Cineantropometria I e II

Somatotipia

Noções Básicas e Método

Prof. Paulo Sergio Chagas Gomes, Ph.D.

Somatótipo

- tipo corporal ou físico
- para estudar indivíduos ou populações
- início na Grécia antiga
- somatotipia
  - Sheldon (1940)
  - Parnell (1958)
  - Heath & Carter (1967)

Fonte: Norton & Olds (1996)

Somatótipo

HIPÓCRATES – ANTIGA GRÉCIA

- Habitus Ptisicus
  - indivíduo magro com predominância do eixo longitudinal
  - de cor pálida e tendência à introversão
- Habitus Apopleticus
  - domínio do eixo transversal com o tronco em proporções iguais ou maiores que os membros
  - musculoso
  - de cor avermelhada e tendo um temperamento ativo, extrovertido

Somatótipo

OUTROS AUTORES

- Von Helmout
  - liga a constituição física e o temperamento à influência astral, com os tipos: solar, lunar, marcial e saturnino
- Vieussens
  - associa a variações em conteúdo de sal e sangue
- Stahl
  - deriva da fermentação de conteúdos sangüíneos
- Boermave
  - julga que a constituição depende do equilíbrio das 4 matérias básicas: água, sal, terra e óleo
- Maller
  - cria a teoria dos temperamentos, ligados à qualidade do sangue em relação às substâncias que o formariam: água, óleo, fogo, sal, terra etc

Somatótipo

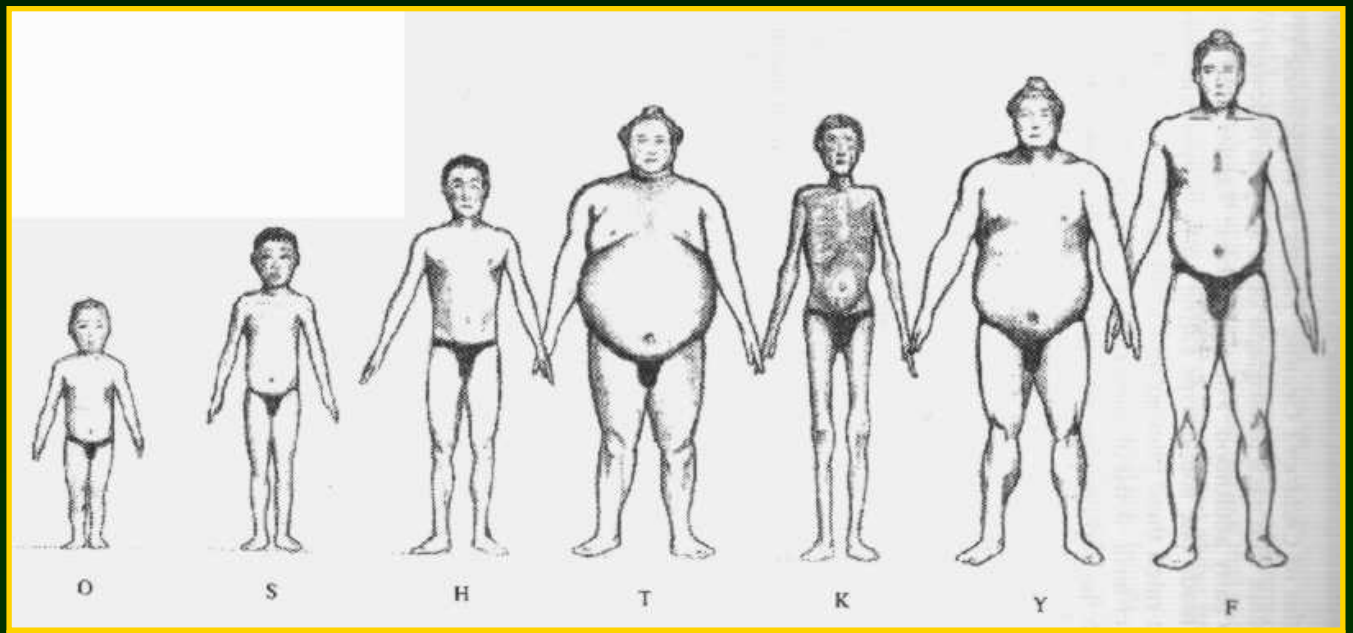
- descrição numérica do físico em termos de forma e composição corporal
- independente de idade, tamanho e sexo
- classificação com 3 componentes (escalas numéricas, sempre descritas na mesma ordem)
  - endomorfia
    - ⇒ gordura relativa
  - mesomorfia
    - ⇒ robustez músculo-esquelética relativa
  - ectomorfia
    - ⇒ linearidade relativa

Fonte: Norton & Olds (1996)

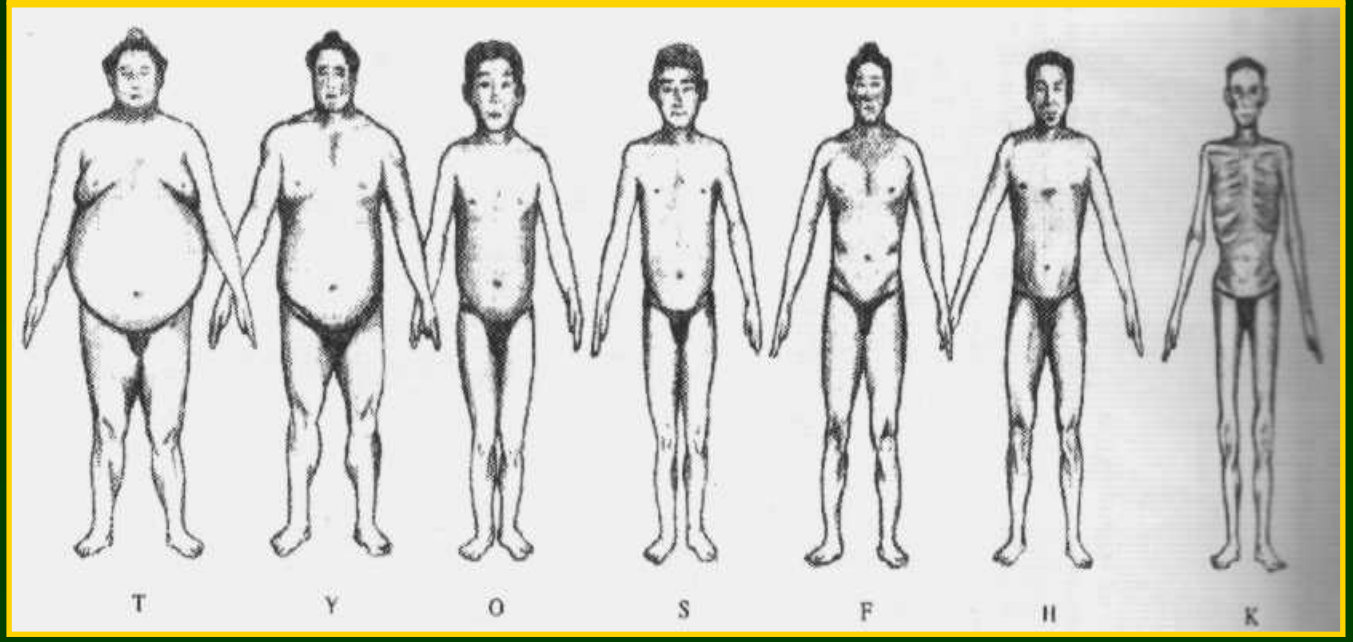
Somatótipo

Fonte: Carter & Heath (1990)

ALTURA ABSOLUTA



ALTURA RELATIVA



Somatótipo Heath-Carter

3 – 2 – 5

Ross, Carr & Carter (1999). Anthropometry Illustrated - CD-ROM.

Somatótipo Heath-Carter

6 – 4,5 – 1

Ross, Carr & Carter (1999). Anthropometry Illustrated - CD-ROM.

Somatótipo Heath-Carter

MEDIDAS ANTROPOMÉTRICAS

- medidas básicas
  - estatura
  - massa corporal
- dobras cutâneas
  - tríceps
  - subescapular
  - supra espinhal
  - panturrilha
- perímetros
  - braço flexionado e tenso
  - panturrilha
- diâmetros
  - úmero
  - fêmur

