



FITNESS TESTING APPENDIX

O R I G Y M

Level 3

The following tests are examples of how you can measure and monitor the abilities and progress of your clients. They take into account all aspects of your client's current fitness capabilities.

Why is fitness testing important?

Simply put, if we didn't test our client's abilities, we couldn't plan effective and safe sessions for them. A client's opinion of their abilities may be higher than they actually are.

An easy example to use is a client's overestimation of how much weight that they can lift. We have split the examples between 4 categories;

- [Anthropometric - P.3-5](#)
- [Cardiovascular - P.6-22](#)
- [Resistance - P.23-32](#)
- [Flexibility - P.33-38](#)

No matter who your client is, we always recommend that you do the baseline tests first then work up to the more advanced or specific testing methods.

By no means is this list exhaustive, however, it does provide a good insight into the many different methods of fitness testing.



ANTHROPOMETRIC TESTING

Body Mass Index (BMI) - P.4

Waist to Hip Ratio - P.5

O R I G Y M

Level 3

Body Mass Index (BMI)

Purpose: a measure of height to weight ratio, providing an indication of whether an individual is overweight or not.

Equipment: If height and weight are not already known/recorded, scales and a stadiometer (or tape measure) are required, along with a calculator.

How to do: If weight and height measurements are required, weigh the client on the scales and measure height using a stadiometer or tape measure. BMI is calculated by dividing a persons weight in kilograms by their square height (m²).

$$\text{BMI (kg/m}^2\text{)} = \text{weight (kg)} / \text{height (m}^2\text{)} \text{ (HxH)}$$

Scoring: Classification for BMI may appear worrying or offensive, however, BMI does not take account of an individual's body composition and may prove inaccurate for those who have a higher than normal amount of muscle mass.

Classification and Health Risk by Body Mass Index

BMI	Classification	Level of health risk
Under 18.5	Underweight	Minimal
18.5 - 24.9	Normal Weight	Minimal
25 - 29.9	Overweight	Increased
30 - 34.9	Obese	High
35 - 35.9	Severely Obese	Very High
40 and above	Morbidly Obese	Extremely High

Waist to Hip Ratio

Purpose: To measure fat distribution and evaluate body weight, giving an indication to overall health. It compares the circumference of an individual's waist to the circumference of their hips.

Equipment: A soft measuring tape and a calculator.

How to do:

- Ensure client is standing up straight and any additional layers of clothing (coats, hoodies, etc) are removed
- Use a tape measure to check the distance around the smallest part of the waist, just above the belly button. This is the waist circumference measurement.
- Then measure the distance around the largest part of the hips (the widest part of the buttocks). This is the hip circumference measurement.
- Calculate Waist to Hip Ratio by dividing the waist circumference by the hip circumference.

$$\text{WHR} = \text{W (cm)} / \text{H (cm)}$$

Scoring:

Waist:Hip Ratio Classifications

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

Waist to hip ratio can also be an indicator for health conditions such as Obesity and Coronary Heart disease.



CARDIOVASCULAR TESTING

Resting Heart Calculation - P.7 Blood Pressure - P.8-9 Heart Rate - P.10 Target Heart Rate Calculation - P.10
The Karvonen Method - P.11 Maximal Heart Rate Method - P.12 Rockport Walking Test - P.13-14
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Resting Heart Rate Calculation

Purpose: Resting heart rate is a measure of the number of times the heart beats every minute. It's a good indicator of overall heart health.

How to do:

1. Rest client seated or in a supine position
2. Locate a site:
 - A. Side and front of the client's neck (carotid artery)
 - B. Thumb side of the client's forearm (Radial artery)
3. Apply light pressure to site with index and middle finger (not thumb)
4. Allow client time to relax before beginning test
5. Count pulse for 60 seconds and repeat test
6. Repeat a third time if first two tests produce vastly different readings

Evaluate results by using the RHR classification chart below:

Men:

