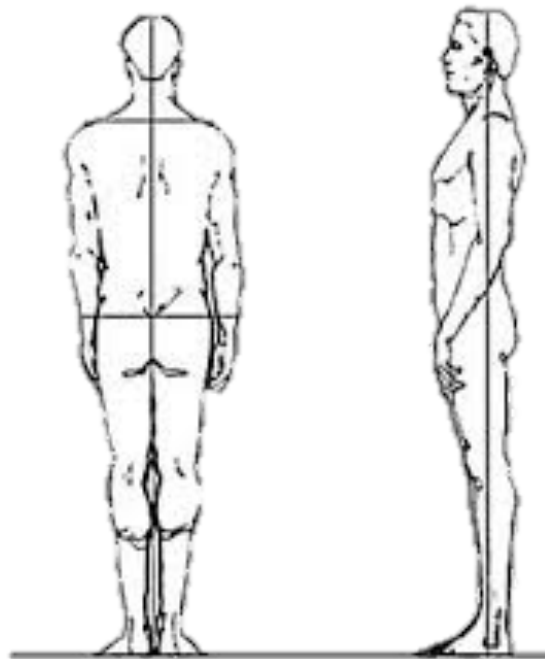


Laboratory Practical 8

Postural Assessment

Posture is the alignment and maintenance of body segments in certain positions (Bloomfield, 1998). Britnell et al. (2005) offered a definition of good posture to be a state of muscular and skeletal balance, which protects the supporting structures of the body against injury or progressive deformity.

Postural symmetry has long been debated as a risk factor for sports and exercise related injury and performance deficits. Traditionally, postural symmetry is assessed using a plumb line approach.



Lateral View

In normal standing, the plumb line should sit anterior to the lateral malleolus. It should then pass up between the mid-point of the tibiofemoral joint line, pass through the greater trochanter of the femur and the mid-point of the glenohumeral joint, before touching behind the ear and leaving the body through the top of the head.

Posterior View

The plumb line should sit equidistant between the medial malleoli as your starting point. From the floor it should then pass through your sacrum and your vertebrae. It should pass

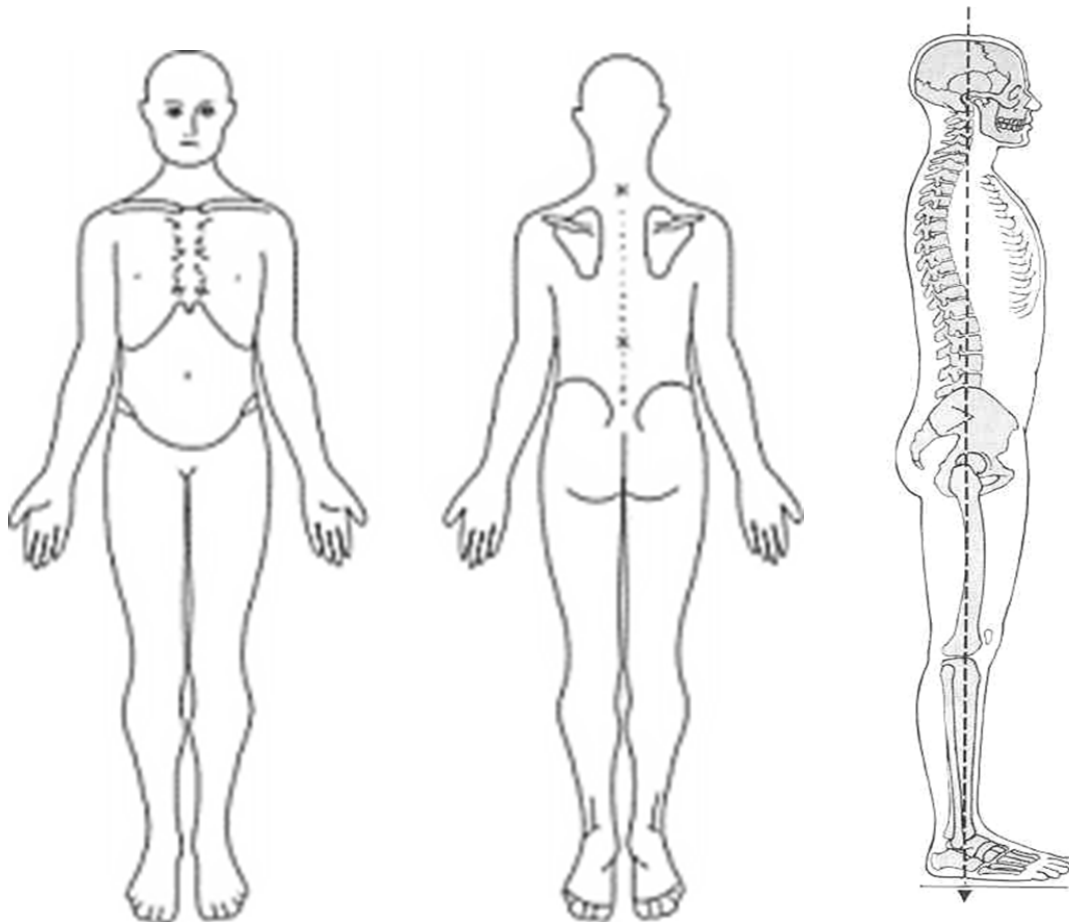
equally between your scapulae as measured as the distance between the medial borders of the scapula and pass through the top of the head.