Somatótipo Heath-Carter

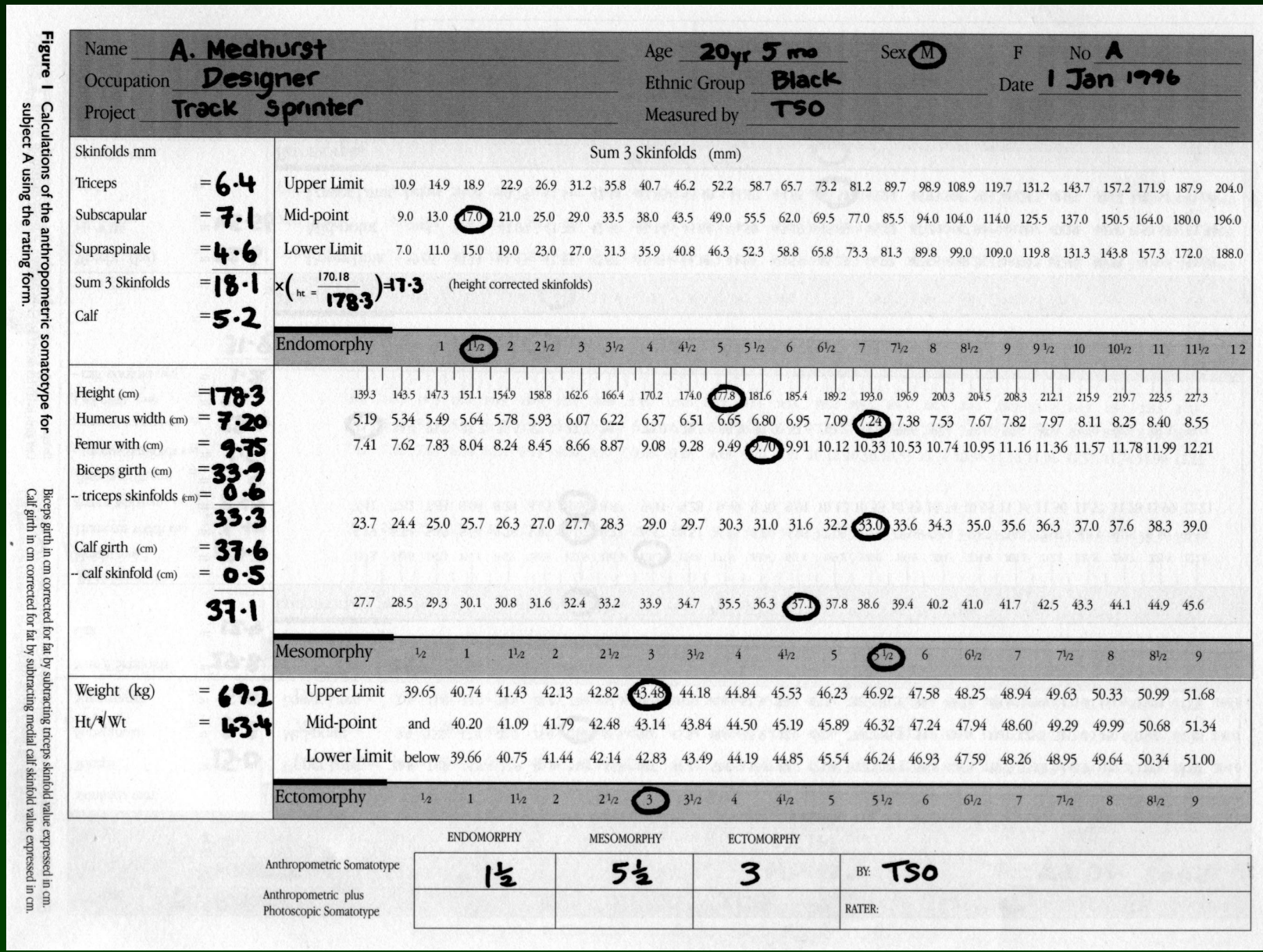


Figure 1 Calculations of the anthropometric somatotype for subject A using the rating form.

Biceps girth in cm corrected for fat by subtracting triceps skinfold value expressed in cm.
Calf girth in cm corrected for fat by subtracting medial calf skinfold value expressed in cm.

Name A. Medhurst | Age 20yr 5 mo | Sex (M) F | No A
Occupation Designer | Ethnic Group Black | Date 1 Jan 1996
Project Track Sprinter | Measured by TSO

Skinfolds mm		Sum 3 Skinfolds (mm)																							
Triceps	= 6.4	Upper Limit	10.9	14.9	18.9	22.9	26.9	31.2	35.8	40.7	46.2	52.2	58.7	65.7	73.2	81.2	89.7	98.9	108.9	119.7	131.2	143.7	157.2	171.9	187.9	204.0
Subscapular	= 7.1	Mid-point	9.0	13.0	(17.0)	21.0	25.0	29.0	33.5	38.0	43.5	49.0	55.5	62.0	69.5	77.0	85.5	94.0	104.0	114.0	125.5	137.0	150.5	164.0	180.0	196.0
Supraspinale	= 4.6	Lower Limit	7.0	11.0	15.0	19.0	23.0	27.0	31.3	35.9	40.8	46.3	52.3	58.8	65.8	73.3	81.3	89.8	99.0	109.0	119.8	131.3	143.8	157.3	172.0	188.0
Sum 3 Skinfolds	= 18.1	× (ht = 170.18 / 178.3) = 17.3 (height corrected skinfolds)																								
Calf	= 5.2	Endomorphy	1	(1½)	2	2½	3	3½	4	4½	5	5½	6	6½	7	7½	8	8½	9	9½	10	10½	11	11½	12	

Height (cm)	= 178.3	139.3	143.5	147.3	151.1	154.9	158.8	162.6	166.4	170.2	174.0	(177.8)	181.6	185.4	189.2	193.0	196.9	200.3	204.5	208.3	212.1	215.9	219.7	223.5	227.3
Humerus width (cm)	= 7.20	5.19	5.34	5.49	5.64	5.78	5.93	6.07	6.22	6.37	6.51	6.65	6.80	6.95	7.09	(7.24)	7.38	7.53	7.67	7.82	7.97	8.11	8.25	8.40	8.55
Femur with (cm)	= 9.75	7.41	7.62	7.83	8.04	8.24	8.45	8.66	8.87	9.08	9.28	9.49	(9.70)	9.91	10.12	10.33	10.53	10.74	10.95	11.16	11.36	11.57	11.78	11.99	12.21
Biceps girth (cm)	= 33.7																								
-- triceps skinfolds (cm)	= 0.6																								
	33.3	23.7	24.4	25.0	25.7	26.3	27.0	27.7	28.3	29.0	29.7	30.3	31.0	31.6	32.2	(33.0)	33.6	34.3	35.0	35.6	36.3	37.0	37.6	38.3	39.0
Calf girth (cm)	= 37.6																								
-- calf skinfold (cm)	= 0.5																								
	37.1	27.7	28.5	29.3	30.1	30.8	31.6	32.4	33.2	33.9	34.7	35.5	36.3	(37.1)	37.8	38.6	39.4	40.2	41.0	41.7	42.5	43.3	44.1	44.9	45.6
		Mesomorphy	½	1	1½	2	2½	3	3½	4	4½	5	(5½)	6	6½	7	7½	8	8½	9					

Weight (kg)	= 69.2	Upper Limit	39.65	40.74	41.43	42.13	42.82	(43.48)	44.18	44.84	45.53	46.23	46.92	47.58	48.25	48.94	49.63	50.33	50.99	51.68					
Ht/∛Wt	= 43.4	Mid-point	and	40.20	41.09	41.79	42.48	43.14	43.84	44.50	45.19	45.89	46.32	47.24	47.94	48.60	49.29	49.99	50.68	51.34					
		Lower Limit	below	39.66	40.75	41.44	42.14	42.83	43.49	44.19	44.85	45.54	46.24	46.93	47.59	48.26	48.95	49.64	50.34	51.00					
		Ectomorphy	½	1	1½	2	2½	(3)	3½	4	4½	5	5½	6	6½	7	7½	8	8½	9					

	ENDOMORPHY	MESOMORPHY	ECTOMORPHY	
Anthropometric Somatotype	1½	5½	3	BY: TSO
Anthropometric plus Photoscopic Somatotype				RATER:

Fonte: Norton & Olds (1996)

Somatótipo Heath-Carter

ENDOMORFIA

$$\text{endomorfia} = -0{,}7182 + 0{,}1451(X_a) - 0{,}00068(X_a)^2 + 0{,}0000014\,(X_a)^3$$

- X_a = somatório das dobras cutâneas de tríceps, subescapular e supra espinhal (mm) multiplicado por 170,18/estatura (cm)
- i.e.

$$X_a = (\text{tríceps} + \text{subescapular} + \text{supra espinhal}) \times \frac{170{,}18}{\text{estatura}}$$

Somatótipo Heath-Carter

MESOMORFIA

$$\textbf{mesomorfia} = 0{,}858(X_a) + 0{,}601(X_b) + 0{,}188(X_c) + 0{,}161\,(X_d) - 0{,}131(X_e) + 4{,}5$$

- X_a = diâmetro de úmero (cm)
- X_b = diâmetro de fêmur (cm)
- X_c = perímetro de braço corrigido (cm)
- X_d = perímetro de panturrilha corrigido (cm)
- X_e = estatura (cm)
- onde

  per. braço corrigido = per. braço flex/tens (cm) – dobra tríceps (cm)

  per. panturrilha corrigido = per. panturrilha (cm) – dobra panturrilha (cm)

cm/10 = mm

Somatótipo Heath-Carter

ECTOMORFIA

Se $X_a \geq 40,75$ então
ectomorfia = $0,732(X_a) - 28,58$

Se $38,25 < X_a < 40,75$ então
ectomorfia = $0,463(X_a) - 17,63$

Se $X_a \leq 38,25$ então
ectomorfia = 0,1

- X_a = razão estatura (cm)/peso (kg)
- i.e.

$$X_a = \frac{\text{estatura}}{\text{massa corporal}^{1/3}}$$

Somatótipo Heath-Carter

Fonte: Carter & Heath (1990)

