

# **Antropologi olahraga (SOMATOTYPE)**

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# Pengelompokkan Bentuk tubuh

- ◆ Kretschmer membagi menjadi 3 kelompok
- ◆ 1. astenis (tipe kurus)
  - badan langsing kurus
  - rongga dada kecil, sempit dan pipih
  - lengan dan tungkai kecil/kurus
  - muka bulat telur
  - BB relatif kurang (di bawah standar)

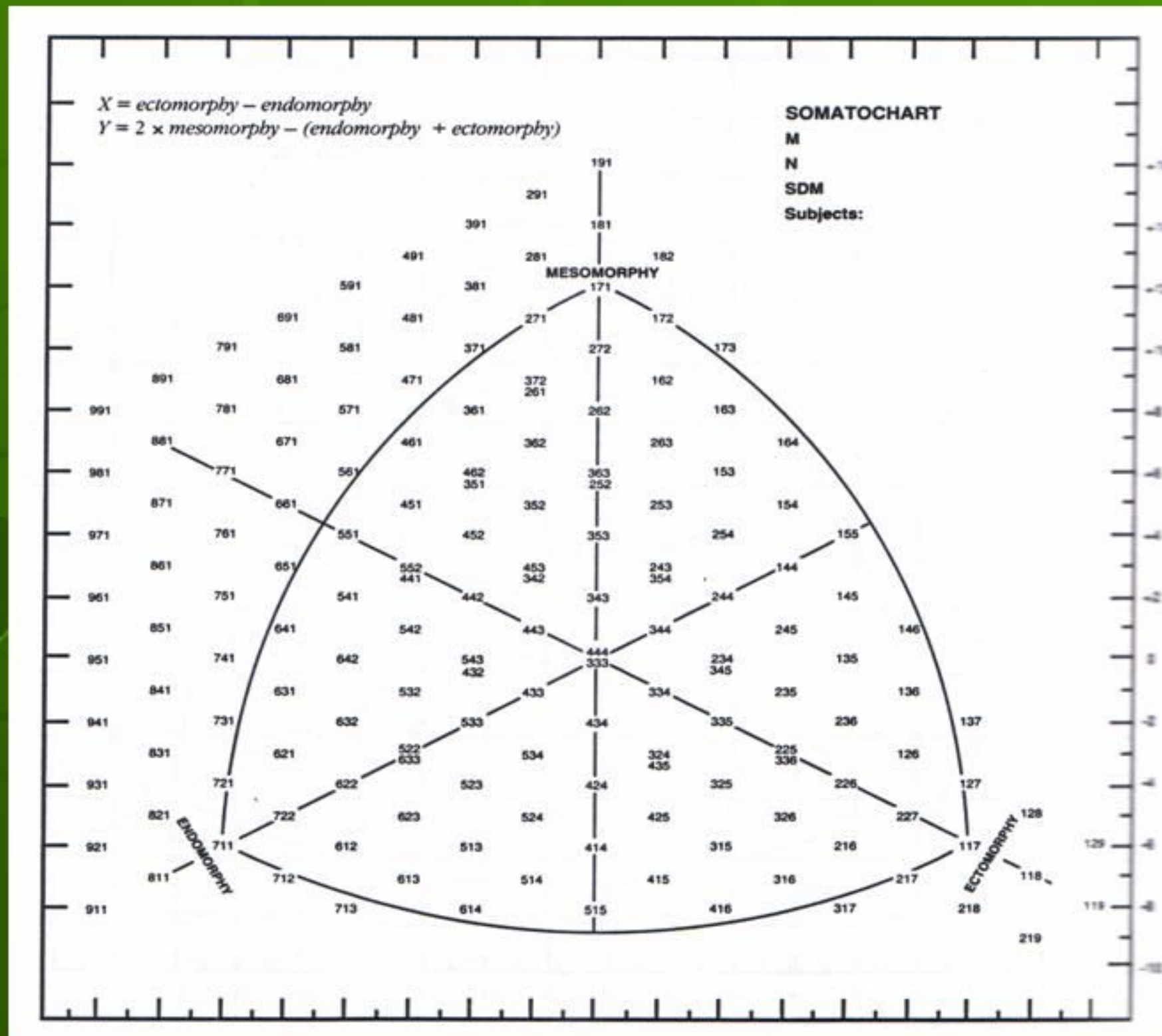
- ◆ 2. Athletis (tipe berotot)
  - tulang dan otot tampak kuat
  - badan kokoh dan tegap
  - tinggi badan cukup
  - bahu lebar, dada besar serta kuat
  - muka bulat telur, bada lebih pendek dari astenis
- ◆ 3. Piknis ( tipe berlemak )
  - badan agak pendek
  - dada bulat, perut besar dan bahu tidak lebar
  - leher pendek dan kuat
  - lengan dan tungkai agak lemah

- ◆ Sheldon membagi bentuk tubuh menjadi 3 kelompok
- ◆ 1. mesomorphy
  - kokoh dan kuat
  - otot berbidang
  - tahan terhadap penyakit
- ◆ 2. endomorphy
  - gemuk
  - lemah
  - tinggi badan relatif pendek
- ◆ 3. Ectomorphy
  - jangkung
  - dada kecil dan pipih
  - lemah
  - otot tidak tampak berkembang

# Lembar kerja penentuan somatotipe

Name _____		Age _____		Sex M _____ F _____		No _____																			
Occupation _____		Ethnic Group _____		Date _____																					
Project _____		Measured by _____																							
Skinfolds mm		Sum 3 Skinfolds (mm)																							
Triceps =	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 =	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 =	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 =	$\times \left( \frac{170.18}{\text{ht}} \right) =$	(height corrected skinfolds)																							
Calf =	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) =		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	200.5	204.5	208.3	212.1	215.9	219.7	223.5	227.3
Humerus width (cm) =		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) =		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) =																									
- triceps skinfolds (cm) =		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) =																									
- calf skinfold (cm) =		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
Weight (kg) =	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 =	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																									
Anthropometric plus Photoscopic Somatotype																									
	BY:																								
	RATER:																								

