Physique and Body Proportions of Female elite Football

Jaswinder Singh*, Y. Momo Singh*, Rajdeep Kaur Talwar*, Gurpreet Kaur**

ABSTRACT

The present study has been conducted on 22 female elite Football players. The data were collected in November 2014 during a national camp held at NS NIS, Patiala. Anthropometric measurements were taken on right side of body, by following standard techniques. Standard instruments were used for data collection. Data were analysed for physique, present body fat and body proportionality. The female elite Football players were 157.4 cm tall and 53.87 kg heavy. Their somatotype components were found to be 3.7-4.8-1.96. Their proportionality profile of body weight and diameter of elbow and knee indicate greater development than universal phantom. The z values of circumference of upper arm (N & F) indicate that proportional lesser development than universal phantom.

INTRODUCTION

Experienced coaches judge the capabilities of players by observing their body structure, composition and proportionality. However, sport sciences provides tools to measure these characteristics quantitatively. Body type is a useful indicator for future performance. Saha (2013) conducted a somatotype on 204 university level male Football players. He reported mean height 168 .75 cm and weight 60.70 kg. The mean somatotype was 2.35-4.63-2.50. Ivana (2005) reported a study on 23 female national Football players of Serbia and Montenegro, participant of 2003 competition. The average height of Football players were 168.1 cm ± 6.5 and their weight was 61.78 kg ± 7.05 (Age =22.7 ±3.7 yr). The female Football players were taller and heavier than average women. Their legs were longer, shoulders were broader and hips were narrower. Orhan et al. (2010) studied somatotype of Turkcell Super League male Football players in Turkey. They reported that there were no special structures between playing positions. Lot of studies have been conducted on somatotype of athletes (Tanner, 1964; de Garay, 1974; Carter, 1984; Carter & Heath 1990; Ackland et al, 2009).

Body proportions, indices or ratios are widely used to know the variation in one body measurement by keeping the other constant in an individual. Ross and Wilson (1974) proposed the term, "Phantom" which is a universal, unisex and bilaterally symmetrical model derived from reference male and female data. The deviations from phantom are expressed as z- values. Ross and Ward (1984) studied the z values of Olympic athletes and observed that runners were more linear than swimmers, since their arm, thigh and tibial lengths proportional to height were larger. The former possess smaller proportional arm girth but larger thigh and calf girths than latter. Weightlifters and wrestlers had similar body proportions but former had proportionally shorter arms and legs and wider shoulders than the latter (Eiben, 1980; Eiben, 1981; Eiben et al, 1977;

Hebbelinck & Ross, 1973; Lasan, 1998; Perez, 1981; Ross, 1976; Ross et al, 1980; Ross & Ward, 1982; Shephard et al, 1985; Siniarska & Wolanski, 2002; and Skibinska 1979). Kaur et al (2002) studied the body proportionality of national female campers.

In India, Somatotype studies on top level female football players still lacking. Keeping this in view present study has been conducted.

METHOLOGY

The present study has been conducted on female football players (N =22) in November, 2014, during national camp held at NS NIS, Patiala. Anthropometric measurements were taken on right side of body, by following standard techniques of Ross et al, (1978). Standard instruments were used for data collection. Data were analysed for physique, percent body fat and body proportionality.

Physique (somatotype)

To assess the physique (endomorphy,

mesomorphy and ectomorphy) of the subject's somatotype estimation equations of Carter and Heath (1990) were used.

Endomorphy=$0.1451(X) - 0.00068(X)^2 + 0.0000014(X)^3 - 0.7182$

Where 'X' is the sum of the triceps, sub-scapular and suprailiac skinfold thickness multiplied by $170.18 \div$ height in cm.

Mesomorphy= $(0.858 \times H.B.D) + (0.601 \times F.B.D) + (0.188 \times C.A.C) + (0.161 \times C.C.C) - (Height \times 0.131) + 4.5$

Where- H.B.D = Humerus Bone Diameter; F.B.D = Femur Bone Diameter;

C.A.C = Corrected Arm Circumference (Arm Girth in cm. – Triceps Skinfold in cm.); C.C.C = Corrected Calf Circumference (Calf Girth in cm. – Calf Skinfold in cm.)

Ectomorphy= If H.W.R. (Height in cm $\div$ $3\sqrt{}$ weight in kg) is greater than or equal to 40.75 ($\leqslant 40.75$) then

Table -1: Anthropometric variables of female National Football players (N=22)

Variables	Mean	SD
Age	22.45	3.35
Height	157.40	4.14
Weight	53.87	5.14
Biepicondylar humerus diameter	6.16	0.37
Biepicondylar femur diameter	9.13	0.42
Upper arm (N) circumference	24.05	1.67
Upper arm (F) circumference	26.95	1.80
Calf circumference	34.30	1.81
Biceps skinfold	5.20	2.08
Triceps Skinfold	13.89	4.67
Subscapular skinfold	13.20	4.67
Suprailiac Skinfold	13.67	6.89
Supraspinale skinfold	8.24	4.48
Calf skinfold	12.65	5.36

Table-2 : Somatotype and percent body fat of female National football players.