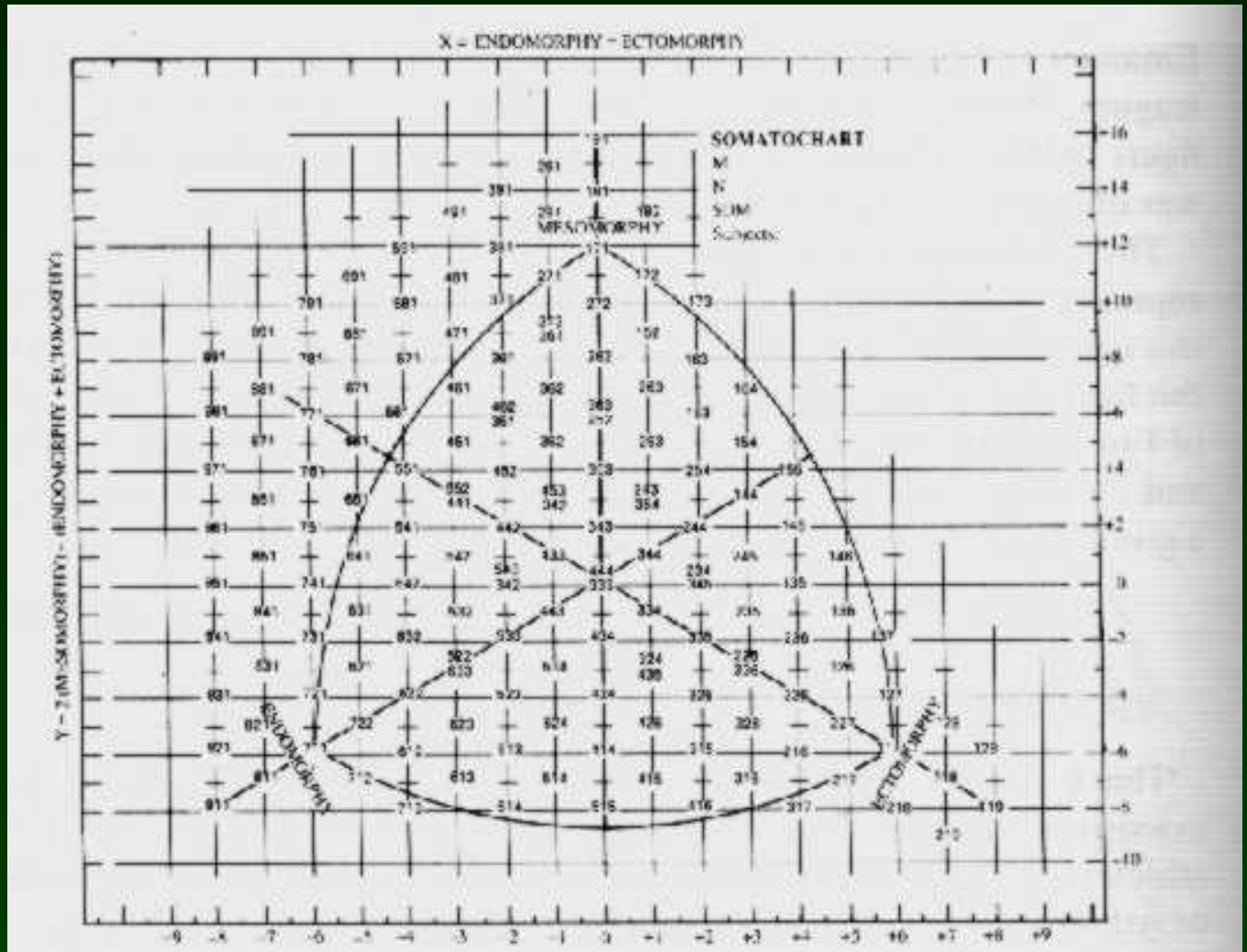


Fig. II.3. Somatochart and grid with equations for plotting individual somatotypes. By using the X, Y coordinates, somatoplots can be interpolated and extrapolated between and beyond those on the somatochart. (From Carter, 1980*a*.)

Somatótipo Heath-Carter

Paraná, Brasil

Papua, Nova Guiné

Sudão

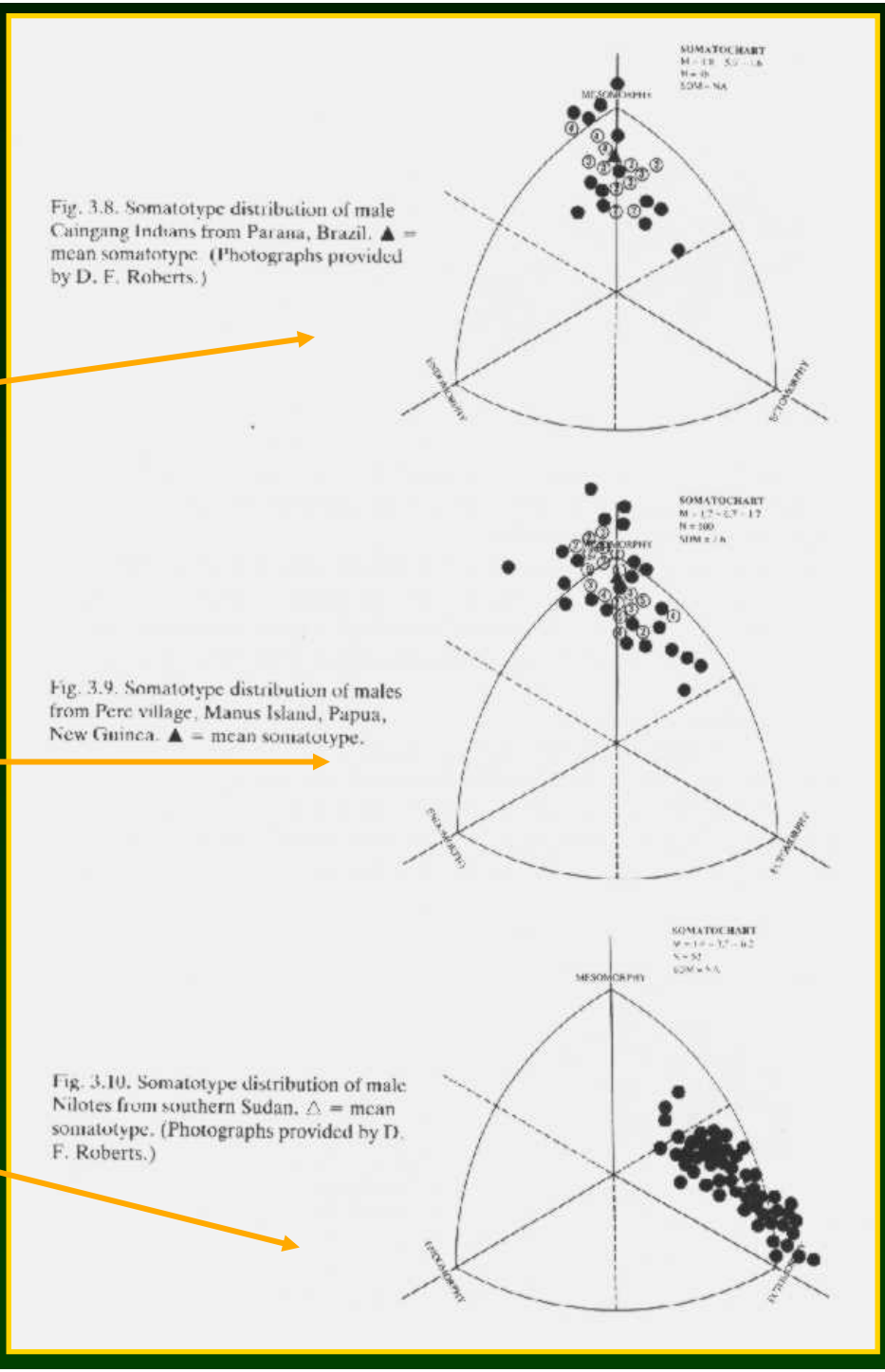


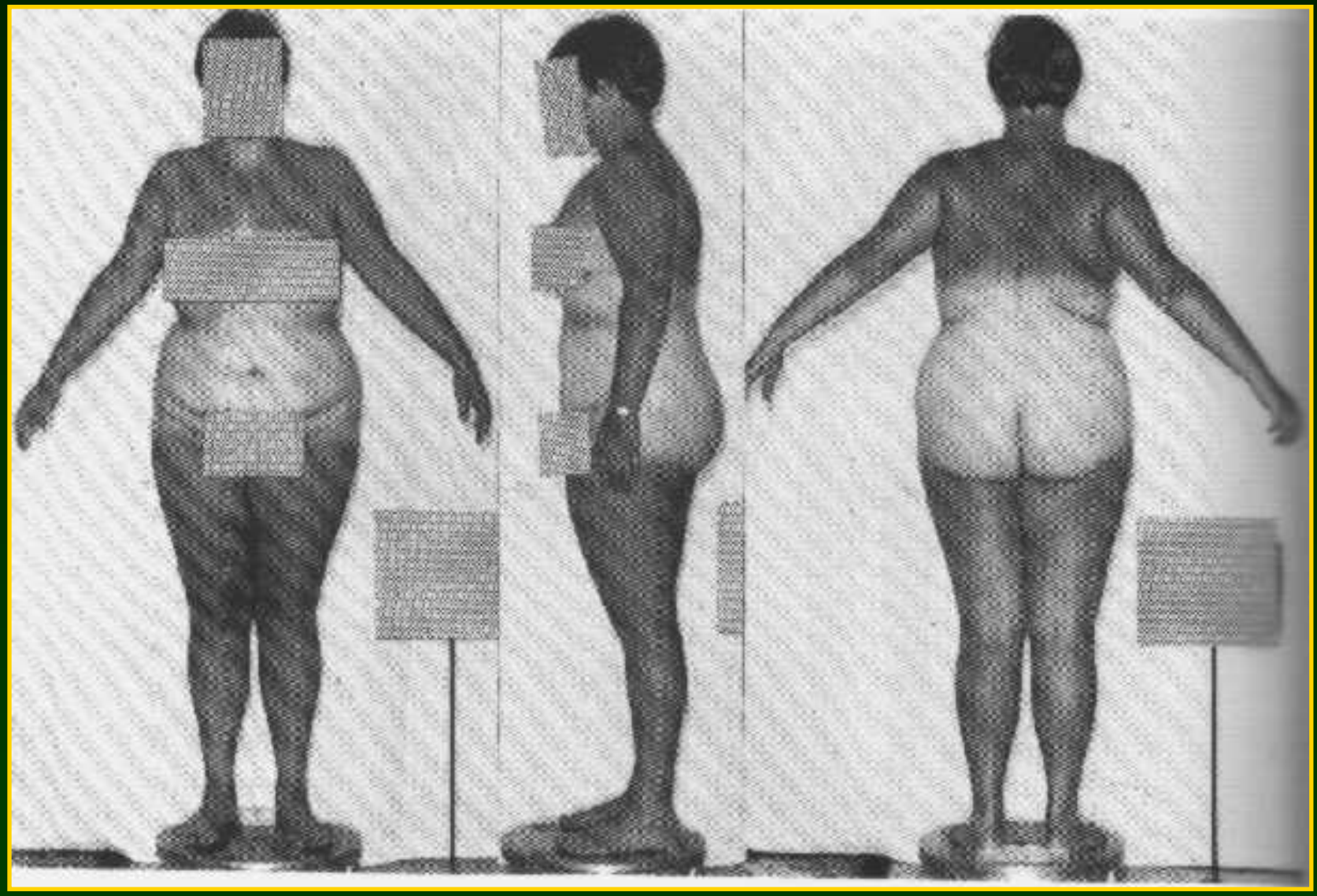
Fig. 3.8. Somatotype distribution of male Caingang Indians from Parana, Brazil. ▲ = mean somatotype. (Photographs provided by D. F. Roberts.)