# Somatochart bentuk tubuh



# Bentuk somatotipe atlet putri nasional australia

- |   |                          |    |                          |
|---|--------------------------|----|--------------------------|
| 1 | Basketball (3.7-4.0-2.9) | 6  | Squash (3.4-4.0-2.8)     |
| 2 | Hockey (3.7-4.5-2.2)     | 7  | Volleyball (3.0-3.5-3.5) |
| 3 | Netball (3.0-3.8-3.3)    | 8  | Badminton (4.1-4.4-2.5)  |
| 4 | Soccer (4.2-4.6-2.2)     | 9  | Lacrosse (4.1-4.5-2.4)   |
| 5 | Softball (3.8-4.3-2.7)   | 10 | Cricket (4.9-4.4-2.0)    |

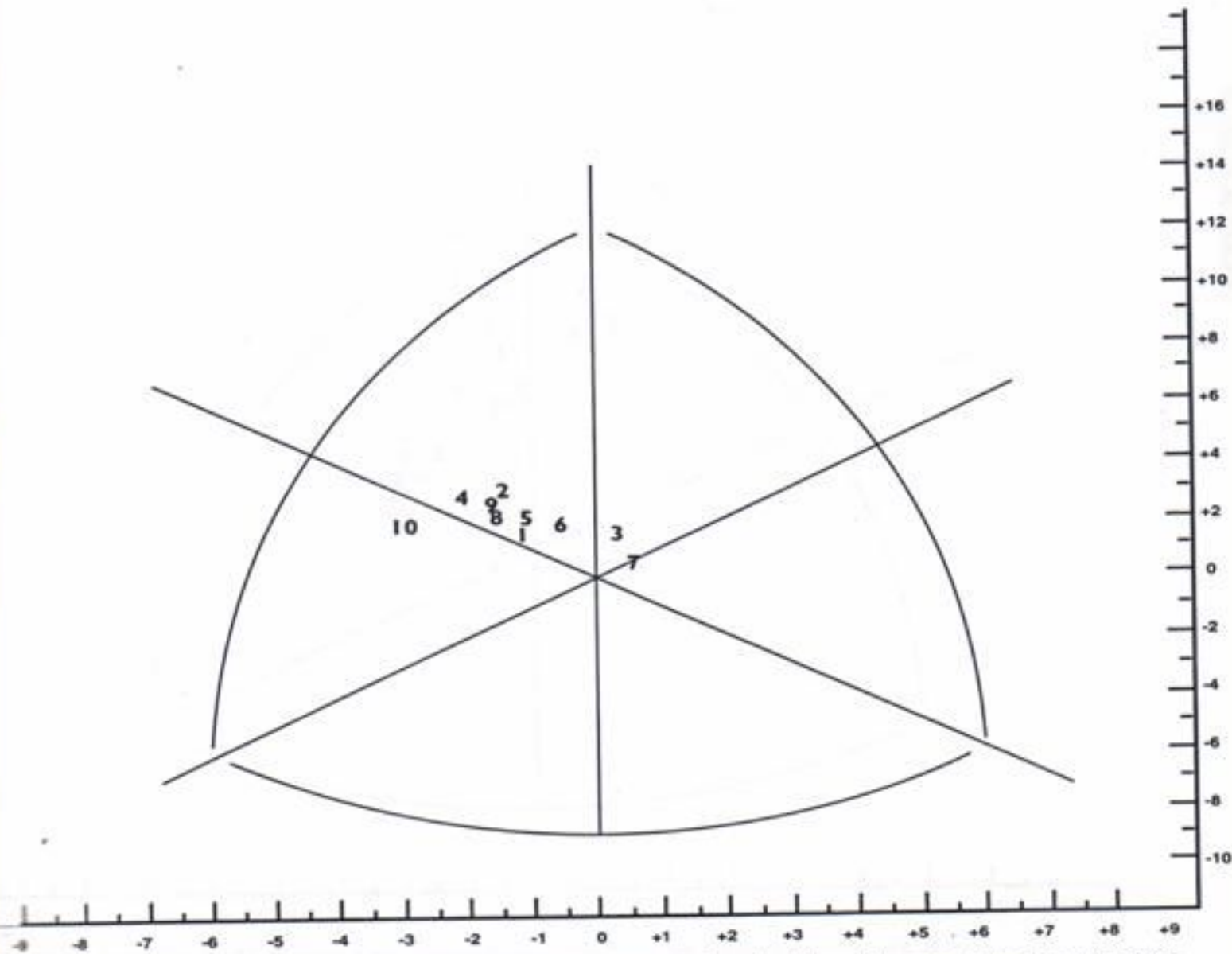


Figure 7 Somatochart showing the somatoplots for Australian female athletes. The mean values are shown after each sport. (Data from Withers, et al., 1987).

# Bentuk somatotipe atlet putra nasional australia

- |   |                                |    |                                  |
|---|--------------------------------|----|----------------------------------|
| 1 | Australian Rules (2.1-5.7-2.5) | 6  | Powerlifting (2.7-7.9-0.6)       |
| 2 | Basketball (2.1-4.5-3.5)       | 7  | Heavyweight rowing (2.0-5.2-3.0) |
| 3 | Gymnastics (1.9-6.1-2.5)       | 8  | Rugby Union (2.7-6.0-2.0)        |
| 4 | Hockey (2.4-5.4-2.6)           | 9  | Distance running (1.8-4.4-3.7)   |
| 5 | Hurdles (1.8-4.1-3.9)          | 10 | Squash (2.5-5.2-2.8)             |