Rating	Age					
	18 - 25	26 - 35	36 - 45	46 - 55	56 - 65	65+
Athlete	49 - 55	49 - 54	50 - 56	50 - 57	51 - 56	50 - 55
Excellent	56 - 61	55 - 61	57 - 62	58 - 63	57 - 61	56 - 61
Good	62 - 65	62 - 65	63 - 66	64 - 67	62 - 67	62 - 65
Above Average	66 - 69	66 - 70	67 - 70	68 - 71	68 - 71	66 - 69
Average	70 - 73	71 - 74	71 - 75	72 - 76	72 - 75	70 - 73
Below Average	74 - 81	75 - 81	76 - 82	77 - 83	76 - 81	74 - 79
Poor	82+	82+	83+	84+	82+	80+

Women:

Rating	Age					
	18 - 25	26 - 35	36 - 45	46 - 55	56 - 65	65+
Athlete	54 - 60	54 - 59	54 - 59	54 - 60	54 - 59	54 - 59
Excellent	61 - 65	60 - 64	60 - 64	61 - 65	60 - 64	60 - 64
Good	66 - 69	65 - 68	65 - 69	66 - 69	65 - 68	65 - 68
Above Average	70 - 73	69 - 72	70 - 73	70 - 73	69 - 73	69 - 72
Average	74 - 78	73 - 76	74 - 78	74 - 77	74 - 77	73 - 76
Below Average	79 - 84	77 - 82	79 - 84	78 - 83	78 - 83	77 - 84
Poor	85+	83+	85+	84+	84+	84+

Blood Pressure

Purpose: To measure the force of blood exerted against the walls of the arteries. There are two measurements associated with blood pressure:

Systolic blood pressure =
the pressure within the arteries when the heart contracts (beats)

Diastolic blood pressure =
the pressure within the arteries when the heart refills (relaxes)

Equipment: Sphygmomanometer (mercurial or machine)

How to do: Encourage clients to be relaxed and not feel anxious or stressed.

- Ask client to sit upright in a chair and ensure both their feet are flat on the floor.
- Place the cuff over the upper part of the left arm, above the elbow, ideally in contact with the skin. With arm in the supinated position, ensure the tubing leads down the centre or slightly to the right of the arm. Tighten the cuff appropriately, making sure two fingers will fit underneath.
- The arm can be rested on a table with the hand and arm relaxed. Ensure that the fists are not clenched when measuring blood pressure.
- Advise the client not to talk and just relax. Press the on button, and then press the start button.
- The cuff will inflate and the pressure will increase until the pulse is cut off at the systolic limit. The machine will then decrease pressure, the flow of blood will continue, and the diastolic reading will be gained at the point where the cuff can no longer sense the palpitation of the blood. (This may temporarily feel a little uncomfortable for the client as the cuff inflates and deflates automatically, but it will only be for a short period of time.)
- Once the reading is provided, make a note of it.
- If required (due to an inconclusive or contraindicated reading), repeat the measurements required after a few minutes.

Blood Pressure (Continued)

Scoring: Blood pressure is measured in millimetres of mercury (mmHg). Mercurial sphygmomanometers are no longer widely used in favour of machine/computerised devices, but the unit of measurement remains the same.

Blood Pressure Category	Systolic mm Hg (upper#)		Diastolic mm Hg (lower#)
Low blood pressure (Hypotension)	Less than 80	OR	Less than 60
Normal	80 - 120	AND	60 - 80
High Blood Pressure (Hypertension Stage1)	140 - 159	OR	90 - 99
High Blood Pressure (Hypertension Stage2)	160 or higher	OR	100 or Higher
High Blood Pressure Crisis (Seek Emergency Care)	Higher than 180	OR	Higher than 100

Source: American Heart Association

Heart Rate

The use of heart rate (HR) is probably the most common method for prescribing aerobic exercise intensity. Heart rate and oxygen consumption are closely related especially when the intensity of exercise is between 50% - 90% of functional capacity (VO2 Max) which is often termed Heart Rate Reserve (HRR) which is the difference between a person's maximum heart rate and their resting heart rate.