Fig. 3.9. Somatotype distribution of males from Pere village, Manus Island, Papua, New Guinea. ▲ = mean somatotype.

Fig. 3.10. Somatotype distribution of male Nilotes from southern Sudan. △ = mean somatotype. (Photographs provided by D. F. Roberts.)

Fonte: Carter & Heath (1990)

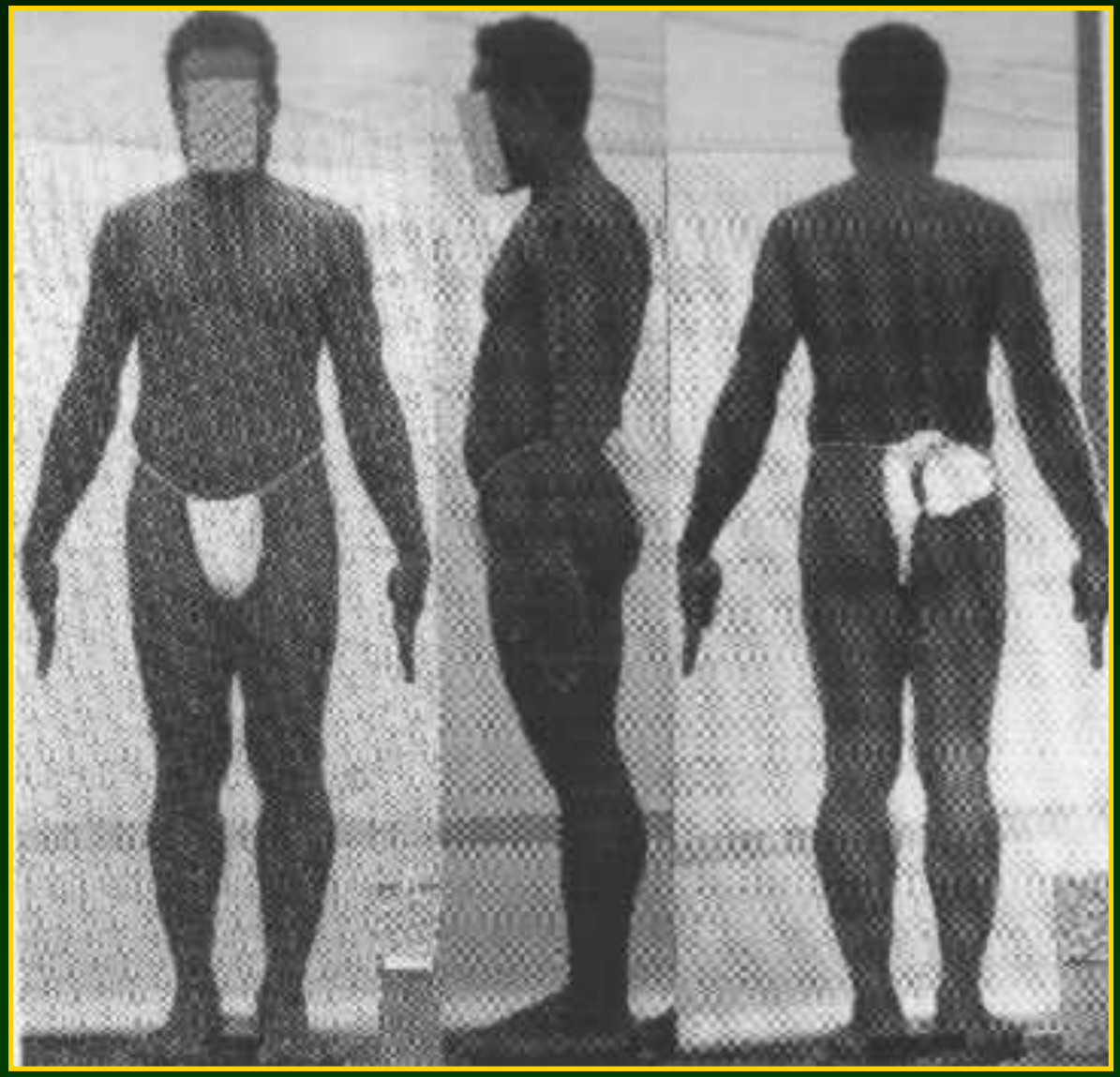
Somatótipo Heath-Carter



10 – 5,5 – 0,5

Fonte: Carter & Heath (1990)

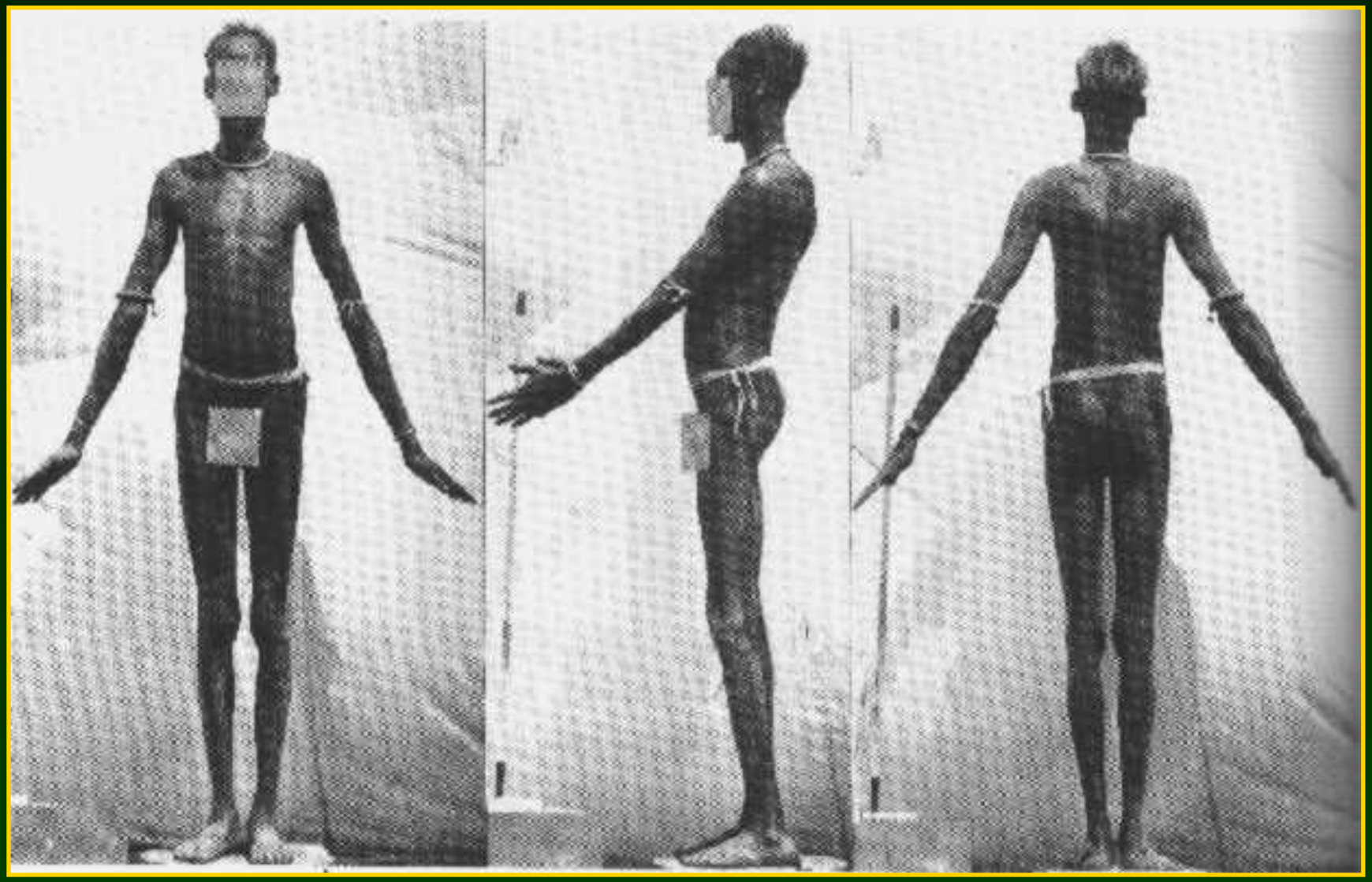
Somatótipo Heath-Carter



1,5 – 9 – 0,5

Fonte: Carter & Heath (1990)