You should be able to notice in this view a right to left comparison of symmetry too.

Consider the muscle bulk of the triceps surae group in your calf, the crease at the back of the knee, the gluteal fold and gluteal muscle bulk, the height of the hands, scapula, shoulders and ears – are they even and level?

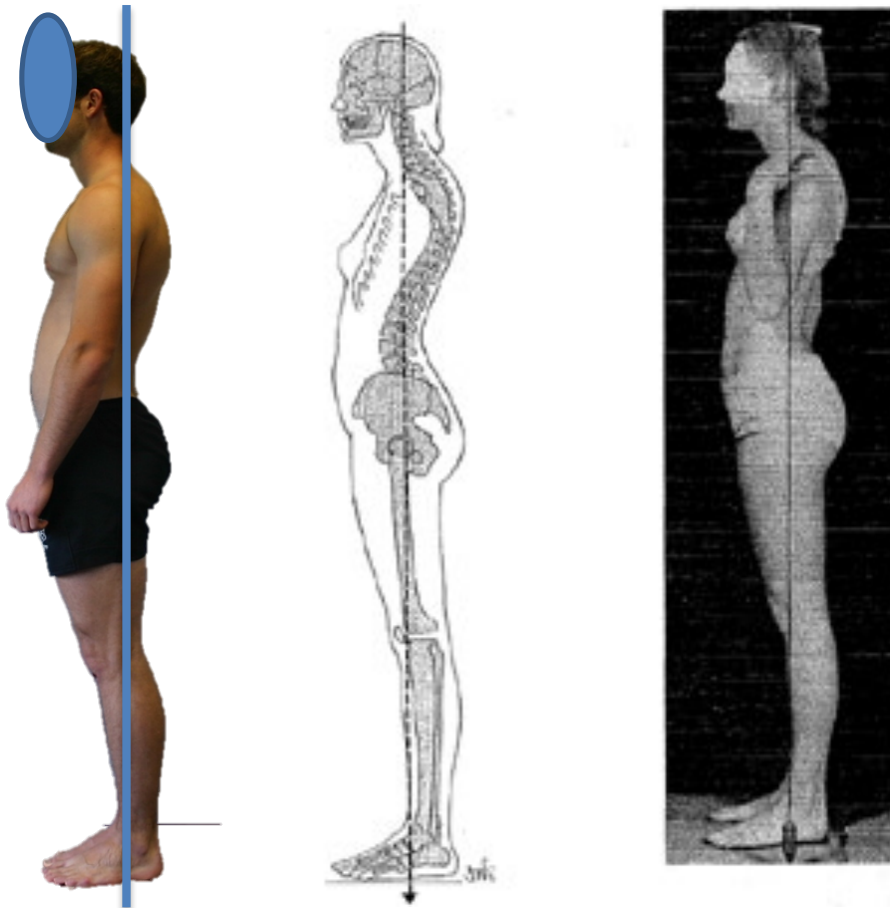
Task One

Undertake a plumbline assessment of static posture and annotate your findings on the images below:



Common Postural Faults

Lordotic/Kyphotic Posture



Observations of the Lordotic/Kyphotic posture include a greater trochanter which sits in front of the plumb line, an increased lumbar lordosis and anterior pelvic tilt, a humeral head which is also in front of the plumb line and protracted/medially rotated shoulders with a forward head posture.