Somatotypes	Mean	SD
Endomorphy	3.75	1.00
Mesomorphy	4.78	0.88
Ectomorphy	1.96	0.83
HWR	41.73	1.13
BMI	21.74	1.13
FAT(%)	24.38	4.09

Table 2 shows that present study female elite Football players possess about 1 unit more mesomorphy than endomorphy. Thus, present level female elite Football players have high fat and endomorphy. However, their BMI has been found in normal healthy range.

Table-3: Proportionality profile of Female National Football Players

Variables	Mean Z-value	SD
Weight	0.412	0.632
Biepicondylar humerus diameter	0.522	1.102
Biepicondylar femur diameter	0.745	1.107
Upper arm (N) circumference	-0.377	0.689
Upper arm (F) circumference	-0.108	0.776
Calf circumference	0.810	0.874
Biceps skinfold	-1.197	1.098
Triceps Skinfold	-0.096	1.072
Subscapular skinfold	-0.580	0.777
Suprailiac Skinfold	-1.126	1.074
Supraspinale skinfold	-1.455	1.063
Calf skinfold	-0.504	1.217

Table 3 shows the proportionality profile of national female Football players. Body weight and diameter of elbow and knee indicate greater development than universal phantom. The z values of circumference of upper arm (N & F) indicate that proportional lesser development than universal phantom. The z values of skinfolds were found to be negative indicating lesser development than phantom. The negative value of players may be due to their fitness. The z value of calf circumference has been found to be positive indicating greater development than universal phantom. The findings indicate that calf region is more exercised than upper arm.

Table -4: Position-wise number of female Football players.

Position	Number
Forward	4
L/R Wing	5
Mid field	4
Defence	7
Goalkeeper	2
Total	**22**

Table 4 shows the distribution of sample. Total sample size is 22. Maximum players are in defence line (7) whereas minimum goalkeeper (2), L/R wing 5, midfield 4 and forward 4, respectively.

Table-5a: Anthropometric measurement of elite female footballers

Group	Parameter		Parameter		Parameter		Parameter		Parameter	
	Age (yr)		Height (cm)		Weight (kg)		Biepicondylar humerus		Biepicondylar femur	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1	21.5	2.1	156.8	4.2	49.6	5.7	5.8	0.18	8.98	0.36
2	23.4	2.1	156.1	6.5	52.0	3.3	5.98	0.19	9.0	0.67
3	25.0	6.2	155.3	1.9	56.2	3.8	6.2	0.60	9.0	0.25
4	21.6	2.50	158.2	2.6	53.5	3.3	6.3	0.11	9.2	0.20
5	20.0	0.0	162.6	0.1	63.5	2.5	6.7	0.14	9.7	0.14

Group 1: Forward; Group 2: L/R Wing Group 3: Mid field; Group 4: Defence; Group 5: Goalkeeper

Table-5b: Anthropometric measurement of female elite footballers

Group	Circumferences (cm)						Skinfolds (mm)			
	Upper arm (normal)		Upper arm flexed		Calf		Biceps		Triceps	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1	22.95	1.49	25.63	1.65	32.38	2.06	4.85	1.05	12.80	3.33
2	23.40	1.17	26.34	1.69	34.50	1.16	4.00	0.71	12.08	1.91
3	23.95	1.00	27.10	0.80	34.73	2.25	6.60	3.32	14.80	3.82
4	24.27	1.51	27.17	1.69	34.40	1.27	5.03	2.19	12.09	3.38
5	27.35	0.49	30.10	0.57	36.50	0.00	6.70	1.84	25.10	0.14

Group 1: Forward; Group 2: L/R Wing Group 3: Mid field; Group 4: Defence; Group 5: Goalkeeper

Table 5a shows that players at mid-field position are oldest among all groups; whereas, the goalkeepers are the youngest. Goalkeepers are tallest (162.6 cm); whereas, midfield shortest among all groups. However, differences are very less in all groups, except goalkeepers, in case of height. Differences in body weight are wide. Minimum weight of 49.6 kg has been noticed in forward players; whereas, maximum in goalkeepers (63.5 kg). Similar trend has been observed in case of elbow and knee diameters.

Table 5b shows the upper arm, calf circumference, biceps and triceps skinfolds. Minimum values of upper arm and calf circumference has been found in forward group; whereas, maximum in goalkeepers. The skinfold of biceps is found to be maximum in goalkeepers. Triceps skinfold is almost double in goalkeepers than all other groups. So, circumferences of goalkeepers may be high due to more fat mass than other groups.