Somatótipo Heath-Carter



1,5 – 2 – 8

Fonte: Carter & Heath (1990)

Somatótipo Heath-Carter

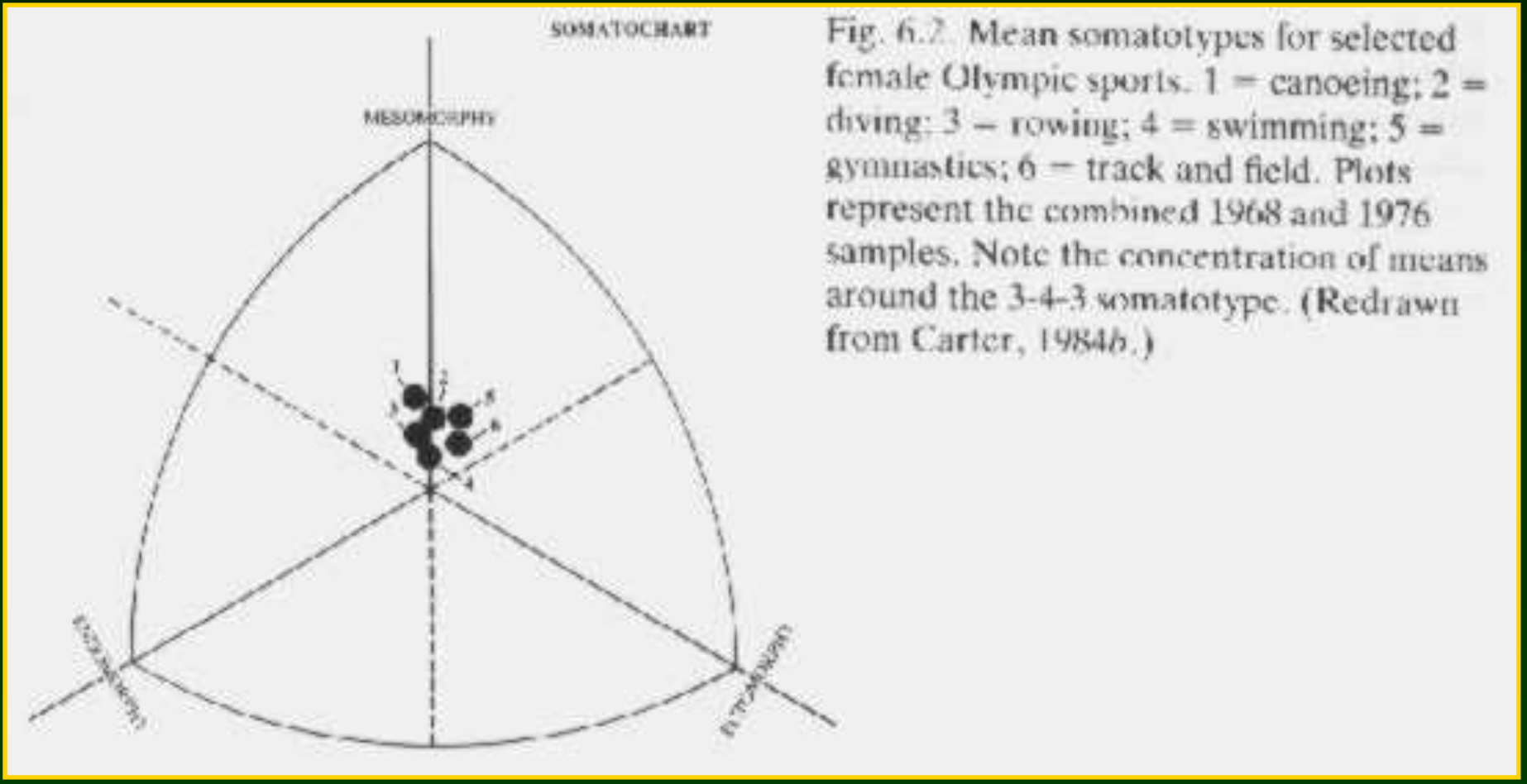
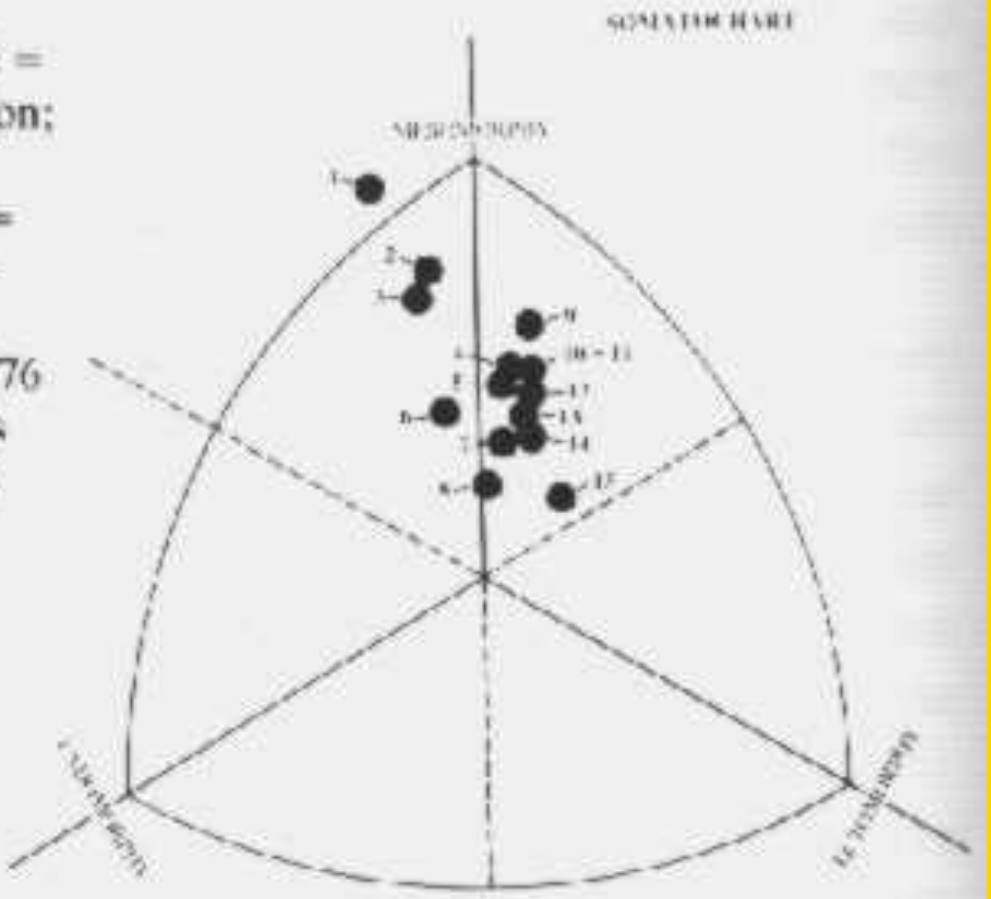


Fig. 6.2. Mean somatotypes for selected female Olympic sports. 1 = canoeing; 2 = diving; 3 = rowing; 4 = swimming; 5 = gymnastics; 6 = track and field. Plots represent the combined 1968 and 1976 samples. Note the concentration of means around the 3-4-3 somatotype. (Redrawn from Carter, 1984*b*.)

Fonte: Carter & Heath (1990)

Somatótipo Heath-Carter

Fig. 6.3. Mean somatotypes for selected male Olympic sports. 1 = weight lifting; 2 = judo; 3 = wrestling; 4 = modern pentathlon; 5 = rowing; 6 = waterpolo; 7 = field hockey; 8 = fencing; 9 = gymnastics; 10 = canoeing; 11 = diving; 12 = boxing; 13 = swimming; 14 = cycling; 15 = basketball. Plots represent the combined 1968 and 1976 samples. Note the concentration of means around the 2-5-2½ somatotype. (Redrawn from Carter, 1984*b*.)