Lower Limb

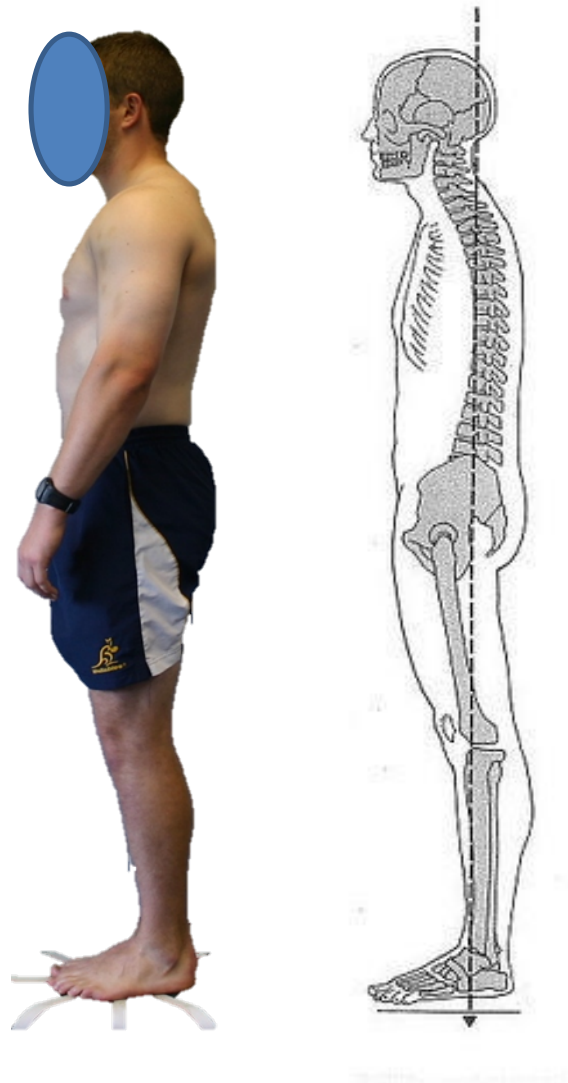
In this position the lumbar spine soft tissue become short and tight. The main hip flexor- iliopsoas is also shortened. A few muscles are also lengthened in this position. For example the hamstrings and lower abdominals are lengthened by this positioning.

Upper Limb

With the protracted and medially rotated shoulder position pectoralis major often shortens and tightens. The forward head carriage often means a shortening of the cervical extensors at the back

of the neck. In this position the neck flexors and the posterior shoulder muscles and rotator cuff are lengthened and weakened by this positioning.