To be as accurate as possible using the HRR method is to determine the:

1. Specific heart rate associated with the desired % of VO2 Max
2. Specific heart rate associated with the lactate threshold

If as stated before the lab is unavailable then the client's Age-Predicted Maximal Heart Rate (APMHR) can be used for the basis of determining exercise intensity.

$$220 - \text{Age} = \text{APMHR}$$

Target Heart Rate (THR) Calculations

There are 2 methods of calculating THR:

- The Karvonen Method
- Maximal Heart Rate Method (MHR)

The relationship between VO2 Max, HRR and MHR can be seen in the table below:

% VO2 Max	% HRR	% MHR
50	50	66
55	55	70
60	60	74
65	65	77
70	70	81
75	75	85
80	80	88
85	85	92
90	90	96
95	95	98
100	100	100

The Karvonen Method

Key:

APMHR = Age-Predicted Maximum Heart Rate

HRR = Heart Rate Reserve

RHR = Resting Heart Rate

THR = Target Heart Rate

THRR = Target Heart Rate Range

Formula:

1. **APMHR** = 220 - AGE
2. **HRR** = **APMHR** - **RHR**
3. **THR** = (**HRR** x Exercise Intensity) + **RHR**
4. Do this Calculation **TWICE** to determine the **THRR**

Example:

Client : 30 Years

RHR = 60 bpm

Assigned Exercise Intensity = 60 - 70% Functional Capacity (VO2 Max)

APMHR = 220 - 30 = **190 bpm**

RHR = **60 bpm**

HRR = 190 - 60 = **130bpm**

THRR (Lowest Range) = (130 x **0.60**) + 60 = 78 + 60 = 138 bpm

THRR (Highest Range) = (130 x **0.70**) + 60 = 91 + 60 = 151 bpm

NB: When monitoring HR during exercise divide the THRR by 6 to yield the clients THRR in number of beats for a 10 second period.

138 / 6 = 23 151 / 6 = 25

The clients **THRR is 23 - 25 beats per 10 seconds**

The Maximal Heart Rate Method

Key:

APMHR = Age-Predicted Maximum Heart Rate

THR = Target Heart Rate

THRR = Target Heart Rate Range

Formula:

1. **APMHR** = 220 - AGE
2. **THR** = (**APMHR** x Exercise Intensity)
4. Do this Calculation **TWICE** to determine the **THRR**

Example:

Client : 30 Years

Assigned Exercise Intensity = 60 - 70% Functional Capacity (VO2 Max)

APMHR = 220 - 30 = 190 bpm

THRR (Lowest Range) = (190 x 0.60) = 114 bpm

THRR (Highest Range) = (190 x 0.70) = 133 bpm

NB: When monitoring HR during exercise divide the THRR by 6 to yield the clients THRR in number of beats for a 10 second period.

114 / 6 = 19 133 / 6 = 22

The clients THRR is 19 - 22 beats per 10 seconds

Rockport Walking Test

Purpose: This test uses calculations to reach a value called VO_2max . VO_2max is the maximum volume of oxygen that can be utilised by the body in one minute during maximal exercise. It is measured as millilitres of oxygen used in one minute per kilogram of body weight.

How to do:

For the duration of the test, the client should walk as fast as possible for one mile. As soon as they have completed the mile, their heart rate should be taken. This can be done with the use of a heart rate monitor or manually using a stopwatch by counting the number of beats for one minute whilst holding the wrist at the site of the radial artery. The time taken to complete the distance should be recorded.

Before using the calculation to determine VO_2max , the instructor will need to know the client age and body weight in pounds (lbs).

Therefore the vital information needed for calculation is as follows:

- The time (in minutes) needed to complete one mile walking as fast as possible
- Heart rate (in beats per minute) taken immediately after the distance has been completed
- Client age (in years)
- Client gender: Male = 1 Female = 0
- Client body weight in pounds (lbs)

The following calculation can be used to determine the clients VO_2max :

$132.853 - (0.0769 \times \text{weight}) - (0.3877 \times \text{age}) + (6.315 \times \text{gender}) - (3.2649 \times \text{time}) - (0.1565 \times \text{heart rate})$

Rockport Walking Test (Continued)

Scoring:

This score can then be measured against the normative data in the chart below:

