

Variation in Physical Structures of the Meitei Women Weight Lifters and the Controlled Group

H. Sorojini Devi

D.M.College of Science, Imphal 795 001, Manipur, India

E-mail: drsorojini_dmc@rediffmail.com

KEYWORDS Physical Structure. Anthropometry. Women. Weight Lifters

ABSTRACT Weight lifting is one of the power games, which demands certain specialized physical structure. The Meitei women weight lifters of state, national and international class numbering 31 individuals have been studied considering 21 anthropometric variables and had also compared with 100 Meitei women non-athletes in respect of the above physical structure. The study revealed that weight lifters have significantly shorter stature with shorter upper and forearm lengths than the non-athletes. At the same time, they have significantly heavier body weight, broader breadth measurements of hand, bi-acromial, bi-iliocristale, bi-trochanteric, and bigger girth measurements of upper and forearm, normal chest, thigh and calf than the non-athletes. Further, they have proportionately heavier body weight, larger proportions of bi-iliocristale, bi-acromial breadths and limb girths than the non-athletes. In respect of body composition, they have higher mean value of total body fat and lean body mass than the controlled group.

INTRODUCTION

Weight lifting is one of the oldest games which strength plays a vital role. Modern weight lifting started in the year 1920 when the seventh Olympic games held in Antwerp. It was considered as the test of one's strength in the earlier times and a weight lifter has to overcome heavy external resistance of the weight. The Meitei women weight lifters started participating in weight lifting event since the year 1985. During the last couple of decades, they have been participated in many national, international and Olympic games. In this sport event, certain specific physical structure with more physical strength, which is different from the athletes of other sport events, seems to play as important factors for success in high level performance. Carter (1970) suggested that the basic structure much be present to achieve success in different sports. Parnell (1958) has also indicated that the choice of sportsmen for a particular event is largely determined by the inborn characteristics. The other factors such as physical training and exercise can improve the performance upto a certain limit that is set up by his genotype (Bouchard and Malina, 1983).

Many sport scientists (Tanner, 1964; Carter, 1970, 1982; de Garay et al., 1974; Sodhi and Sidhu, 1984; Venkateshwarulu, 1990) studied the physical structures of the national and international weight lifters in order to understand the typical body structures in relation to the events by considering anthropometric measurements,

In order to discern certain body structure, which may contribute in the performance of the weight lifters, the present study has been conducted among the the Meitei women weight lifters and controlled group by comparing the anthropometric measurements, body proportions and the body compositional factors.

MATERIAL AND METHODS

The sample of the present study consists of 31 Meitei women weight lifters and another 100 non-athletes controlled group, who have already attained 18 years of age. Maximum players (58.06%) were national and international players, while the remaining (41.94%) were state players. The data of the athletes were collected from the Khuman Lampak Stadium and the data of the non-athletes were collected from the 4 valley districts of Manipur, i.e. Thoubal, Bishnupur, Imphal east and Imphal west districts in the year 1995. The age of the athletes and the non-athletes ranges from 18-32 years.

A total of 21 anthropometric measurements were collected from each individual following the standard norms of Weiner and Lourie (1969). The anthropometric measurements are body weight, stature, sitting height vertex, trunk length, upperarm length, forearm length, hand length, thigh length, lower leg length, hand breadth, bi-acromial breadth, bi-iliocristale breadth, bi-trochanteric breadth, upperarm girth, forearm girth, normal chest girth, thigh girth, calf girth, bicep

skinfold, tricep skinfold and sub-scapular skinfold.

From these 21 anthropometric measurements, 15 variables (Table 2) have been considered for calculating Z values (proportionality value). The Z values were computed by Z score formula of the Phantom Stratagem method (Ross and Ward, 1974) and revised afterward by Ross and Wilson (1982).

From the skinfold measurements, fat percent was calculated by using the equation of Slaughter et al. (1988). From the fat percent, total body fat and lean body mass have also been assessed for each individual.

Statistical constants such as mean ($\bar{X}$), Standard error of mean ($SE\bar{X}$), Standard deviation (SD) of each variable were calculated. The t-test was applied for bi-variate comparison of the two groups.

RESULTS AND DISCUSSION

In the 21 anthropometric variables, it has been revealed that the weight lifters are heavier in body weight (54.87 kg) and shorter in stature (151.25 cm) than the controlled group, who have respective mean values of body weight (47.86 kg) and stature (153.94 cm). Moreover, the present Meitei women weight lifters have shorter upper

and forearm lengths, larger and broader measurements of hand, bi-acromial, bi-ilicristale, bi-trochanteric breadths, and also in body girth measurements of upperarm, forearm, normal chest, thigh and calf and have higher readings in these variables than the controlled group. Statistically, significant differences in maximum number of the above 13 variables i.e., body weight, stature, upper and forearm lengths, 4 dimensional breadth measurements and 5 girth (Fig. 1) measurements have been shown in between the two groups (Table 1). However, Statistically, no significant differences have also been observed in some linear measurements such as sitting height vertex, trunk length, thigh and lower leg lengths and also in 3 skinfold measurements in the comparison of two groups. Further, the weight lifters did not reveal any significant variation in age from the controlled group ($t=-0.81$, $P>0.05$) level.