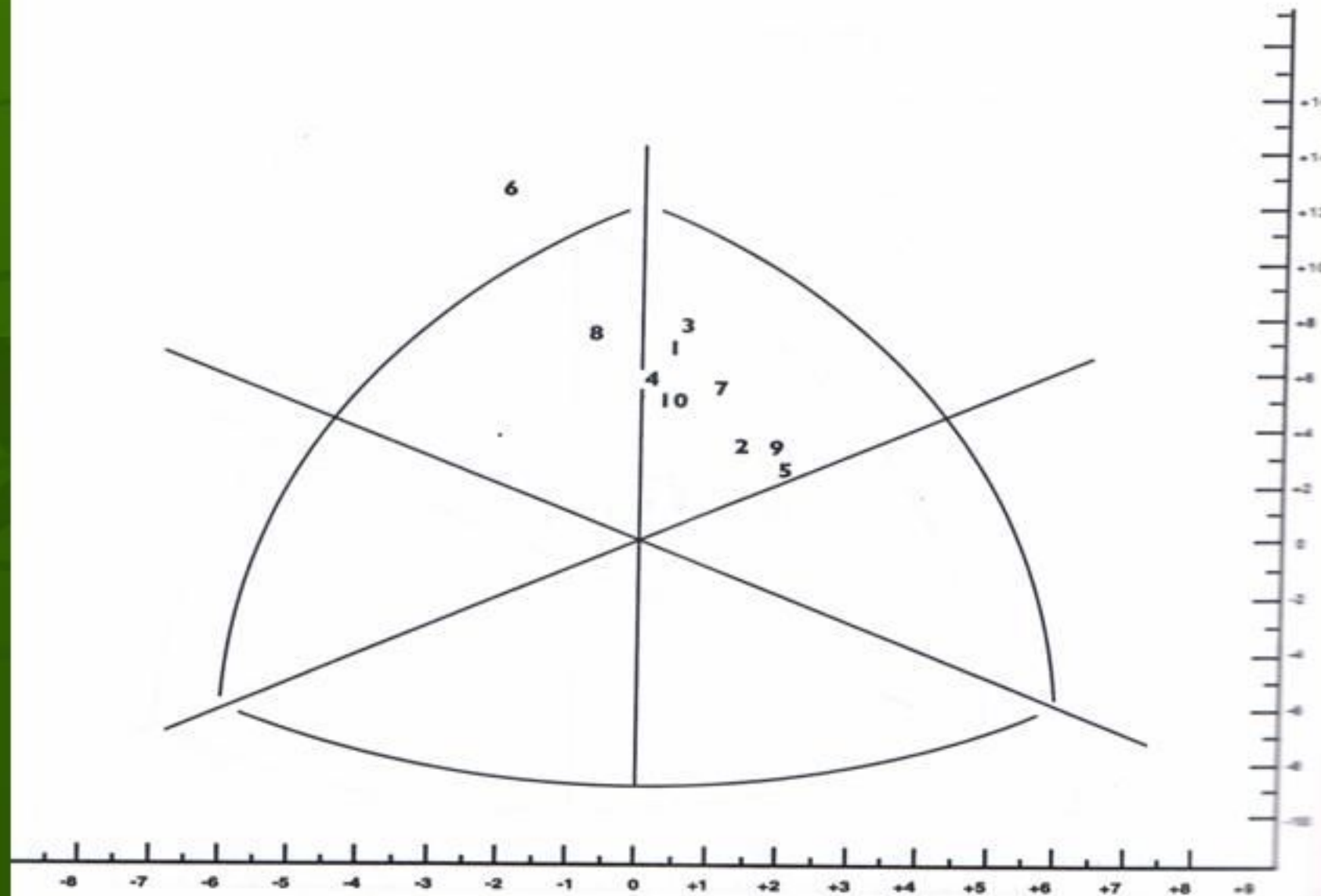


Figure 8 Somatochart showing the somatoplots for Australian male athletes. The mean values are shown after each sport. (Data mainly from Withers, et al., 1986).



## Penentuan bentuk somatotipe menurut *the Heath-Carter*

- ◆ **Endomorphy**, ada beberapa langkah, yaitu
  1. Catat hasil pengukuran 4 macam skinfolds.
  2. Jumlahkan pengukuran skinfolds dari triceps, subscapular, dan supraspinale selanjutnya dikoreksi /dibagi dengan tinggi badan ( $170.18/\text{tinggi badan dalam cm}$ ).
  3. Lingkari nilai yang paling dekat pada nomor 2 di sebelah kanan (batas atas, nilai tengah, atau batas bawah) dan tarik garis tegak lurus untuk menentukan nilai endomorphy.

- ◆ **Mesomorphy**, ada beberapa langkah cara menentukannya
  1. catat tinggi badan dan lebar humerus dan femur pada kotak sebelah kanan yang cocok. Catat koreksi skinfold sebelum mengukur lingkar lengan (arm) keadaan tegang dan rilek begitu juga lingkar betis (calf) dan konfersikan nilai skinfold dari mm kedalam cm (dibagi 10).
  2. Nilai tinggi badan langsung dilingkari nilai yang mendekati tinggi sebenarnya.
  3. tentukan nilai deviasi dengan menentukan sebelah kanan dari tinggi badan nilainya positif dan sbelah kiri dari tinggi badan nilainya negatif dan nilai nol terletak tegak lurus dengan lingkaran nilai tinggi badan, kecuali pada nilai lingkar betis yang dikoreksi dengan calf skinfolds tidak ada nilai nol tetapi nilainya tergantung arahnya bisa negatif atau positif.
  4. Hitung dan Jumlahkan nilai deviasi dengan menggunakan rumus  $(D/8 + 4)$ , selanjutnya lingkari nilai mesomorphy

## Ectomorphy, ada beberapa langkah cara menentukannya

- ◆ 1. Catat berat badan dalam kg  $\sqrt[3]{BB}$
- ◆ 2. Tinggi badan dibagi akar 3 dari berat badan (TB  $\sqrt[3]{BB}$ )
- ◆ 3. lingkari nilai yang mendekati nilai no.2 dan tarik garis vertikal untuk menentukan kelompok ectomorphy.