Fitness categories for Males based on VO₂max expressed in mL/kg/min

Age (years)	Low	Fair	Average	Good	High
20 - 29	<24	25 - 33	34 - 42	43 - 52	>53
30 - 39	<22	23 - 30	31 - 38	39 - 48	>49
40 - 49	<19	20 - 26	27 - 35	36 - 44	>45
50 - 59	<17	18 - 24	25 - 33	34 - 42	>43
60 - 69	<15	16 - 22	23 - 30	31 - 40	>41

Fitness categories for Females based on VO₂max expressed in mL/kg/min

Age (years)	Low	Fair	Average	Good	High
20 - 29	<23	24 - 30	31 - 37	38 - 48	>49
30 - 39	<19	20 - 27	28 - 33	34 - 44	>45
40 - 49	<16	17 - 23	24 - 30	31 - 41	>42
50 - 59	<14	15 - 20	21 - 27	28 - 37	>38
60 - 69	<12	13 - 17	18 - 23	24 - 34	>35

Bleep Test

Purpose: Maximal aerobic capacity test.

Equipment: Flat surface, marking cones, meter marker, timer (can be found on the app store).

How to do: Cones are placed 20m apart and the client is to ensure that they run to the opposite side either on or between the signal/beeps. Every minute the speed will increase and the client must maintain pace to keep up with the signals.

If a client fails to keep up with a signal, they get a warning and 2 more signals to 'catch up' if they cannot do so, the test is over.

Scoring: Results presented as level number / number of shuttles within that level.

Males 12+

Age	Very Poor	Poor	Fair	Average	Good	Very Good	Excellent
12 - 13 Yrs	<2/6	2/6-3/5	3/6-5/1	5/2-6/1	6/2-7/4	7/5-9/3	>9/3
14 - 15 Yrs	<4/7	4/7-6/1	6/2-7/4	7/5-8/9	8/10-9/8	9/9-12/2	>12/2
16 - 17 Yrs	<5/1	5/1-6/8	6/9-8/2	8/3-9/9	9/10-11/3	11/4-13/7	>13/7
18 - 25 Yrs	<5/2	5/2-7/1	7/2-8/5	8/6-10/1	10/2-11/5	11/6-13/3	>9/3
26 - 35 Yrs	<5/2	5/2-6/5	6/6-7/9	7/10-8/9	8/10-10/6	10/7-12/9	>12/9
36 - 45 Yrs	<3/8	3/8-5/3	5/4-6/4	6/5-7/7	7/8-8/9	8-10/11/3	>11/3
46 - 55 Yrs	<3/6	3/6-4/6	4/7-5/5	5/6-6/6	6/7-7/7	7/8-9/5	>9/5
56 - 65 Yrs	<2/7	2/7-3/6	3/7-4/8	4/9-5/6	5/7-6/8	6/9-8/4	>8/4
>65 Yrs	<2/2	2/2-2/5	2/6-3/7	3/8-4/8	4/9-6/1	6/2-7/2	>7/2

Bleep Test (Continued)

Females 12+

Age	Very Poor	Poor	Fair	Average	Good	Very Good	Excellent
12 - 13 Yrs	<2/6	2/6-3/5	3/6-5/1	5/2-6/1	6/2-7/4	7/5-9/3	>9/3
14 - 15 Yrs	<3/3	3/3-5/2	5/3-6/4	6/5-7/5	7/6-8/7	8/8-10/7	>10/7
16 - 17 Yrs	<4/2	4/2-5/6	5/7-7/1	7/2-8/4	8/5-9/7	9/8-11/10	>11/10
18 - 25 Yrs	<4/5	4/5-5/7	5/8-7/2	7/3-8/6	8/7-10/1	10/2-12/7	>12/7
26 - 35 Yrs	<3/8	3/8-5/2	5/3-6/5	6/6-7/7	7/8-9/4	9/5-11/5	>11/5
36 - 45 Yrs	<2/7	2/7-3/7	3/8-5/3	5/4-6/2	6/3-7/4	7/5-9/5	>9/5
46 - 55 Yrs	<2/5	2/5-3/5	3/6-4/4	4/5-5/3	5/4-6/2	6/3-8/1	>8/1
56 - 65 Yrs	<2/2	2/2-2/6	2/7-3/5	3/6-4/4	4/5-5/6	5/7-7/2	>7/2
>65 Yrs	<1/5	1/5-2/1	2/2-2/6	2/7-3/4	3/5-4/3	4/4-5/7	>5/7

Queens College Step Test

Purpose: To provide cardiorespiratory and endurance fitness results.

