Static health tests

Resting heart rate

Resting heart rate (RHR) is the amount of times your heart beats every minute at rest. The average resting heart rate is between 60 and 80 (Heyward, 2002) and is measured in beats per minute (bpm).

Resting heart rate (bpm) references		
	Men	**Women**
Normal.	60-80	60-80
Average.	70	75
Special attention.	≥90	≥90
Medical referral.	≥100	≥100

Adapted from Heyward and Gibson, 2014

A RHR of less than 60 bpm is called bradycardia and may be the result of good aerobic fitness, hypothermia, low thyroid function and certain medications.

A RHR of greater than 100 bpm is called tachycardia and may be the result of stimulants like caffeine, excess stress, fever, poor aerobic fitness and certain medications. A RHR of 100 bpm is a contraindication for exercise and should be signposted to a GP for clearance.

Resting heart rate – method of assessment (Adapted from Franklin, 2000)

1. Ensure that your client has rested for 5-10 minutes in a relaxed, seated position prior to measuring heart rate.
2. Locate the correct site of the carotid or radial artery. These are the most commonly used sites.
3. Use the tips of the middle and index fingers to gently locate the artery. Do not use your thumb; it has a pulse of its own and may produce an inaccurate count.
4. Allow 30 seconds for your client to get comfortable with the method and relax.
5. Count pulse for 60 seconds, record the result and repeat for accuracy.

Locations of peripheral pulse (adapted from Latin, 1998)

Carotid: The common carotid artery sites are located on both sides of the front of the neck. Each are in the groove formed by the larynx (Adam's apple) and the sternocleidomastoid muscles (muscles on the side of the neck) just below the mandible (lower jawbone).

Radial: The radial artery runs deeply on the anterolateral (thumb side) aspect of the forearm and becomes superficial near the distal head of the radius (directly in line with the base of the thumb).

Blood pressure

BUPA (2002) describes blood pressure (BP) as 'a measure of the force that the blood applies to the walls of the arteries as it flows through them'. It is measured in millimetres of mercury (mmHg) and is expressed using two

numbers, written as 120/80mmHg ('one hundred and twenty over eighty'). These two numbers represent the systolic and diastolic blood pressures respectively.

Systolic blood pressure: The systolic blood pressure (SBP) is the pressure exerted on the artery walls when the cardiac muscle is contracting (ventricular systole) and pumping blood. This is the higher of the two numbers and is usually noted first.

Diastolic blood pressure: The diastolic blood pressure (DBP) is the pressure exerted on the artery walls when the heart is in a relaxed state. The heart goes through this period of relaxation, or diastole, to allow the chambers of the heart to fill with blood prior to contraction.

Optimal blood pressure: The ACSM (2014) defines optimal blood pressure, with respect to cardiovascular risk, as being below 120 mmHg for systolic pressure and 80 mmHg for diastolic pressure.

Factors that increase blood pressure		
	Acute (immediate)	**Chronic (long-term)**
Systolic	Stress, anxiety or arousal Physical activity / exertion Food Caffeine Smoking Illicit drugs	Psychological stress/anxiety Sedentary lifestyle/inactivity Obesity High dietary salt (Na) intake Low dietary potassium (K) intake Excessive alcohol intake Certain medications/drugs
Diastolic	Heavy weight training Isometric exercise	Psychological stress/anxiety Sedentary lifestyle/inactivity Obesity High dietary salt (Na) intake Low dietary potassium (K) intake Excessive alcohol intake Certain medications/drugs

CLASSIFICATION OF BLOOD PRESSURE (MMHG) FOR ADULTS (18+)			
BP classification	**SBP**		**DBP**
Clinical hypotension	< 100	and	< 60
Normal (optimal)	< 120	and	< 80
Normal (pre-hypertension)	120-139	or	80-89
Hypertension Stage 1 **(medical referral)**	140-159	or	90-99
Stage 2 **(medical referral)**	≥ 160	or	≥ 100

Adapted from the Seventh Report of the JNC, 2003

Blood pressure is most commonly taken using a sphygmomanometer and stethoscope or the increasingly popular electrical monitor. Good practice denotes that the pressure reading is taken on the left arm with the cuff around the humerus and the stethoscope placed at the crease of the elbow.