## Persamaan untuk pendesimalisasian antropometrik somatotipe cara kedua

◆ **Endomorphy** =  $-0.7182 + 0.1451 \sum x$  SF  $-0.00068 \sum x$  SF<sup>2</sup> +  $0.0000014 x$

◆  $\sum SF^3$

◆  $\sum$  SF adalah jumlah triceps, subzcapular, dan supraspinale dibagi dengan 170.18/TB.

**Mesomorphy** =  $0.858 \times \text{lebar humerus} + 0.601 \times \text{lebar femur} + 0.188 \times$   
koreksi lingkaran lengan +  $0.161 \times \text{koreksi lingkaran betis} - \text{tinggi badan} \times 0.131 + 4.5$

Ada 3 persamaan yang digunakan untuk menghitung ectomorphy

- ◆ Bila HWR (ratio TB dan BB) lebih besar atau sama dengan 40.75 maka

$$\text{Ectomorphy} = 0.732 \times \text{HWR} - 28.58$$

- ◆ Bila HWR kurang dari 40.75 dan besar dari 38.25 maka

$$\text{Ectomorphy} = 0.463 \times \text{HWR} - 17.63$$

- ◆ Bila HWR sama atau kecil dari 38.25 maka

$$\text{Ectomorphy} = 0.1$$

# Endomorphy rating scale and characteristics

## Endomorphy Rating Scale and Characteristics (relative fatness)

1   1½   2   2½   3   3½   4   4½   5   5½   6   6½   7   7½   8   8½

Low relative fatness; little subcutaneous fat; muscle and bone outlines visible.	Moderate relative fatness; subcutaneous fat covers muscle and bone outlines; softer appearance.	High relative fatness; thick subcutaneous fat; roundness of trunk and limbs; increased storage of fat in abdomen.	Extremely high relative fatness; very thick subcutaneous fat and high amounts of abdominal trunk fat; proximal concentration of fat in limbs.
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# Mesomorphy rating scale and characteristics

## Mesomorphy Rating Scale and Characteristics (musculo-skeletal robustness relative to height)

1	1½	2	2½	3	3½	4	4½	5	5½	6	6½	7	7½	8	8½
Low relative				Moderate relative				High relative				Extremely high			
musculo-skeletal				musculo-skeletal				musculo-skeletal				relative musculo-			
development;				development;				development; wide				skeletal developmen			
narrow skeletal				increased muscle bulk				skeletal diameters;				very bulky muscles;			
diameters; narrow				and thicker bones and				bulky muscles; large				very wide skeleton			
muscle diameters;				joints.				joints.				and joints.			
small joints in limbs.															

# Ectomorphy rating scale and characteristics

## Ectomorphy Rating Scale and Characteristics (relative linearity)

1	1½	2	2½	3	3½	4	4½	5	5½	6	6½	7	7½	8	8½
Low relative				Moderate relative				High relative				Extremely high relative			
linearity; great bulk				linearity; less bulk per				linearity; little bulk				linearity; very			
per unit of height;				unit of height; more				per unit of height.				stretched-out; narrow			
round like a ball;				stretched-out.								like a pencil; minimal			
relatively bulky												bulk per unit of height.			
limbs.															



# Lembaran Kerja anthropometry

## Anthropometry Proforma

Test ID

Name: .....

DOB: ..... Test Date: .....

Subj. Postcode: ..... Gender: M  F

Country of Birth: ..... Box Ht: .....

Mass (kg): ..... Height (cm): .....

Lab: Tester ID   :

Sport: .....

Intensity	Frequency	Duration
Nil	≤ 2	< 3
Walk	≥ 3	3-12
Vigorous		> 12

	ID	Site	Trial 1	Trial 2	Trial 3	Median
<b>Skinfolds (mm)</b>	1	triceps				
	2	subscapular				
	3	biceps				
	4	iliac crest				
	5	supraspinale				
	6	abdominal				
	7	front thigh				
	8	medial calf				
	9	mid-axilla				
<b>Girths (cm)</b>	10	head				
	11	neck				
	12	arm (relaxed)				
	13	arm (flexed and tensed)				
	14	forearm (maximum)				
	15	wrist (distal styloids)				
	16	chest (mesosternale)				
	17	waist (minimum)				
	18	gluteal (hips)				
	19	thigh (1 cm gluteal)				
	20	thigh (mid tro-tib-lat)				
	21	calf (maximum)				
	22	ankle (minimum)				
<b>Lengths (cm)</b>	23	acromiale-radiale				
	24	radiale-styilion				
	25	midstyliion-dactyliion				
	26	iliospinale b. ht				
	27	trochanterion b. ht				
	28	trochanterion-tibiale laterale				
	29	tibiale laterale to floor				
	30	tibiale mediale-sphy. tibiale				
<b>Breadths/Lengths (cm)</b>	31	biacromial				
	32	biiliocrystal				
	33	foot length				
	34	sitting height				
	35	transverse chest				
	36	A-P chest depth				
	37	humerus				
	38	femur				
<b>Sport</b>	39					
<b>Specific</b>	40					
<b>Sites</b>	41					
	42					