In respect of 15 variables of body proportion, here again, the weight lifters have proportionately heavier body weight, broader bi-acromial, bi-trochanteric, larger chest girth and limb girths of upperarm, forearm, thigh and calf and have higher readings than the controlled group. Statistically, significant differences have been found in the above 8 variables in between the weight lifters and controlled group (Table 2). In contrast, no significant differences have also been found in

Table 1: Distribution of Mean ($\bar{X}$), Standard Error of Mean ($SE\bar{X}$), Standard Deviation (SD) and t -values for Anthropometric Variables of the Weight Lifters and the Controlled group.

S. No.	Variable (cm)	Weight Lifters (n=31)			Controlled (n =100)			t- value
		$\bar{X}$	$SE\bar{X}$	SD	$\bar{X}$	$SE\bar{X}$	SD	
1	Age (yrs)	19.10	0.69	3.82	19.64	0.25	2.49	-0.81
2	Body weight (kg)	54.87	1.34	7.45	47.86	0.56	5.63	5.26**
3	Stature	151.25	0.94	5.24	153.94	0.46	4.61	-2.78**
4	Sitting height vertex	76.91	0.56	3.09	77.97	0.23	2.30	-1.92
5	Trunk length	51.70	0.43	2.39	51.90	0.23	2.30	0.44
6	Upperarm length	28.41	0.25	1.38	28.92	0.11	1.12	2.05*
7	Forearm length	22.53	0.22	1.24	23.16	0.09	0.88	2.87**
8	Hand length	17.20	0.13	0.70	17.12	0.06	0.57	0.58
9	Thigh length	36.55	0.32	1.78	37.01	0.16	1.56	1.41
10	Lower leg length	34.23	0.34	1.92	34.54	0.15	1.49	0.88
11	Hand breadth	7.33	0.07	0.38	6.92	0.04	0.38	5.67**
12	Bi-acromial breadth	35.47	0.25	1.42	34.66	0.13	1.34	3.04**
13	Bi-ilicristale breadth	27.18	0.32	1.77	26.35	0.16	1.56	2.56*
14	Bi-trochanteric breadth	32.14	0.30	1.66	30.57	0.13	1.27	5.30**
15	Upperarm girth	28.08	0.43	2.41	24.05	0.21	2.09	9.08**
16	Forearm girth	23.81	0.25	1.42	21.77	0.16	1.55	7.37**
17	Normal chest girth	85.23	0.97	5.42	81.53	0.54	5.41	3.58**
18	Thigh girth	54.80	0.65	3.64	46.72	0.31	3.09	12.11**
19	Calf girth	34.41	0.38	1.79	30.81	0.18	1.71	9.36**
20	Bicep skinfold (mm)	5.13	0.25	1.41	5.14	0.14	1.36	0.04
21	Tricep skinfold (mm)	12.86	0.57	3.15	12.16	0.31	3.05	1.17
22	Sub-scapular skinfold (mm)	12.99	0.52	2.89	13.29	0.36	3.63	-0.51

* P < 0.05

** P < 0.01

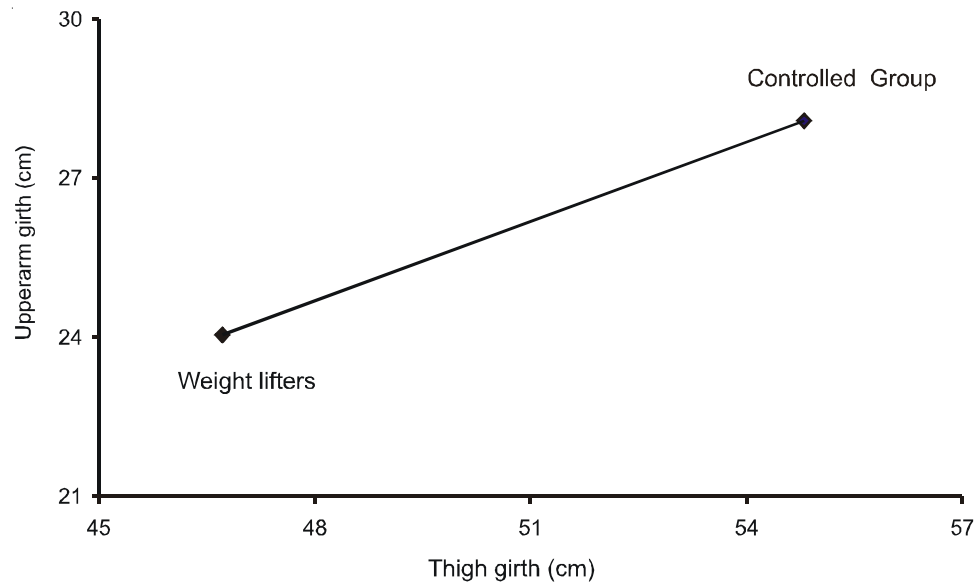


Fig. 1. Relationship between upper arm girth and thigh girth of the weight lifters and controlled group