Guidelines for taking blood pressure (Reeves, 1995)

1. Ensure that your client has been relaxed for at least five minutes. The client's arm should be restriction free, bare and resting at a 45 degree angle, supported on a flat surface at heart height and the palm is facing up.
2. Palpate the brachial artery and wrap the deflated cuff firmly around the upper arm so that the midline of the cuff is directly over the located pulse. The edge of the cuff should be approximately 2.5cm (1inch) above the inner elbow crease.
3. Ensure the cuff is snug around the arm; if it is too loose then BP will be underestimated.
4. Position the earpieces of the stethoscope so that they are aligned with the auditory canals (i.e. angled anteriorly).
5. Place the head (bell) of the stethoscope over the brachial pulse, but not under the cuff. Make certain that the entire head of the stethoscope is in contact with the skin without too much heavy pressure.
6. Close the valve by rotating the switch clockwise and quickly and steadily inflate the cuff pressure to 20-30 mmHg above the estimated systolic value. This will collapse the brachial artery and there will be no blood flow.
7. Partially open the valve by turning the switch anti-clockwise slightly and slowly deflate the cuff at a constant rate of 2-3 mmHg/sec.
8. The first sharp thud caused by the sudden rush of blood as the artery opens (the arterial pressure and cuff pressure are equal) corresponds to the systolic BP.
9. Continue to reduce the pressure at a constant rate. As soon as the pulsing sound becomes muffled and disappears, the cuff pressure is equal to the diastolic pressure and normal blood flow is restored – this is the diastolic BP.

Body composition – skinfold analysis

Skinfold measurement is one of the most popular and practical options for measuring body composition. The method is reasonably accurate and cheap to use. Skinfold measurements correlate well (r = 0.70-0.90) with body composition determined by more accurate and costly methods such as hydrostatic weighing (ACSM, 1996). However, the technique requires considerable practice for a trainer to become proficient and some clients may regard it as too invasive. The method is based on the fact that superficial deposits of body fat at various locations correlate well with total body fat.

Identifying skinfold sites

The skinfold sites (Durnin and Wormersley, 1974) are listed below. The values obtained from the four sites are added together and entered into tables to convert to body fat percentage.

Triceps – a vertical fold on the posterior mid line of the upper arm, measured exactly halfway between the posterior acromion on the scapula and olecranon process of the ulna.

Biceps – a vertical fold on the anterior mid line of the upper arm over the bicep muscle, located 1 cm higher than the level used to mark the triceps.

Sub-scapular – an angled fold taken 2 cm below the inferior angle of the scapula and angled at 45º rising up towards the spine.

Suprailiac – an almost horizontal, slightly oblique fold taken 1-2 cm above and parallel to the iliac or pelvic crest and in line with the anterior axilla or most anterior point of the armpit.

Skinfold analysis protocol (Adapted from Heyward and Gibson, 2014)

1. Take all measurements on the left side of the body (English normative data – left; American – right).
2. Anatomical land marking needs to be measured and marked up accurately.
3. Place the thumb and index finger of the left hand 8cm apart just above the land mark, gather up the full skinfold and hold away from the body throughout the full measuring process.
4. Place the jaws of the calliper perpendicular to the skinfold directly on the landmark about half the depth of the fold. Release the jaw pressure slowly.
5. The dial is read as accurately as possible 1-2 seconds after the grip has been released and the jaws of the calliper have come to rest on the skinfold.
6. Open the jaws of the calliper and remove before finally releasing skinfold from between the thumb and finger.
7. Take a minimum of two measurements at each site to confirm accuracy, rotating around the sites between measures rather than consecutive measures at the same site.