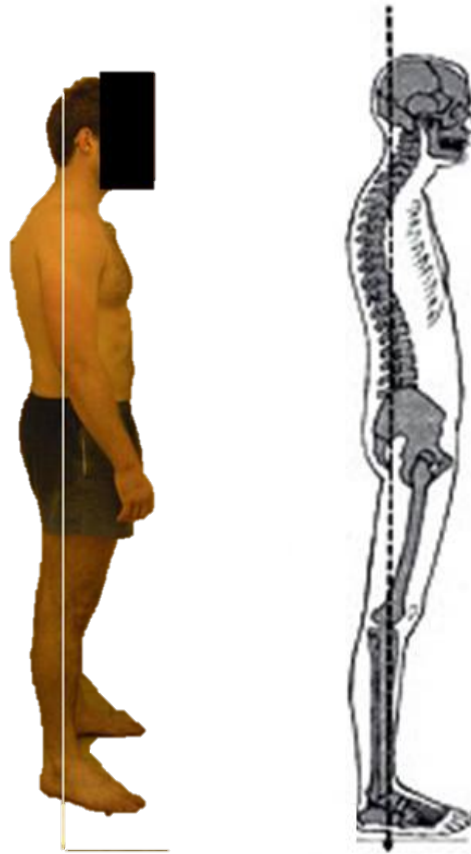
Flat Back Posture



This postural type is characterised by no obvious curvature of the spine. There is no obvious lordotic curvature in the lumbar spine or pronounced thoracic kyphosis.

This postural type is often caused by excessively strong abdominal muscles and excessively tight hamstrings.

Sway Back Posture



This type of posture is characterised by a posterior displacement of the upper torso and an anterior displacement of the lower torso and hips. The hips are forced in to a hyperextended position which is aggravated by dynamic movements such as running.

It is caused by a weakness of the abdominals (especially the external obliques) and the hip flexors.

Practical 1

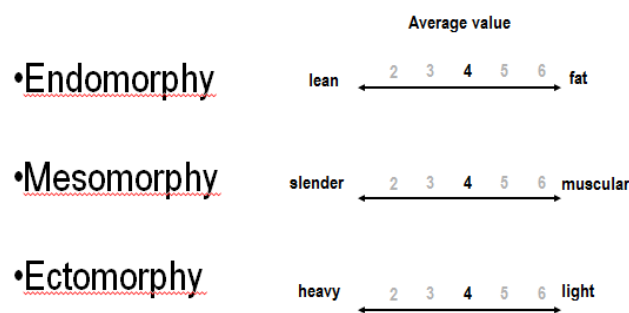
Does static posture have any predictive value for sport and exercise injuries in athletic populations?

Laboratory Practical 9

Somatotyping

Somatotype is a physique classification system which recognises a body shape category, which necessarily falls between pre-determined end limits. It is defined as a quantified expression and description of the present morphological conformation of a person. It is independent of size, age and gender (Carter and Heath, 1990).

Somatotype is a three figure reference which characterises physique and body shape. It comprises values, originally proposed on a 7-point scale, which summarise the physique, and can be plotted on the tri-polar somatochart.



Where

- Endomorphy: Roundness or fatness, based on 3 skinfolds Independent of size
- Mesomorph: Musculo-skeletal robustness, based on elbow & knee breadths, and corrected girths of calf and upper arm
- Ectomorphy: Relative fragility, based on height and weight

(Heath & Carter, 1967)

Measurements Required: (all Right sided)

Each measurement should be repeated 3 times for consistency and the average scored used.

Total mass (kg)

The subject, wearing minimal clothing, stands in the centre of the scale platform. Record clients weight to the nearest tenth of a kilogram. A correction is made for clothing so that nude weight is used in subsequent calculations.

Stature (cm)

Taken against a height scale or stadiometer. Take height with the subject standing straight, against an upright wall or stadiometer, touching the wall with heels, buttocks and back. Orient the head in the Frankfort plane (the upper border of the ear opening and the lower border of the eye socket on

a horizontal line), and the heels together. Instruct the subject to stretch upward and to take and hold a full breath. Lower the headboard until it firmly touches the vertex.

Upper arm circumference (cm)

Elbow flexed and tensed, right. The subject flexes the shoulder to 90 degrees and the elbow to 45 degrees, clenches the hand, and maximally contracts the elbow flexors and extensors. Take the measurement at the greatest girth of the arm.