Fonte: Carter & Heath (1990)

Somatótipo Heath-Carter

	Sujeito 1	Sujeito 2
Medidas básicas		
estatura (cm)	178,3	170,7
massa corporal (kg)	69,2	52,6
Dobras cutâneas		
tríceps (mm)	6,4	15,0
subescapular (mm)	7,1	8,8
supra espinhal (mm)	4,6	6,0
panturrilha (mm)	5,2	12,4
Perímetros		
braço flex/tenso (cm)	33,9	24,9
panturrilha (cm)	37,6	33,1
Diâmetros		
úmero (cm)	7,2	6,1
fêmur (cm)	9,8	8,7

Somatótipo Heath-Carter

Sujeito 1

endomorfia = - 0,7182 + 0,1451(X_a) – 0,00068(X_a)^2 + 0,0000014 (X_a)^3

- X_a = (tríceps + subescapular + supra espinhal) x $\frac{170,18}{\text{estatura}}$

$X_a = (6,4 + 7,1 + 4,6) \times \frac{170,18}{178,3}$

$X_a = (18,1) \times (0,95) = 17,3$

endo = – 0,7182 + 0,1451(17,3) – 0,00068(17,3)^2 + 0,0000014(17,3)^3

endo = – 0,7182 + 0,1451(17,3) – 0,00068(299,29) + 0,0000014(5177,7)

endo = – 0,7182 + 2,5102 – 0,2035 + 0,0072

endo = 1,6

Somatótipo Heath-Carter

Sujeito 1

mesomorfia = 0,858(X_a) + 0,601(X_b) + 0,188(X_c) + 0,161 (X_d) – 0,131(X_e) + 4,5

- X_a = diâmetro de úmero (cm) = 7,2
- X_b = diâmetro de fêmur (cm) = 9,8
- X_c = perímetro de braço corrigido (cm) = 33,9 – 0,64 = 33,3
- X_d = perímetro de panturrilha corrigido (cm) = 37,6 – 0,52 = 37,1
- X_e = estatura (cm) = 178,3

meso = 0,858(7,2) + 0,601(9,8) + 0,188(33,3) + 0,161(37,1) – 0,131(178,3) + 4,5

meso = 6,1776 + 5,8898 + 6,2604 + 5,9731 – 23,3573 + 4,5

meso = 5,4

Somatótipo Heath-Carter

Sujeito 1

Se $X_a \geq 40,75$ então
ectomorfia = $0,732(X_a) - 28,58$
Se $38,25 < X_a < 40,75$ então
ectomorfia = $0,463(X_a) - 17,63$
Se $X_a \leq 38,25$ então
ectomorfia = 0,1

- $X_a = \dfrac{\text{estatura (cm)}}{\text{massa corporal}^{1/3}\ \text{(kg)}}$

$$X_a = \frac{178,3}{(69,2)^{1/3}} = \frac{178,3}{4,11} = 43,38$$

ecto = 0,732(43,38) – 28,58

ecto = 31,75 – 28,58

ecto = 3,2

Somatótipo Heath-Carter

Sujeito 2

endomorfia = - 0,7182 + 0,1451(X_a) – 0,00068(X_a)^2 + 0,0000014 (X_a)^3

- X_a = (tríceps + subescapular + supra espinhal) x $\frac{170,18}{\text{estatura}}$

$X_a = (15,0 + 8,8 + 6,0) \times \frac{170,18}{170,7}$

$X_a = (29,8) \times (1,00) = 29,8$

endo = – 0,7182 + 0,1451(29,8) – 0,00068(29,8)^2 + 0,0000014(29,8)^3

endo = – 0,7182 + 0,1451(29,8) – 0,00068(888,0) + 0,0000014(26463,6)

endo = – 0,7182 + 4,3239 – 0,6038 + 0,0370

endo = 3,0

Somatótipo Heath-Carter

Sujeito 2

mesomorfia = 0,858(X_a) + 0,601(X_b) + 0,188(X_c) + 0,161 (X_d) – 0,131(X_e) + 4,5

- X_a = diâmetro de úmero (cm) = 6,1
- X_b = diâmetro de fêmur (cm) = 8,7
- X_c = perímetro de braço corrigido (cm) = 24,9 – 1,5 = 23,4
- X_d = perímetro de panturrilha corrigido (cm) = 33,1 – 1,24 = 31,9
- X_e = estatura (cm) = 170,7

meso = 0,858(6,1) + 0,601(8,7) + 0,188(23,4) + 0,161(31,9) – 0,131(170,7) + 4,5

meso = 5,2338 + 5,2287 + 4,3992 + 5,1359 – 22,3617 + 4,5

meso = 2,1

Somatótipo Heath-Carter

Sujeito 2

Se $X_a \geq 40,75$ então
ectomorfia = $0,732(X_a) - 28,58$
Se $38,25 < X_a < 40,75$ então
ectomorfia = $0,463(X_a) - 17,63$
Se $X_a \leq 38,25$ então
ectomorfia = 0,1

- $X_a = \dfrac{\text{estatura (cm)}}{\text{massa corporal}^{1/3}\ \text{(kg)}}$

$$X_a = \frac{170,7}{(52,6)^{1/3}} = \frac{170,7}{3,75} = 45,52$$

ecto = 0,732(45,52) – 28,58

ecto = 33,32 – 28,58

ecto = 4,7

Somatótipo Heath-Carter

	Sujeito 1	Sujeito 2
Medidas básicas		
estatura (cm)	178,3	170,7
massa corporal (kg)	69,2	52,6
Dobras cutâneas		
tríceps (mm)	6,4	15,0
subescapular (mm)	7,1	8,8
supra espinhal (mm)	4,6	6,0
panturrilha (mm)	5,2	12,4
Perímetros		
braço flex/tenso (cm)	33,9	24,9
panturrilha (cm)	37,6	33,1
Diâmetros		
úmero (cm)	7,2	6,1
fêmur (cm)	9,8	8,7

1,6 5,4 3,2

3,0 2,1 4,7

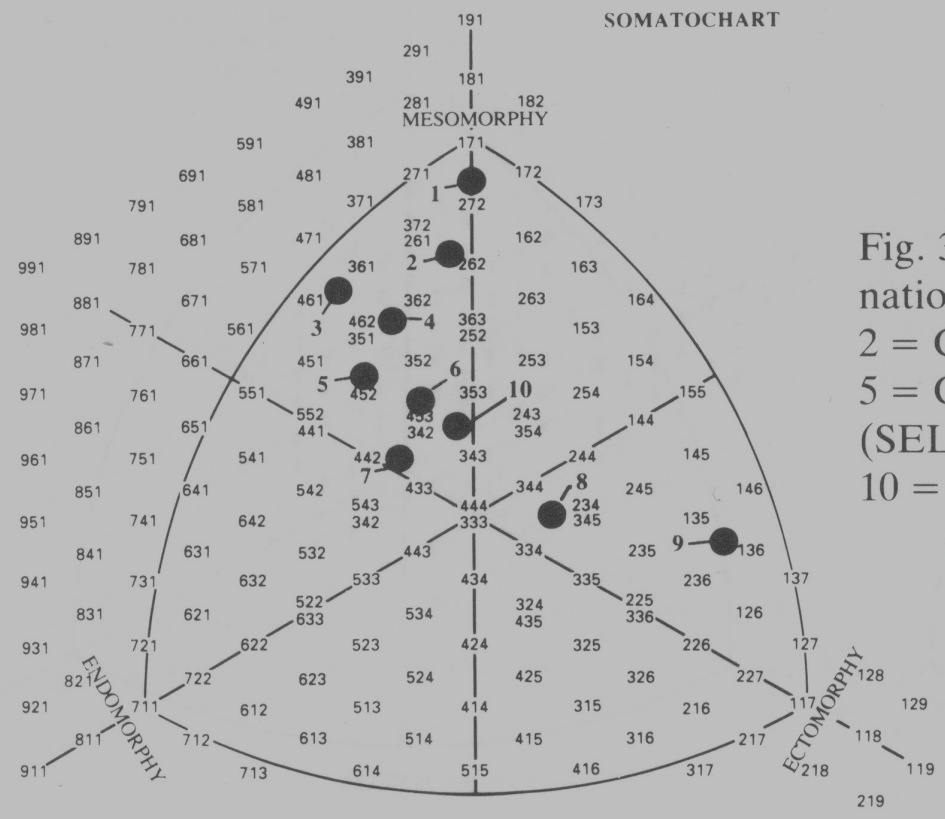


Fig. 3.1. Mean somatotypes of male nationality and ethnic samples. 1 = Manus; 2 = Caingang; 3 = Eskimo; 4 = British; 5 = Canadian; 6 = USA (FAA); 7 = USA (SEL); 8 = Indians; 9 = Nilotes; 10 = Mexican.

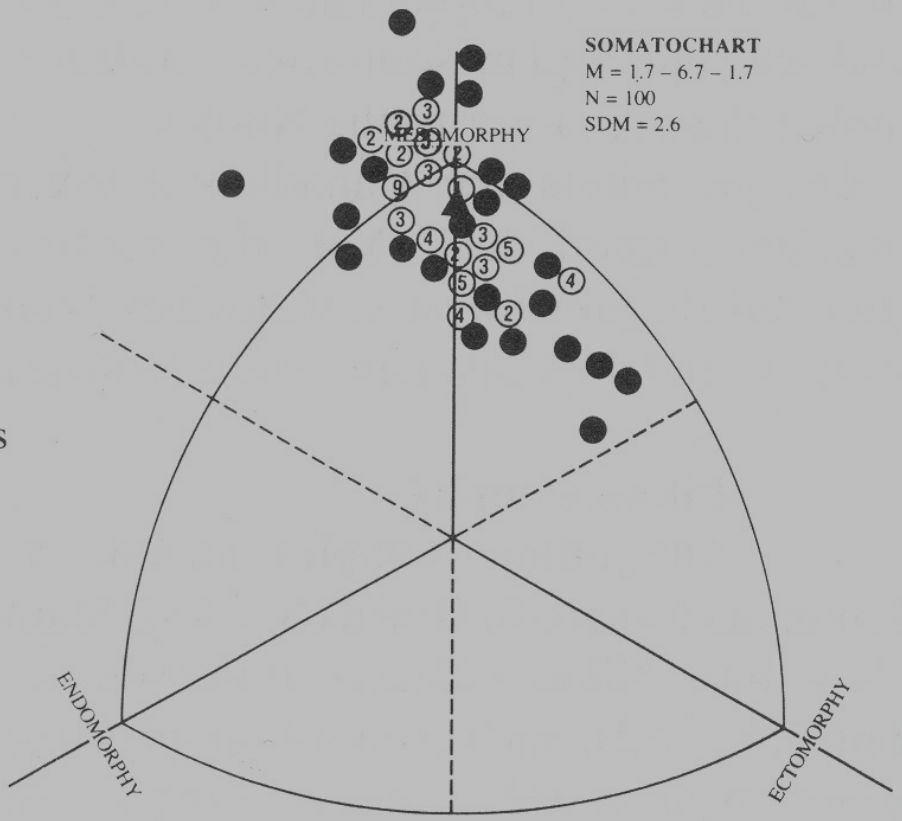


Fig. 3.9. Somatotype distribution of males from Pere village, Manus Island, Papua, New Guinea. ▲ = mean somatotype.