Figure 10 Standard anthropometric proforma

# Anatomi landmarks

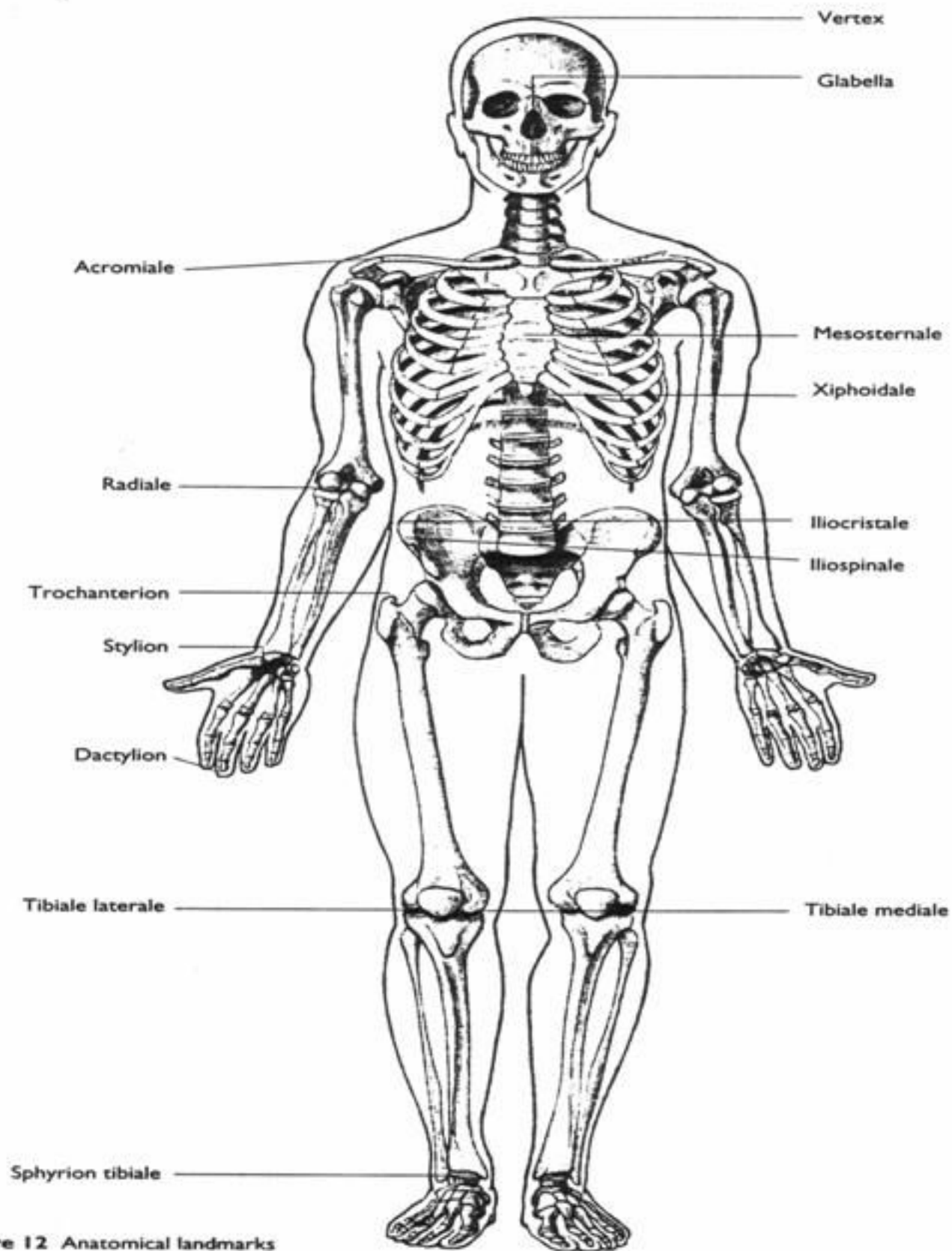
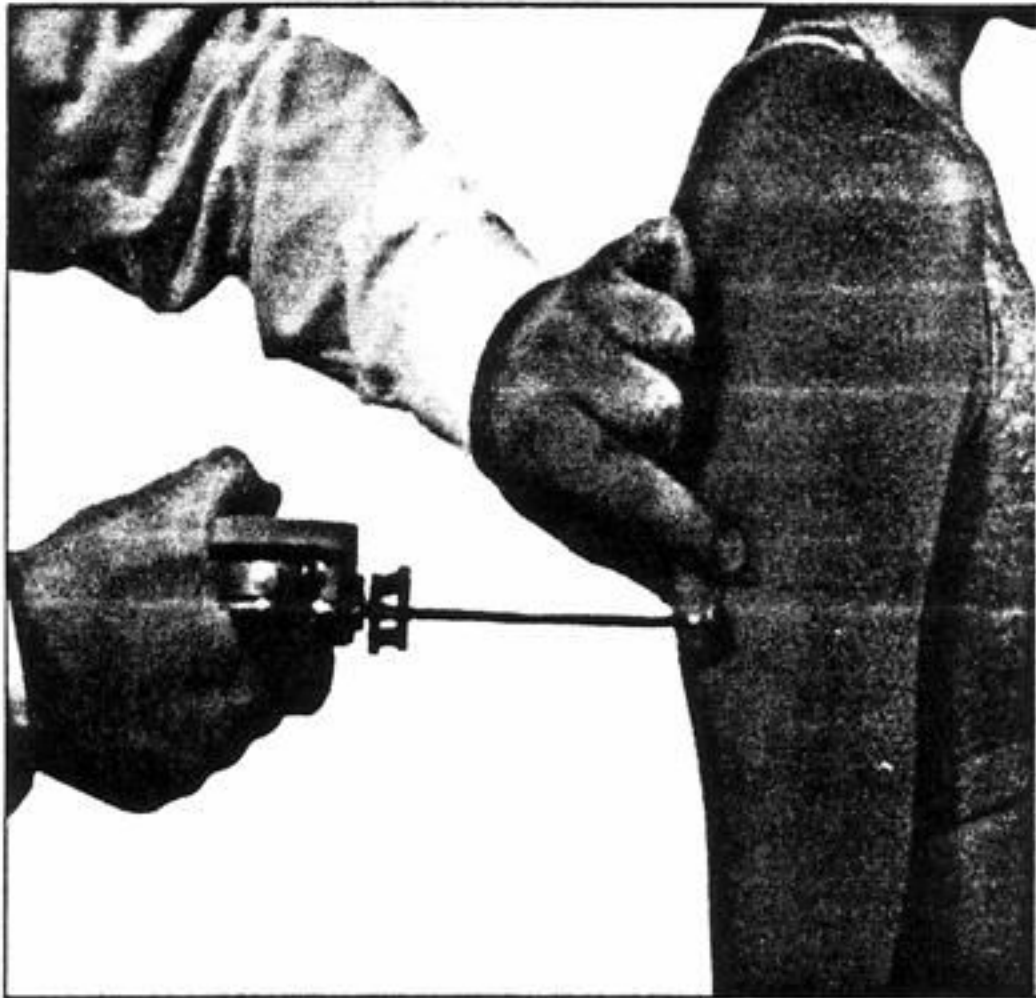