Max. Calf circumference (cm)

The subject stands with feet slightly apart. Place the tape around the calf and measure the maximum circumference.

Femur breadth (cm)

Seat the subject with knee bent at a right angle. Measure the greatest distance between the lateral and medial epicondyles of the femur with firm pressure on the crossbars in order to compress the subcutaneous tissue.

Humerus breadth (cm)

The width between the medial and lateral epicondyles of the humerus, with the shoulder and elbow flexed to 90 degrees. Apply the caliper at an angle approximately bisecting the angle of the elbow. Place firm pressure on the crossbars in order to compress the subcutaneous tissue.

Skinfolds

Raise a fold of skin and subcutaneous tissue firmly between thumb and forefinger of the left hand and away from the underlying muscle at the marked site. Apply the edge of the plates on the caliper branches 1 cm below the fingers of the left hand and allow them to exert their full pressure before reading at 2 sec the thickness of the fold. Take all skinfolds on the right side of the body. The subject stands relaxed, except for the calf skinfold, which is taken with the subject seated.

Triceps skinfold (mm)

With the subject's arm hanging loosely in the anatomical position, raise a fold at the back of the arm at a level halfway on a line connecting the acromion and the olecranon processes.

Subscapular skinfold (mm)

Raise the subscapular skinfold on a line from the inferior angle of the scapula in a direction that is obliquely downwards and laterally at 45 degrees.

Supraspinale skinfold (mm)

Raise the fold 5-7 cm (depending on the size of the subject) above the anterior superior iliac spine on a line to the anterior axillary border and on a diagonal line going downwards and medially at 45 degrees.

Medial calf skinfold (mm)

Raise a vertical skinfold on the medial side of the leg, at the level of the maximum girth of the calf.

Somatotype Rating Form

HEATH-CARTER SOMATOTYPE RATING FORM														
NAME			AGE			SEX: M F			NO:					
OCCUPATION			ETHNIC GROUP			DATE								
PROJECT:						MEASURED BY:								
Skinfolds mm Triceps = Subscapular = Supraspinale = SUM 3 SKINFOLDS = Call =			SUM 3 SKINFOLDS (mm) 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 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 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 x $\left(\frac{170.18}{\text{ht}^2}\right)$ = mm (height corrected skinfolds)											
Height cm Humerus width cm Femur width cm Biceps girth -T* Calf girth -C*			Endomorphy 1 1½ 2 2½ 3 3½ 4 4½ 5 5½ 6 6½ 7 7½ 8 8½ 9 9½ 10 10½ 11 11½ 12 129.7 141.5 147.3 151.2 154.9 158.8 162.8 166.4 170.2 174.0 177.8 181.6 185.4 189.2 193.0 196.9 200.7 204.5 208.3 212.1 215.9 219.7 223.5 227.3 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 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 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 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 = HI, $\sqrt[3]{\frac{W}{H^3}}$ =			Mesomorphy 1 1½ 2 2½ 3 3½ 4 4½ 5 5½ 6 6½ 7 7½ 8 8½ 9 Upper limit 39.65 40.74 41.43 42.13 42.82 43.68 44.18 44.84 45.53 46.23 46.92 47.58 48.25 48.94 49.63 50.33 50.99 51.68 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 1 1½ 2 2½ 3 3½ 4 4½ 5 5½ 6 6½ 7 7½ 8 8½ 9											
Anthropometric Somatotype Anthropometric plus Phalangeal Somatotype			ENDOMORPHY 			MESOMORPHY 			ECTOMORPHY 			BY:, RATER:		

* 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.

(Carter, 2002)

To calculate your scores:

Endomorphy

Add the skinfolds at the triceps, subscapular and supraspinale sites.