Table-5c: Anthropometric measurement of elite female footballers

Group	Subscapular (mm)		Suprailiac (mm)		Supraspinale (mm)		Calf skinfold (mm)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1	10.20	1.10	11.95	4.72	6.10	1.65	10.00	2.05
2	11.84	4.36	10.60	3.71	6.48	2.18	11.36	2.13
3	17.40	1.77	20.13	6.93	12.95	4.74	16.00	9.03
4	12.63	3.09	10.60	3.29	6.40	1.67	11.57	4.91
5	16.20	1.70	22.60	14.71	14.00	9.90	18.20	5.66

Group 1: Forward; Group 2: L/R Wing; Group 3: Mid field; Group 4: Defence; Group 5: Goalkeeper

Table 5c shows the mean and SD value of skinfolds position-wise in sample of female elite Football players. Forward group of players are found to be leanest among all groups in skinfolds except suprailiac. Goalkeepers are found to fatty among all groups.

Table-6: Somatotype and Body fat (%) of female elite Football players.

Group		Somatotype	HWR	Body fat (%)
1	Mean SD	3.17-3.95-2.71 0.49-0.57-0.70	42.75 0.96	22.71 3.15
2	Mean SD	3.31-4.70-2.03 0.77-1.50-0.89	41.81 1.22	22.31 3.30
3	Mean SD	4.77-4.98-1.12 0.65-0.44-0.39	40.58 0.53	28.27 2.89
4	Mean SD	3.35-4.98-2.17 0.72-0.46-0.69	42.01 0.95	22.85 3.12
5	Mean SD	5.38-5.54-1.25 0.81-0.21-0.37	40.76 0.51	30.42 3.49

Group 1: Forward; Group 2: L/R Wing; Group 3: Mid field; Group 4: Defence; Group 5: Goalkeeper

Endomorphy has been found highest in goalkeepers among all groups. All groups possess good mesomorphy, highest in goalkeepers whereas lowest in forward. Forward group were found to be more ectomorphic; whereas, goalkeepers least. Goalkeepers and midfield players are found to be possessing high values of fat (Table 6).

Table-7a: Body proportionality of female Football players.

	Weight	Biepicondylar humerus	Biepicondylar femur	Biceps skinfold	Triceps skinfold	Subscapular skinfold	Suprailliac skinfold
1	-0.16	-0.53	0.45	-1.37	-0.35	-1.21	-1.39
	0.47	0.25	0.52	0.54	0.73	0.18	0.74
2	0.36	0.15	0.72	-1.82	-0.50	-0.86	-1.60
	0.70	1.21	2.24	0.35	0.44	0.89	0.55
3	1.07	0.81	0.60	-0.40	0.17	0.37	-0.06
	0.33	1.79	0.66	1.77	0.89	0.37	1.08
4	0.24	0.94	0.85	-1.30	-0.54	-0.71	-1.62
	0.50	0.40	0.61	1.15	0.80	0.66	0.53
5	0.95	1.51	1.31	-0.50	2.43	-0.05	0.18
	0.32	0.41	0.30	0.96	0.04	0.35	2.26

Group 1: Forward; Group 2: L/R Wing; Group 3: Mid field; Group 4: Defence; Group 5: Goalkeeper

Table-7b: Body proportionality of female Football players.

	Supraspinale Skinfold (mm)	Calf skinfold (mm)	Upper arm circumference (N) mm	Upper arm circumference (flexed) mm	Calf circumference (mm)
1	-1.96	-1.11	-0.86	-0.68	-0.06
	0.41	0.42	0.54	0.64	0.61
2	-1.87	-0.77	-0.57	-0.26	1.06
	0.50	0.52	0.79	1.05	1.11
3	-0.28	0.32	-0.28	0.12	1.21
	1.12	2.07	0.33	0.26	1.03
4	-1.91	-0.77	-0.34	-0.08	0.76
	0.40	1.11	0.66	0.73	0.63
5	-0.17	0.65	0.74	0.88	1.28
	2.32	1.27	0.22	0.24	0.01

Group 1: Forward; Group 2: L/R Wing; Group 3: Mid field; Group 4: Defence; Group 5: Goalkeeper

Table 7a and 7b show the body proportions of female Football players. It has been found that L/R wing, defence group and goalkeepers have same z- value of body fat and diameters as that of phantom, whereas, forwards are lighter and possesss lesser diameters than phantom.Our players are found to possess negative z-values for skinfolds as compared to that of phantom, indicating that they are leaner than universal phantom. All the players except goal keepers possess negative Z values of upper arm circumference. It has been found from the Table that players possess positive z- values of calf circumferences, indicating that they have greater development of calf muscles than phantom.

CONCLUSION

Our players are found to be shorter and lighter than national players of Serbia. They have high fat and endomorphy; however, their BMI has been found to be in normal weight and healthy range. They possess greater values of body diameter than universal phantom. They possess negative z-values of skinfolds indicating lesser development of fat than universal phantom. The negative value of players may be due to their fitness. The positive Z-value of calf circumference indicates greater development of calf muscle than phantom.

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