Figure 12 Anatomical landmarks

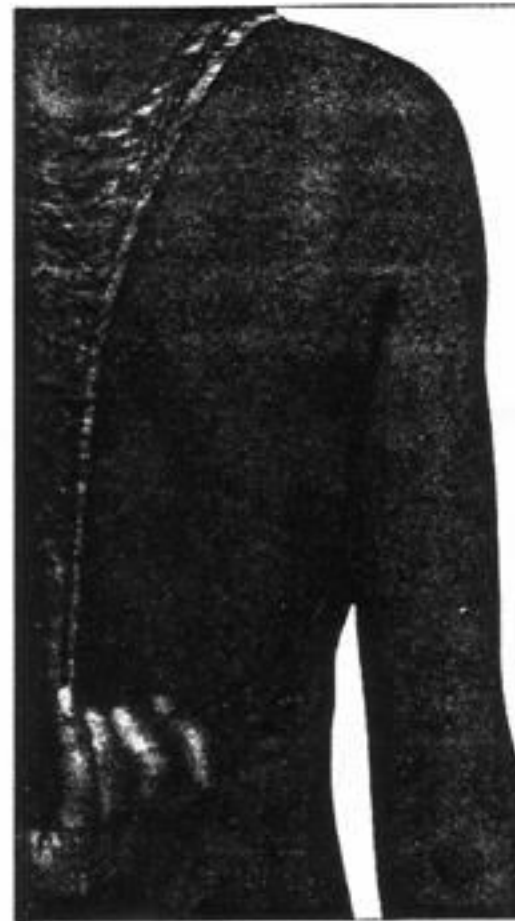
# Anatomical Landmarks for Skinfold

## Triceps



**Figure 13** Measurement of the triceps skinfold

## Subscapular



**Figure 14a** Location of the subscapular landmark



**Figure 