Multiply this sum by 170.18 / height

This total (in mm) is "E" in the following calculation:

$$\text{Endomorphy} = -0.7182 + (0.145 \times E) - (0.00068 \times E^2) + (0.0000014 \times E^3)$$

Mesomorphy

Record height (H), humerus breadth (HB) and femur breadth (FB), max calf girth and max upper arm girth, with the arm flexed to 45° and tensed.

Calculate corrected arm (AG) and calf girth (CG) by subtracting triceps and medial calf skinfolds from the respective girths.

$$AG = \text{Girth} - \text{triceps skinfold}$$

$$CG = \text{Girth} - \text{Medial calf skinfold}$$

Substitute these values in the following equation:

$$\text{Mesomorphy} = (0.858 \times HB) + (0.601 \times FB) + (0.188 \times AG) + (0.161 \times CG) - (0.131 \times H) + 4.5$$

Ectomorphy

Record height in cm and weight in kg.

Divide the height by the cube root of weight to calculate the reciprocal of the ponderal index or RPI. The magnitude of the RPI determines which formula is used to calculate ectomorphy.

If RPI is greater than 40.74,

$$\text{Ectomorphy} = (0.732 \times \text{RPI}) - 28.58$$

If RPI is between 39.65 and 40.74,

$$\text{Ectomorphy} = (0.463 \times \text{RPI}) - 17.615$$

If RPI is less than 39.65,

$$\text{Ectomorphy} = 0.5$$

Reporting the Anthropometric Somatotype

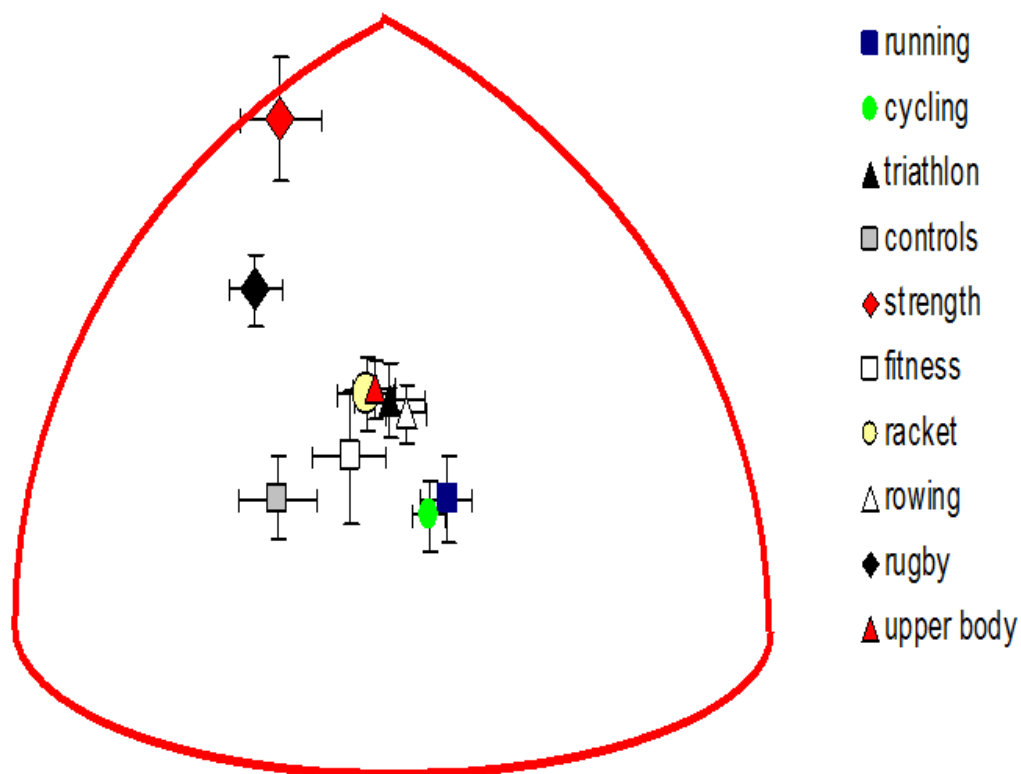
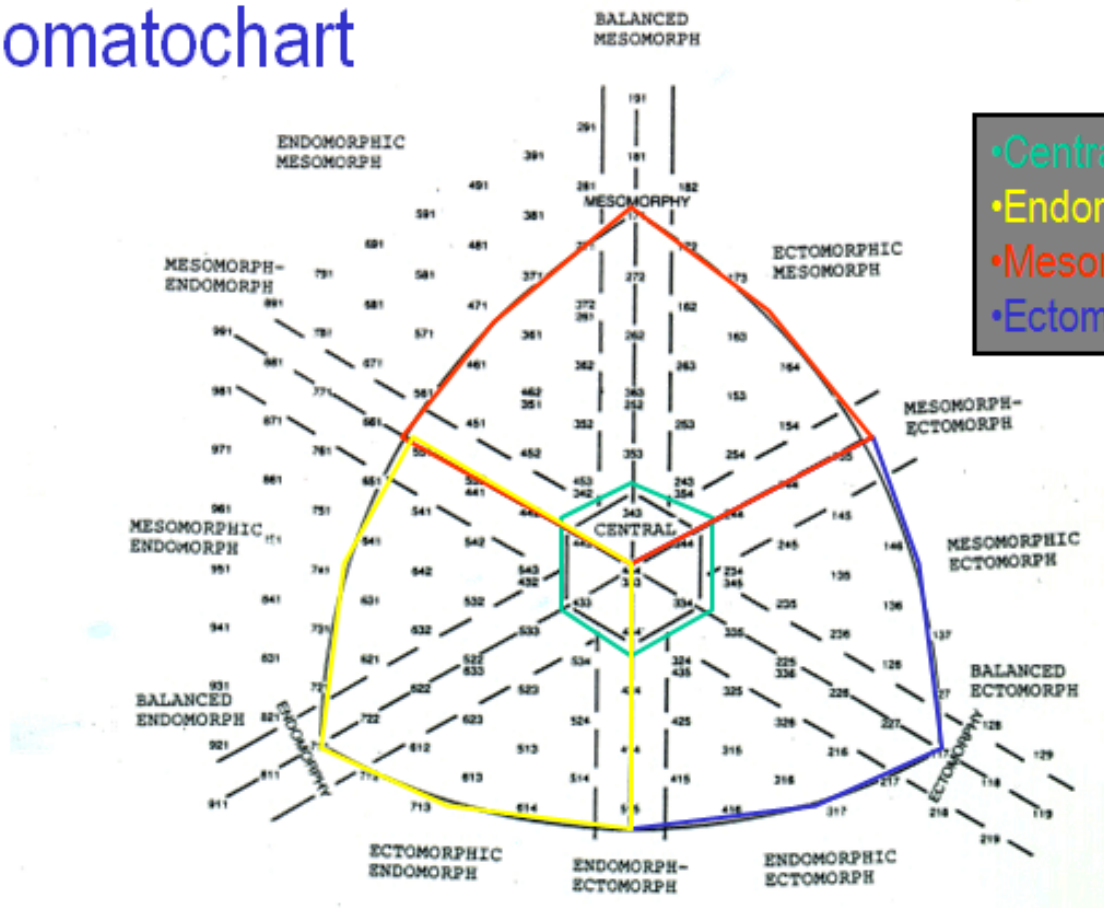
In the box at the bottom of the Rating Form enter your 3 scores for Endomorph, Mesomorph and Ectomorph. You will need to use rounding to the nearest whole number. E.g.

1.7 – 4.3 – 1.4 would become 2 – 4 – 1.

You can then plot your somatotype on the Somatochart below.

Is the client's somatotype reflective of any athletic populations or sporting characteristics?

Somatochart



Somatotyping of 106 Male Athletes (Stewart & Hannan, 2000)