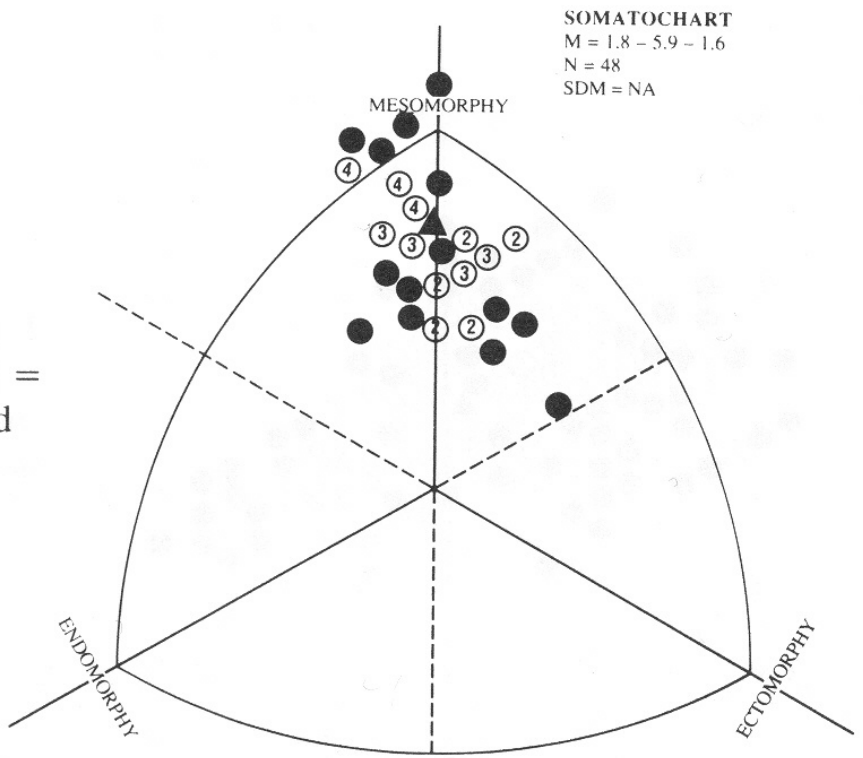


Fig. 3.8. Somatotype distribution of male Caingang Indians from Parana, Brazil. ▲ = mean somatotype. (Photographs provided by D. F. Roberts.)

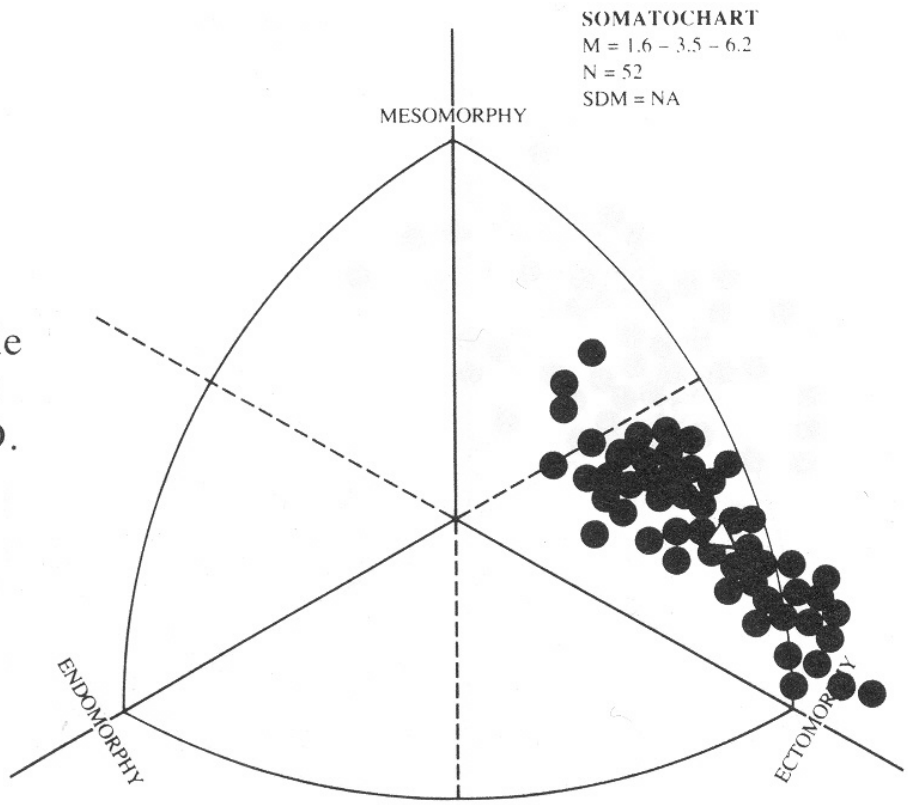


Fig. 3.10. Somatotype distribution of male Nilotes from southern Sudan. △ = mean somatotype. (Photographs provided by D. F. Roberts.)

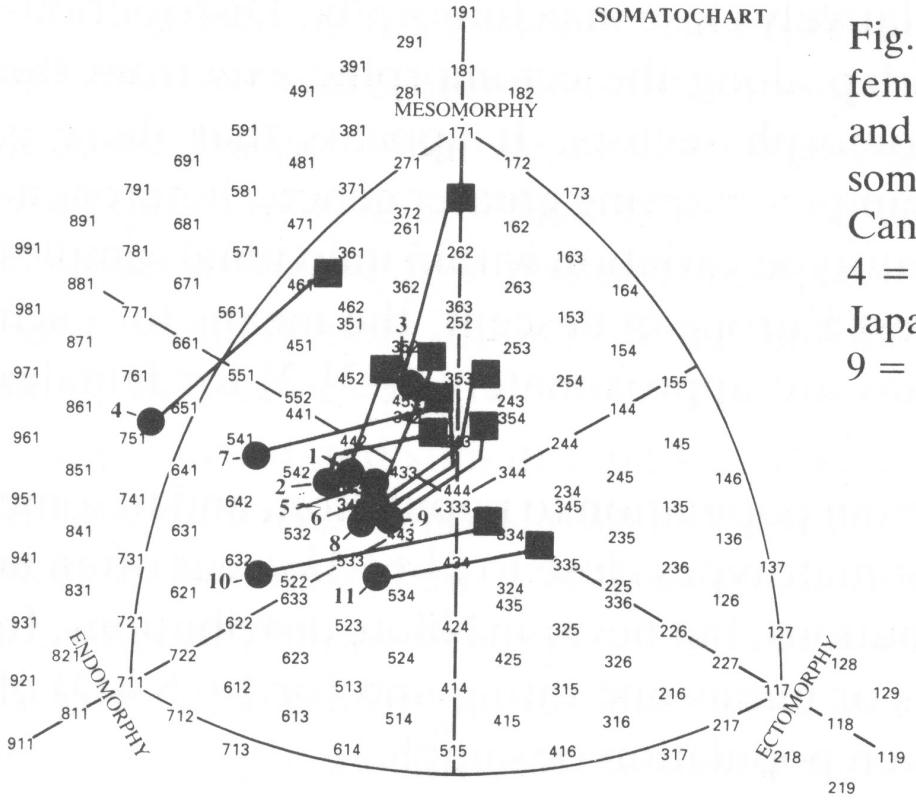
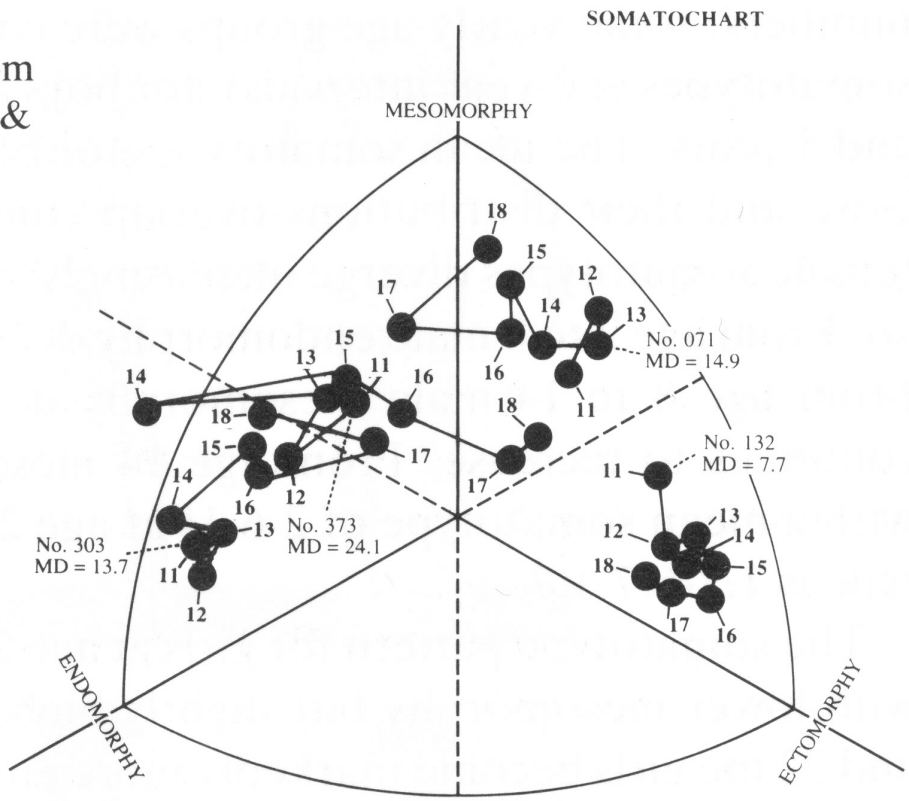