sitting height vertex, forearm, upperarm, thigh and lower leg lengths and in three skinfolds of bicep, tricep and sub-scapular.

In body composition, the weight lifters have a more or less same mean value of Fat percent (22.77) as compared with that of the controlled group, who have a mean value of Fat percent (22.51). But the weight lifters have significantly larger total body fat and lean body mass than the controlled group ($t=2.77, 5.06, P<0.05$) level (Table 3).

CONCLUSION

The present study revealed that the Meitei women weight lifters have a typical physical structure, which is different from that of the controlled group. The heavier body weight with shorter stature is of advantageous to overcome the heavy external resistance of the weight. The shorter arms are also convenient to stay the heavy bar nearer to the body axis. Moreover, the broader hand, bi-acromial, bi-iliocristale, bi-trochanteric,

Table 2: Distribution of Mean ($\bar{X}$), Standard Error of Mean ($SE\bar{X}$), Standard Deviation (SD) and t -Values for Body Proportion (Z- values) of the Weight Lifters and the Controlled Group.

S.No.	Variable	Weight Lifters (n=31)			Controlled (n =100)			t- value
		$\bar{X}$	$SE\bar{X}$	SD	$\bar{X}$	$SE\bar{X}$	SD	
1	Body weight	1.56	0.17	0.93	0.02	0.09	0.91	8.07**
2	Sitting height vertex	-0.75	0.09	0.50	-0.82	0.04	0.38	0.75
3	Forearm length	0.57	0.14	0.78	0.76	0.06	0.55	1.27
4	Upperarm length	-0.32	0.09	0.51	-0.31	0.06	0.64	0.12
5	Thigh length	2.68	0.11	0.63	2.58	0.05	0.53	0.77
6	Lower leg length	-2.47	0.10	0.58	-2.59	0.05	0.50	1.09
7	Bi-acromial breadth	0.98	0.14	0.76	0.15	0.07	0.72	5.38**
8	Bi-iliocristale breadth	1.00	0.17	0.95	0.18	0.10	1.04	4.14**
9	Forearm girth	1.18	0.18	0.99	-0.75	0.12	1.22	8.97**
10	Upperarm girth	2.02	0.20	1.11	-0.12	0.10	1.03	9.57**
11	Chest girth	1.56	0.19	1.07	0.45	0.12	1.22	4.85
12	Thigh girth	1.39	0.17	0.92	-0.98	0.08	0.80	12.85**
13	Calf girth	1.51	0.17	0.96	-0.51	0.08	0.84	10.51**
14	Tricep skinfold	-0.20	0.14	0.80	-0.44	0.07	0.75	1.43
15	Sub-scapular skinfold	-0.51	0.11	0.63	-0.49	0.08	0.79	0.13

** $P<0.01$

Table 3: Distribution of Mean ($\bar{X}$), Standard Error of Mean ($SE\bar{X}$), Standard Deviation (SD) and t -values for Body Composition of the Weight Lifters and the Controlled Group

S.No.	Components	Weight Lifters (n=31)			Controlled (n =100)			t- value
		$\bar{X}$	$SE\bar{X}$	SD	$\bar{X}$	$SE\bar{X}$	SD	
1	Fat percent	22.77	0.67	3.73	22.51	0.40	3.96	0.34
2	Total body fat (kg)	12.59	0.54	3.00	10.90	0.29	2.86	2.77**
3	Lean body mass (kg)	42.29	0.99	5.50	36.96	0.36	3.60	5.06**

**P<0.01, df=129

upper and lower limb girth measurements are suggestive of well developed musculo-skeletal tissue amongst them. The proportionately larger body dimensions and limb girths are also additional advantages for them. Moreover, larger amount of lean body mass might give enough strength to overcome the heavy weight. Such a trend was also found among national and international weight lifters (Tanner, 1964 and Sodhi and Sidhu, 1984). From the present study, it may be concluded that among the Meitei women, there are individuals, whose body structures are suited in the demands of this specialized weight lifting event but quite different from that of the controlled group. The variations in the physical structures are determined by genetic as well as environmental factors.

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