Once all of the skinfold sites have been measured and checked, the trainer then determines the total of all four skinfold measures in millimetres. This total is then compared to the correct gender normative data table and cross-referenced to the correct age range. This will provide an estimate of their current body fat percentage. Body fat percentage can then be used to determine the client's overall lean mass and body fat mass. This data can provide more information for future reference when the client has made changes to their body composition. The following example will demonstrate this.

For example

A 34-year-old female client weighing 78kg has the following skinfold measurements:

- Triceps; 25mm.
- Biceps; 14mm.
- Subscapular; 18mm.
- Suprailiac; 28mm.

Total = 85mm which, according to norms tables, is 35.12% body fat.

This means that 27.4kg of the client's weight is body fat and 50.6kg is lean tissue.

Three months later, her body weight is 75kg. Her skinfold measurements are tested again:

- Triceps; 19mm.
- Biceps; 11mm.
- Subscapular; 13mm.
- Suprailiac; 21mm.

Total = 64mm which, according to norms tables, is 31.65% body fat.

This means that 23.7kg of the client's weight is now body fat, a loss of 3.7kg, and 51.3kg is lean tissue, an increase of 0.7kg. This shows that the client has lost even more body fat than the weighing scales have indicated as she has gained lean tissue.

WOMEN % FAT FOR SUM OF SKINFOLD MEASUREMENTS AT ALL FOUR SITES					
Sum of skinfold sites (mm)	**Age (years)**				
	17-19	**20-29**	**30-39**	**40-49**	**50+**
10	3.46	4.88	8.72	11.71	12.88
12	5.70	7.27	10.85	13.81	15.10
14	7.62	9.30	12.68	15.59	16.99
16	9.29	11.08	14.27	17.15	18.65
18	10.77	12.66	15.68	18.54	20.11
20	12.10	14.08	16.95	19.78	21.44
22	13.32	15.38	18.10	20.92	22.64
24	14.43	16.57	19.16	21.95	23.74
26	15.46	17.67	20.14	22.91	24.76
28	16.42	18.69	21.05	23.80	25.71
30	17.31	19.64	21.90	24.64	26.59
32	18.15	20.54	22.70	25.42	27.42
34	18.94	21.39	23.45	26.16	28.21
36	19.69	22.19	24.16	26.85	28.95
38	20.40	22.95	24.84	27.51	29.65
40	21.08	23.67	25.48	28.14	30.32
42	21.72	24.36	26.09	28.74	30.96
44	22.34	25.02	26.68	29.32	31.57
46	22.93	25.65	27.24	29.87	32.15
48	23.50	26.26	27.78	30.39	32.71
50	24.04	26.84	28.30	30.90	33.25
55	25.32	28.21	29.51	32.09	34.51
60	26.49	29.46	30.62	33.17	35.67
65	27.58	30.62	31.65	34.18	36.74
70	28.58	31.70	32.60	35.11	37.74
75	29.53	32.71	33.49	35.99	38.67
80	30.41	33.66	34.33	36.81	39.54
85	31.24	34.55	35.12	37.58	40.36
90	32.03	35.40	35.87	38.31	41.14
95	32.78	36.20	36.58	39.00	41.88
100	33.49	36.97	37.25	39.66	42.59
110	34.82	38.39	38.51	40.89	43.90
120	36.04	39.70	39.66	42.02	45.10
130	37.17	40.91	40.73	43.06	46.22
140	38.22	42.04	41.72	44.03	47.25
150	39.20	43.09	42.65	44.94	48.22
160	40.12	44.08	43.52	45.79	49.13
170	40.99	45.01	44.34	46.59	49.98
180	41.81	45.89	45.12	47.35	50.79
190	42.59	46.73	45.85	48.07	51.56
200	43.33	47.53	46.55	48.75	52.29