Fig. 3.51. Mean somatotypes of male ■ and female ● samples illustrating the magnitude and direction (in two dimensions) of somatotype sexual dimorphism. 1 = Canadian; 2 = Czechoslovak; 3 = Manus; 4 = Eskimo; 5 = USA; 6 = Hawaii Japanese; 7 = Mexican; 8 = South African; 9 = English; 10 = Jat-Sikh; 11 = Bania.

Fig. 4.6. Somatotypes and migratory distances (MD) of four boys followed from ages 11 to 18. (Redrawn from Pařízková & Carter, 1976.)



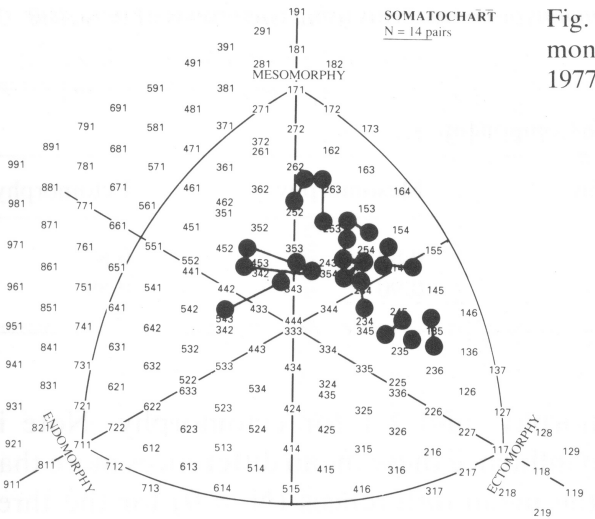


Fig. 5.1. Somatotypes of Prague monozygotic twins. (Redrawn from Kovář, 1977.)

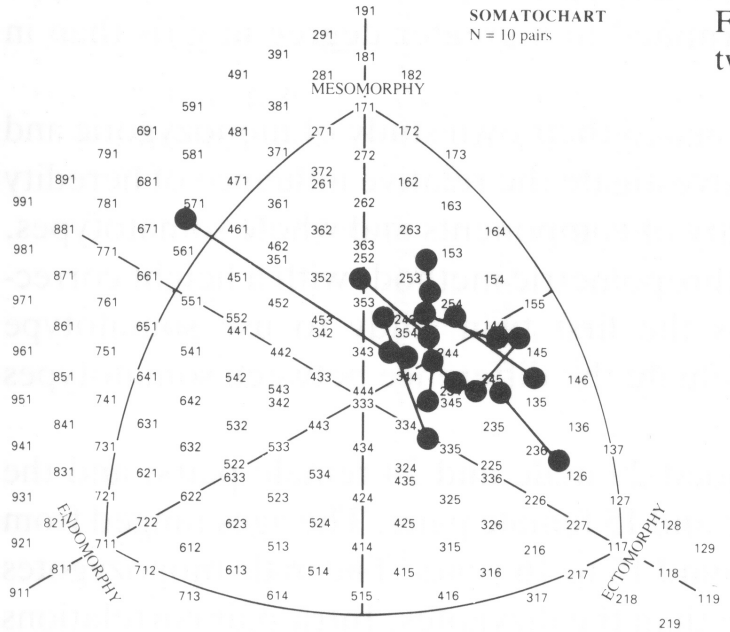


Fig. 5.2. Somatotypes of Prague dizygotic twins. (Redrawn from Kovář, 1977.)

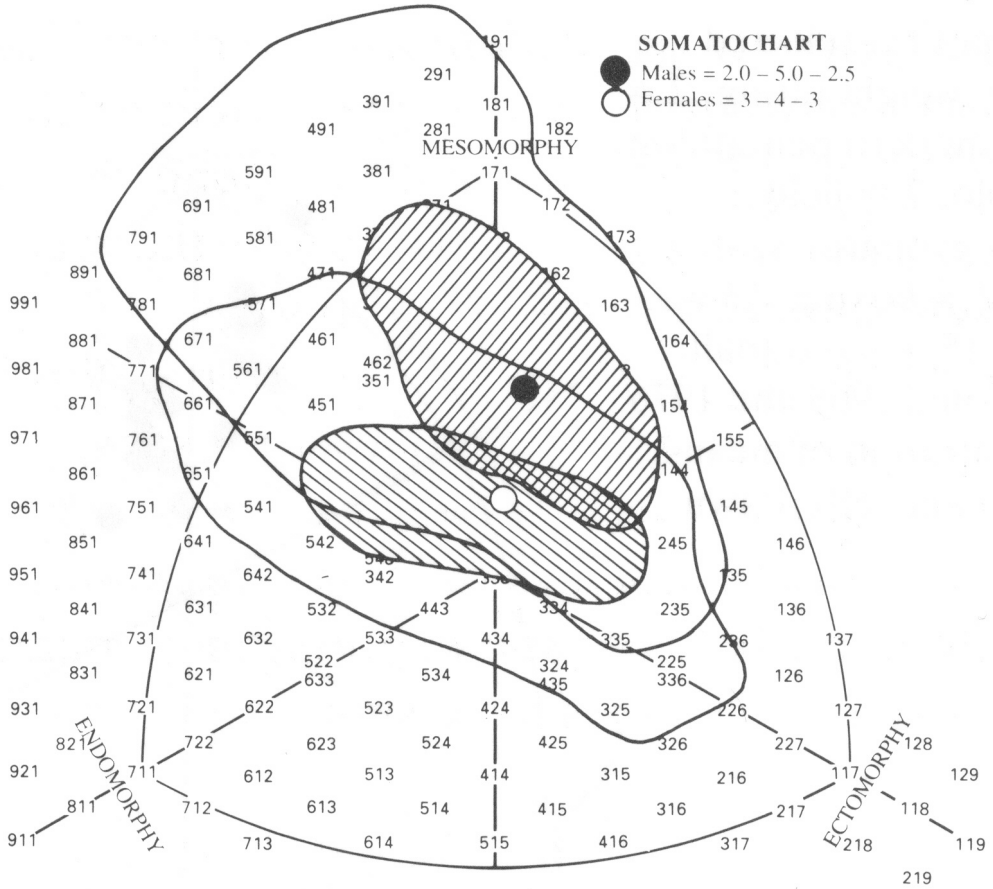


Fig. 6.1. Somatotype distribution of male (upper areas) and female (lower areas) athletes from combined 1968 and 1976 Olympic samples. The shaded areas enclose approximately 50% of somatotypes closest to their respective means. ● = males; ○ = females. (From Carter, 1984*b*.)

Body building (Table 6.2, Fig. 6.12(*a*), (*b*), (*c*))

Body builders, who use weight lifting and other specialized training to develop extraordinary muscle mass, body shape, definition, and aesthetic

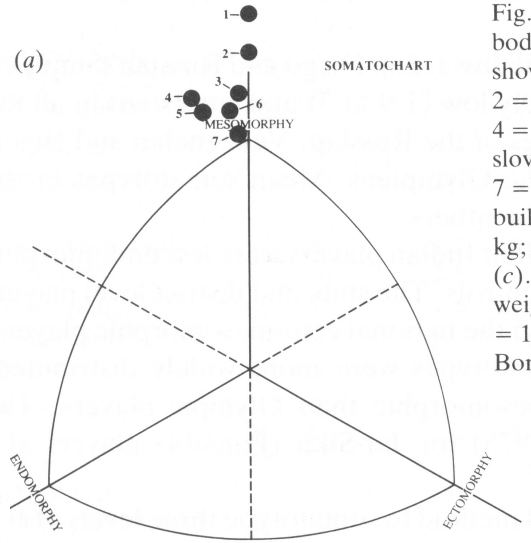


Fig. 6.12(*a*). Mean somatotypes for male body builders, and plots for the two subjects shown in (*b*) and (*c*). 1 = Subject in (*b*); 2 = Subject in (*c*); 3 = International, 1981; 4 = Czechoslovakia, 1971; 5 = Czechoslovakia, 1979; 6 = California, 1985; 7 = Czechoslovakia, 1969. (*b*). Body builder. Height = 173.2 cm; weight = 90.0 kg; HWR = 38.7; somatotype = 1-10½-1. (*c*). Body builder. Height = 156.9 cm; weight = 65.7 kg; HWR = 38.9; somatotype = 1-9½-1. (Photos with permission from J. Borms.)