14b** Measurement of the subscapular skinfold

# Anatomical Landmarks for skinfold

## Measurement Biceps



Figure 17 Measurement of the biceps skinfold

## Measurement of the Iliac Crest

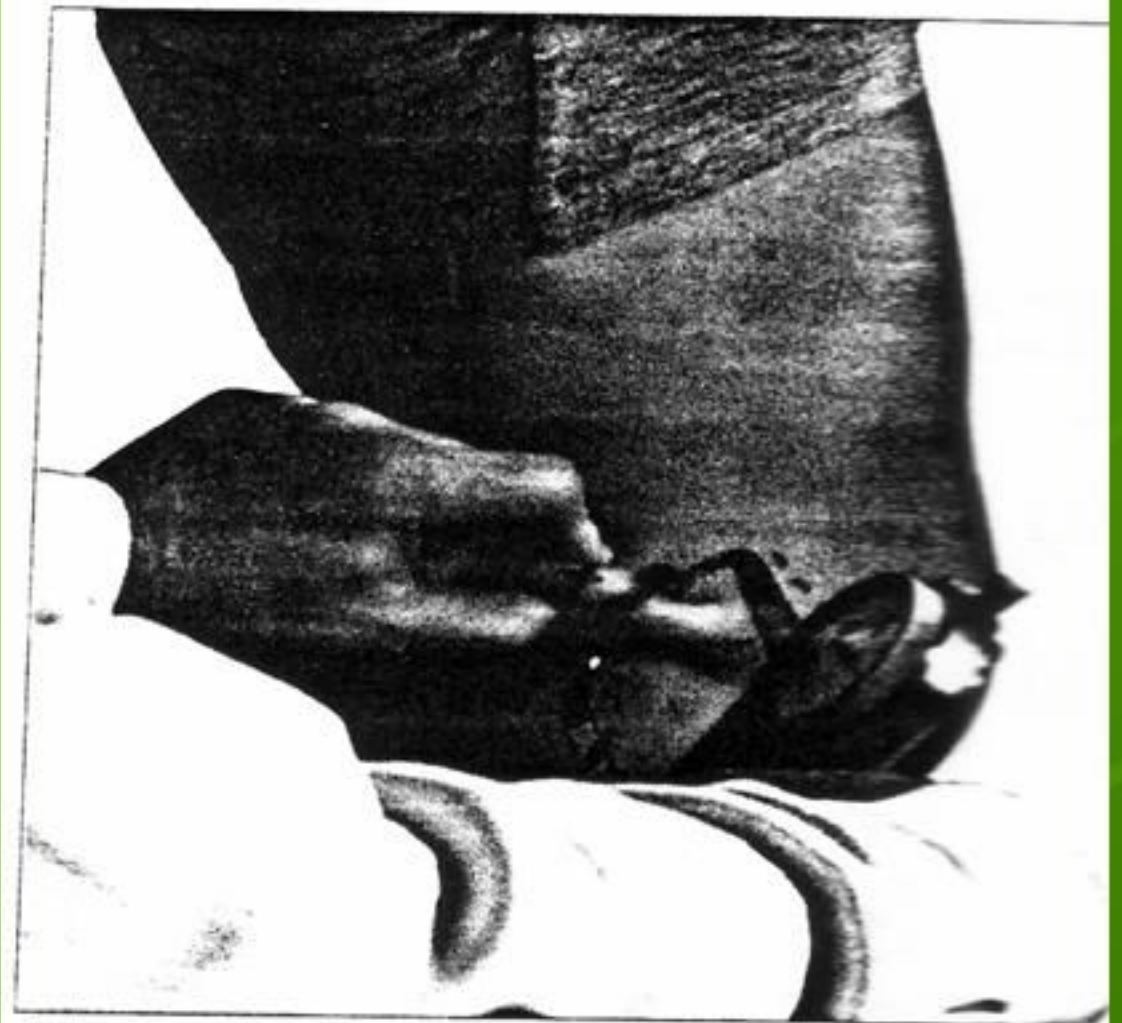
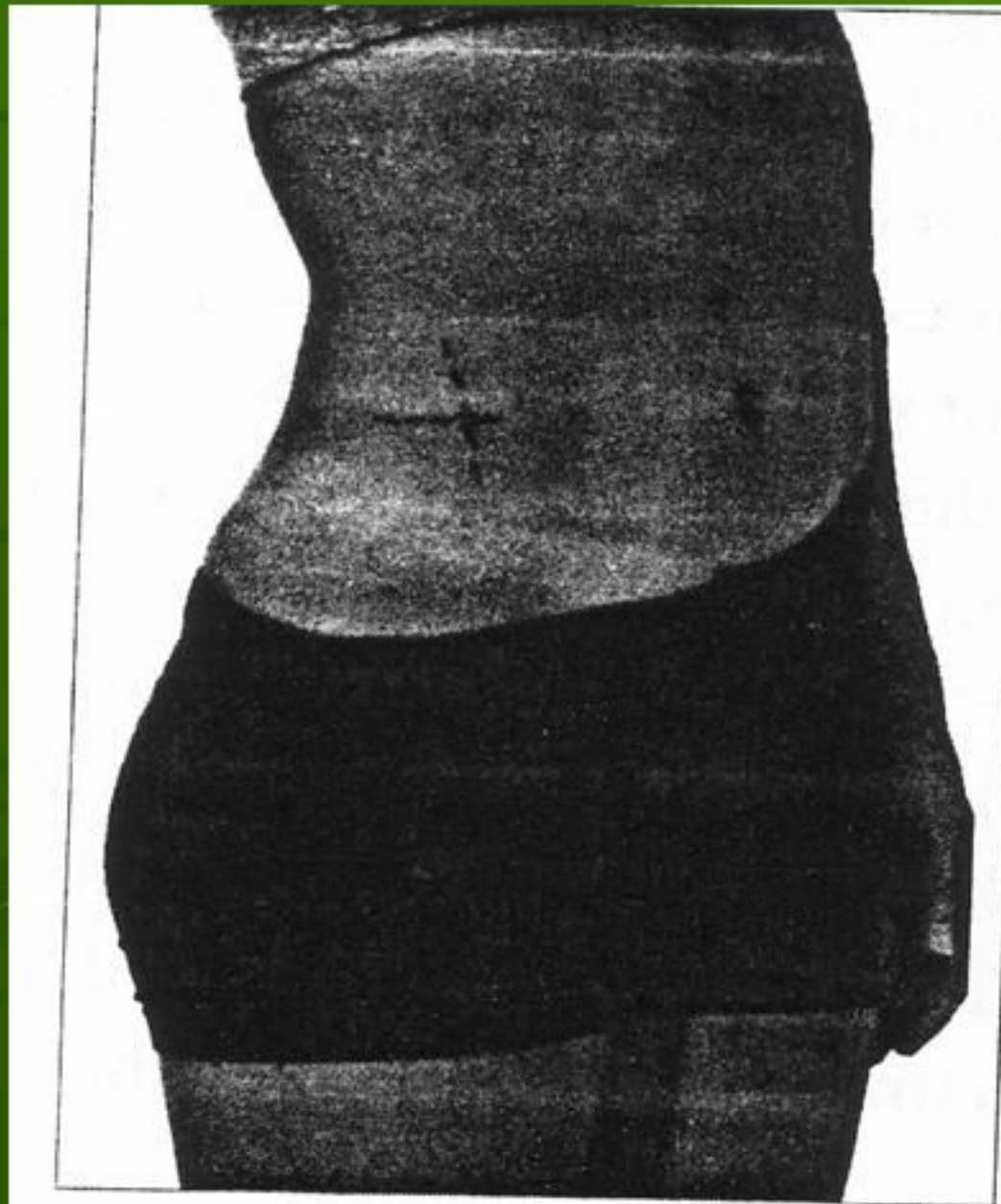