MEN % FAT FOR SUM OF SKINFOLD MEASUREMENTS AT ALL FOUR SITES					
Sum of skinfold sites (mm)	**Age (years)**				
	17 - 19	**20 - 29**	**30 - 39**	**40 - 49**	**50 +**
10	0.41	0.04	5.05	3.30	2.63
12	2.46	2.10	6.86	5.61	5.20
14	4.21	3.85	8.40	7.58	7.39
16	5.74	5.38	9.74	9.31	9.31
18	7.10	6.74	10.93	10.84	11.02
20	8.32	7.96	12.00	12.22	12.55
22	9.43	9.07	12.97	13.47	13.95
24	10.45	10.09	13.87	14.62	15.23
26	11.39	11.03	14.69	15.68	16.42
28	12.26	11.91	15.46	16.67	17.53
30	13.07	12.73	16.17	17.60	18.56
32	13.84	13.49	16.84	18.47	19.53
34	14.56	14.22	17.47	19.28	20.44
36	15.25	14.90	18.07	20.06	21.31
38	15.89	15.55	18.63	20.79	22.13
40	16.51	16.17	19.17	21.49	22.92
42	17.10	16.76	19.69	22.16	23.66
44	17.66	17.32	20.18	22.80	24.38
46	18.20	17.86	20.65	23.41	25.06
48	18.71	18.37	21.10	24.00	25.72
50	19.21	18.87	21.53	24.56	26.35
55	20.37	20.04	22.54	25.88	27.83
60	21.44	21.11	23.47	27.09	29.20
65	22.42	22.09	24.33	28.22	30.45
70	23.34	23.01	25.13	29.26	31.63
75	24.20	23.87	25.87	30.23	32.72
80	25.00	24.67	26.57	31.15	33.75
85	25.76	25.43	27.23	32.01	34.72
90	26.47	26.15	27.85	32.83	35.64
95	27.15	26.83	28.44	33.61	36.52
100	27.80	27.48	29.00	34.34	37.35
110	29.00	28.68	30.05	35.72	38.90
120	30.11	29.79	31.01	36.99	40.33
130	31.13	30.82	31.89	38.15	41.65
140	32.08	31.77	32.71	39.24	42.87
150	32.97	32.66	33.48	40.26	44.02
160	33.80	33.49	34.20	41.21	45.10
170	34.59	34.28	34.88	42.11	46.12
180	35.33	35.02	35.53	42.96	47.08
190	36.04	35.73	36.13	43.77	48.00
200	36.71	36.40	36.71	44.54	48.87

Body mass index (BMI)

The body mass index (BMI) is worked out using the following equation:

WORK IT OUT

$$\text{BMI (kg/m}^2\text{)} = \frac{\text{Weight (kg)}}{\text{Height}^2\text{ (m)}}$$

For example

If a 70kg man (2.2lbs = 1kg) stands 5ft 8in tall (2.45 cm = 1 inch), then:

$$\text{BMI} = \frac{70\text{kg}}{1.72\text{m}^2} = \frac{70}{2.96} = 23.6\text{kg/m}^2$$

BMI classification	
Underweight	<18.5
Normal range	18.5-24.9
Overweight	≥25.0
Preobese	25.0-29.9
Obese	≥30.0
Obese class I	30.0-34.9
Obese class II	35.0-39.9
Obese class III	≥40.0

Foresight, 2007

As BMI uses weight only and does not consider body composition, it is not appropriate for measuring fat loss. However, it is useful as a quick method to determine bodyweight compared to national guidelines and as a potential factor for disease risk.

National Institute of Health, 1998

This measurement is particularly inaccurate for individuals who have a higher than normal amount of muscle mass. They will often be classified in overweight categories suggesting an increased risk, which is not correct if they are muscular and still lean. BMI should not be used as a means of monitoring changes in body composition.

Waist to hip ratio

The pattern of body fat distribution is recognised as an important predictor of the health risks of obesity (Van Itallie, 1988). Fat stored around the abdominal region (as opposed to your legs, hips and arms) is considered to be a greater risk factor for CHD. Health risk increases with waist to hip ratio, and standards for risk vary with age and gender. For example:

Classification	Male	Female
High risk	>1.0	>0.85
Moderate risk	0.90–1.0	0.80–0.85
Low risk	<0.90	<0.80

Adapted from Van Itallie, 1988