941), Sigerreth (1944),Cureton (1947),Barrow

It is observed that height, sitting height and trunk length of non-sportsmen has been found more than those of the inter-university gymnasts (table-2) and the difference in means is statistically significant. The result is in complete agreement with those of Gunney (1973), LeVeau et.al (1974), They found that the shorter gymnasts have more strength and body weight ratio than the taller.

The upper extremity i.e. total arm length, upper arm length and fore arm length of non-sportsmen have more than those of the inter-university gymnasts (as shown in the table-2). The results are also in agreement with those of Digiovanna (1943).

The lowers extremity length i.e. total leg length, thigh length and foot length of non-sportsmen

have more than those of the inter-university gymnasts.

From the results, it is clear that elbow, shoulder, hip, knee and ankle diameters of non-sportsmen have more than those of the inter-university gymnasts whereas wrist diameter is insignificant (table-3). The result is agreement with those of Bawa (1981).

The girth measurements i.e. abdomen, hip, thigh and calf girths are more than those of the inter-university gymnasts (as shown in the table-4).

The skin fold measurements i.e. biceps, triceps, sub-scapular, suprailiac, thigh, calf skin and sum of four skin folds (biceps, triceps, sub-scapular and suprailiac skin folds) of non-sportsmen have been found to be greater than those of the inter-university gymnasts and the differences are statistically significant (as shown in the table-5). Here non-sportsmen have more thickness of subcutaneous tissues it means they have more body fat weight. The results of the present study are broadly supported by the findings of Bird (1961), Bosco (1962), Falls and Humphrey (1974). He stated "The less body fat leads to a body weight with relatively more muscles mass". The study of body composition in sports is essential because it reveals the development of different tissue components in sportsmen specializing in different physical activities. A particular proportion of the lean body mass or fat may be advantageous or disadvantageous in some way in the performance of certain events. For example, excessive body fat is useful in the case of channel swimmers but it is disadvantageous in the case of higher level of competitions in gymnastics.

Body composition variables i.e. fat percentage and fat weight of non-sportsmen have more than those of the inter-university gymnasts (as shown in the table 6) whereas body density and lean body mass of inter-university gymnasts have been found more than those of the non-sportsmen. The other similar studies i.e. (Bird (1961), Parizkova and poupa (1963), Sinning and Lindberg (1972) Falls and Humphrey (1974) reported that the excessive amount of fat create hinderance in executing gymnastics elements as it increases the body weight and leads to reduction of relative strength.

Conclusions

From the results of the study, the following conclusions have been drawn:

- The motor fitness components i.e. strength, speed, endurance, flexibility, agility, power and balance are found more in inter-university gymnasts than those of the non-sportsmen.
- The age is found more in inter-university level gymnasts than those of the non-sportsmen. But weight is found more in non-sportsmen than those of the inter-university gymnasts.
- The linear measurements i.e. height, sitting height, trunk length, total arm length, upper arm length, fore arm length, total leg length, thigh length and foot length are found more in non-sportsmen than those of the inter-university gymnasts.
- The shoulder, hip and knee diameters are found more in non-sportsmen than those of the inter-university gymnasts.
- The abdomen, hip and calf girths are found more in non-sportsmen than those of the inter-university gymnasts.
- The thickness of subcutaneous tissues of biceps, triceps, sub-scapular, suprailiac, thigh, calf and sum of skin folds are found more in non-sportsmen than those of the inter-university gymnasts.
- Body compositions variables i.e. fat percentage and fat weight are found more in non-sportsmen than those of the inter-university gymnasts.

Reference

1. Falls, H.B., Humphrey, L.P. "Comparison of Somatotype and Body Composition between Place Winner in an A.I.A.W. Gymnastics Meet". Unpublished abstract, South-West Missoun State University., 1974. c.f Christensen, C. 'The Gymnast Body'. International Gymnast.1: TS.PP 10-12, 1979.

2. Falls, H.B., Humphrey, L.P. "Comparison of Somatotype and Body Composition between Place Winner in an A.I.A.W. Gymnastics Meet". Unpublished abstract, South-West Missouri State University. 1974. c.f Christensen, C. 'The Gymnast Body'. International Gymnast.1: TS.PP 10-12, 1979.
3. Harre, D. Training-Lehre. Sportverleg, Berlin, PP 180, 1979.
4. Hirata, K; - Intra-Physique and age of Tokyo Olympic Champion. Journal of Sports Med; and Physical Fitness, 1966; 6:207-222.
5. Kaur, Gurvinder:- A Comparative Study of Motor Fitness of Basketball, Volleyball, Hockey and Gymnastics Women Players. Unpublished M.P.Ed. ; Thesis, Kurukshetra University, Kurukshetra.
6. Kjeldsen, E.-: A Study to determine the Relationship between the Edwards Personal preference Schedule and Participation in Gymnastics. Unpublished masters Thesis, Springfield College, 1961.
7. Larson, A Factor Analysis of Motor Ability Variables and Test for College men. Research Quart, 1941, 12(3): 499-517.
2. LeVeau, Barney., and McConville, J.T.'Muscle Strength, Flexibility, and Body Size of Adult Males'. Med. Sci. in Sports. 6: PP 146-150, 1974.
3. Parizkova, J., and paupa, D. ' Some Metabolic Consequences of Adaptation to Muscular Work'. British J.of Nutr., 17: PP 341-345, 1963.
4. Rani Manjula:- A Comparative Study of Basic Physical Fitness of Gymnast and non-Gymnast Girls Players of Haryana, age 16-20 years. Unpublished M.P.Ed. Thesis, Kurukshetra University Kurukshetra, 1978.
5. Salmela, John, H.: - Competitive Behavior of Olympic Gymnasts. Springfield: Charles C; Thomas, 1982.
6. Sigereth P.O.1940 "An Attempt to isolate and identify fundamental factorsw that underline Motor Fitness". Microcard Doctoral Dissertation, University of Oregon.
7. Singh Gurdial and Kalpana Debnath:- Contribution of Strength Variables Towards Competitive Performance in Men Artistic Gymnastics. NIS Scientific Journal, 1989, 12 (3): 25-30.
8. Singh. N. (1983) "Physique and Performance of Indian Male Gymnasts". Unpublished Masters' Thesis N.S.N.I.S Patiala. April 1983.
9. Sinning, W.E., and Lindberg, G.D. ' Physical characteristics of College Women Gymnasts'. Res. Quar.43: PP 226-234, 1972.
10. Wetstone, G. ' Tests for predicting potential ability in Gymnastics and Tumbling'. Res. Quar., 9: PP 115-125, 1938.