Figure 18 Measurement of the Iliac crest skinfold

# Anatomical Landmarks for skinfold

Supraspinale landmarks



**Figure 19a** Location of the supraspinale landmark

Supraspinale skinfold



**Figure 19b** Measurement of the supraspinale skinfold

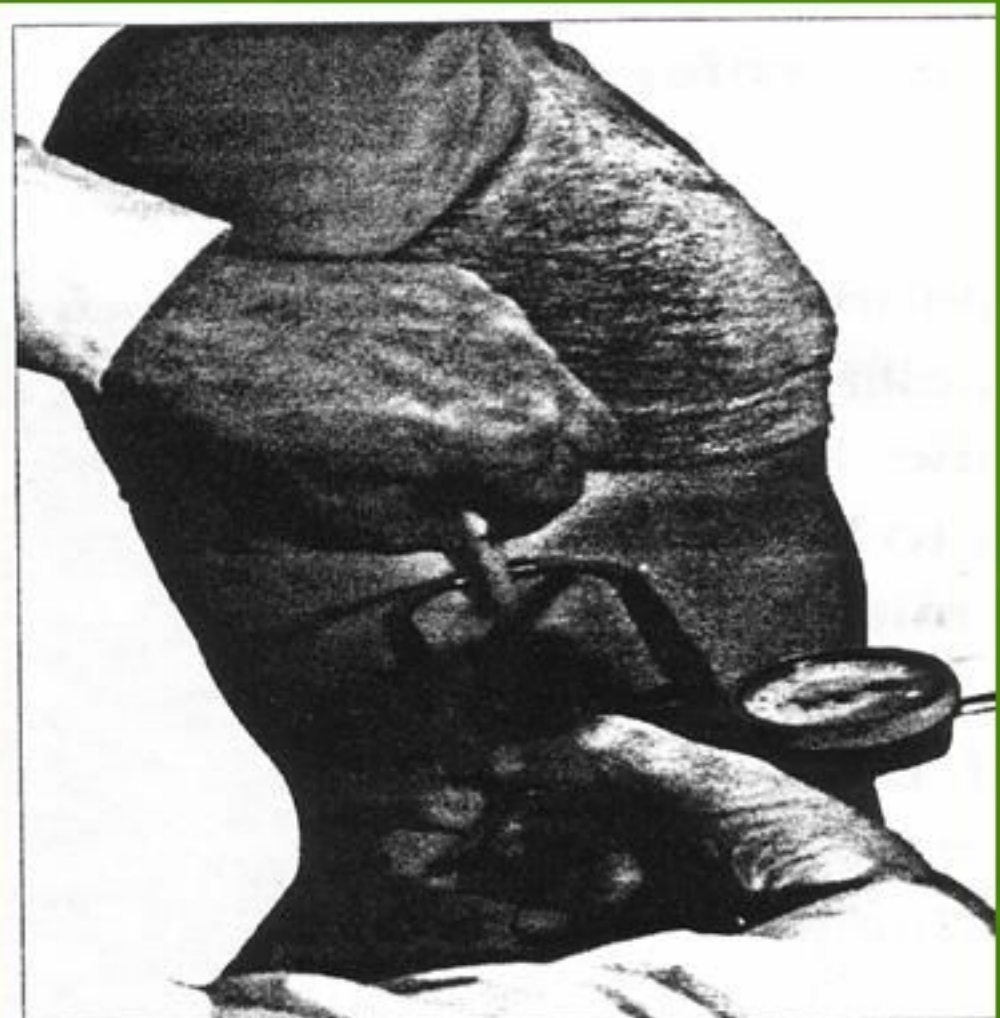
# Anatomical Landmarks for skinfold

## Abdominal



**Figure 20** Measurement of the abdominal skinfold

## Mid-axilla



**Figure 23** Measurement of the mid-axilla skinfold

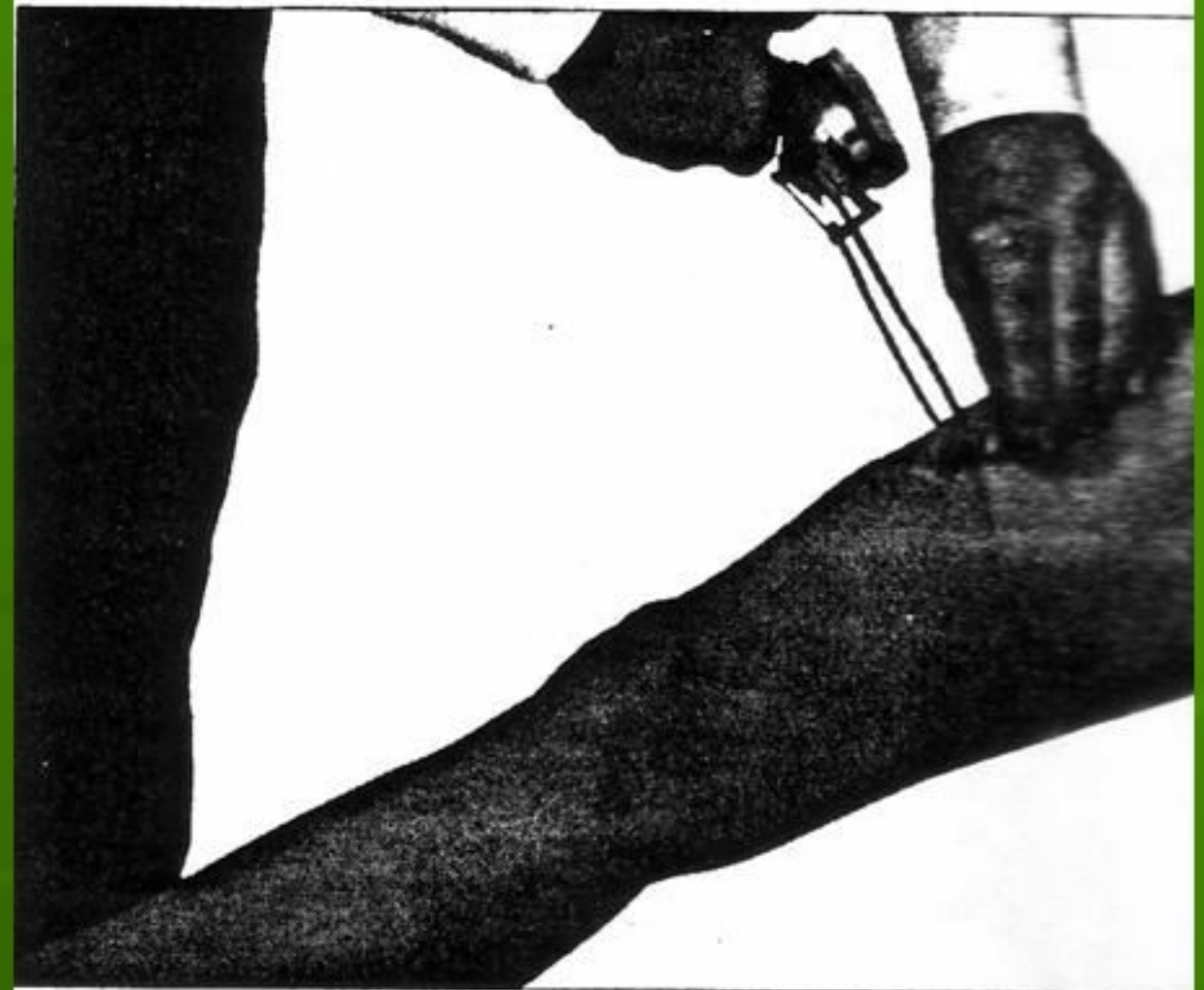
# Anatomical Landmarks for skinfold

## Front Thigh



**Figure 21a** Location of the front thigh landmark

## Front Thigh skinfold



**Figure 21b** Measurement of the front thigh skinfold without subject assistance