Equipment: 16" (41cm) step, Stopwatch, Timer, Heart rate monitor.

How to do: For no more than 3 minutes the client will step on/off the box using a 'up,up,down,down' cadence. Upon completion the heart rate is measured after 10 seconds of recovery, for a maximum of 15 seconds. Multiply this by 4 to have the BPM figure.

Scoring: During the test, males must achieve 24 steps per minute and females 22. Upon the recording of heart rate use the VO2 max calculator to discover your clients current fitness level.

Men: $VO_{2max} (ml/kg/min) = 111.33 - (0.42 \times \text{heart rate (bpm)})$

Women: $VO_{2max} (ml/kg/min) = 65.81 - (0.1847 \times \text{heart rate (bpm)})$

Maximal oxygen uptake norms for Men (ml/kg/min) -

	Age (years)					
Rating	18 - 25	26 - 35	36 - 45	46 - 55	56 - 65	65+
Excellent	>60	>56	>51	>45	>41	>37
Good	52 - 60	49 - 56	43 - 51	39 - 45	36 - 41	33 - 37
Above Average	47 - 51	43 - 48	39 - 42	36 - 38	32 - 35	29 - 32
Average	42 - 46	40 - 42	35 - 38	32 - 35	30 - 31	26 - 28
Below Average	37 - 41	35 - 39	31 - 34	29 - 31	26 - 29	22 - 25
Poor	30 - 36	30 - 34	26 - 30	25 - 28	22 - 25	20 - 21
Very Poor	<30	<30	<26	<25	<22	<20

Maximal oxygen uptake norms for Women (ml/kg/min) -

	Age (years)					
Rating	18 - 25	26 - 35	36 - 45	46 - 55	56 - 65	65+
Excellent	>56	>52	>45	>40	>37	>32
Good	47 - 56	45 - 52	38 - 45	34 - 40	32 - 37	28 - 32
Above Average	42 - 46	39 - 44	34 - 37	31 - 33	28 - 31	25 - 27
Average	38 - 41	35 - 38	31 - 33	28 - 30	25 - 27	22 - 24
Below Average	33 - 37	31 - 34	27 - 30	25 - 27	22 - 24	19 - 21
Poor	28 - 32	26 - 30	22 - 26	20 - 24	18 - 21	17 - 18
Very Poor	<28	<26	<22	<20	<18	<17

Anderson Test

Purpose: Testing of aerobic fitness.

Equipment: Marker Cones, metre measure & stopwatch.

How to do: Cones are set 20 metres apart. The client is to run or walk between the cones for 15 seconds ensuring that they touch the floor at either end of the track, then stop in position for 15 seconds. After 20 intervals (15 on & 15 off) the test is over. The total distance covered is then calculated.

Scoring: Using the following equation where M=0 and F=1

Rating score= $18.38 + (0.03301 \times \text{running distance in metres}) \text{ minus } (5.92 \times \text{gender})$.

Normative Data:

Mens:

	20 - 29 Years	30 - 39 Years	40 - 49 Years	50 - 65 Years
Poor	<39	<35	<31	<26
Below Average	39 - 43	35 - 39	31 - 35	26 - 31
Average	44 - 51	40 - 47	36 - 43	32 - 39
Good	52 - 56	48 - 51	44 - 47	40 - 43
Very Good	>57	>52	>48	>44

Womens:

	20 - 29 Years	30 - 39 Years	40 - 49 Years	50 - 65 Years
Poor	<29	<28	<26	<22
Below Average	29 - 34	28 - 33	26 - 31	22 - 28
Average	35 - 43	34 - 41	32 - 40	29 - 36
Good	44 - 48	42 - 47	41 - 45	37 - 41
Very Good	>49	>48	>46	>42

PWC 170/PWC 75%

Purpose: A measure of aerobic fitness.

Equipment: Gym bike, Stopwatch & Heart Rate Monitor.

How to do:

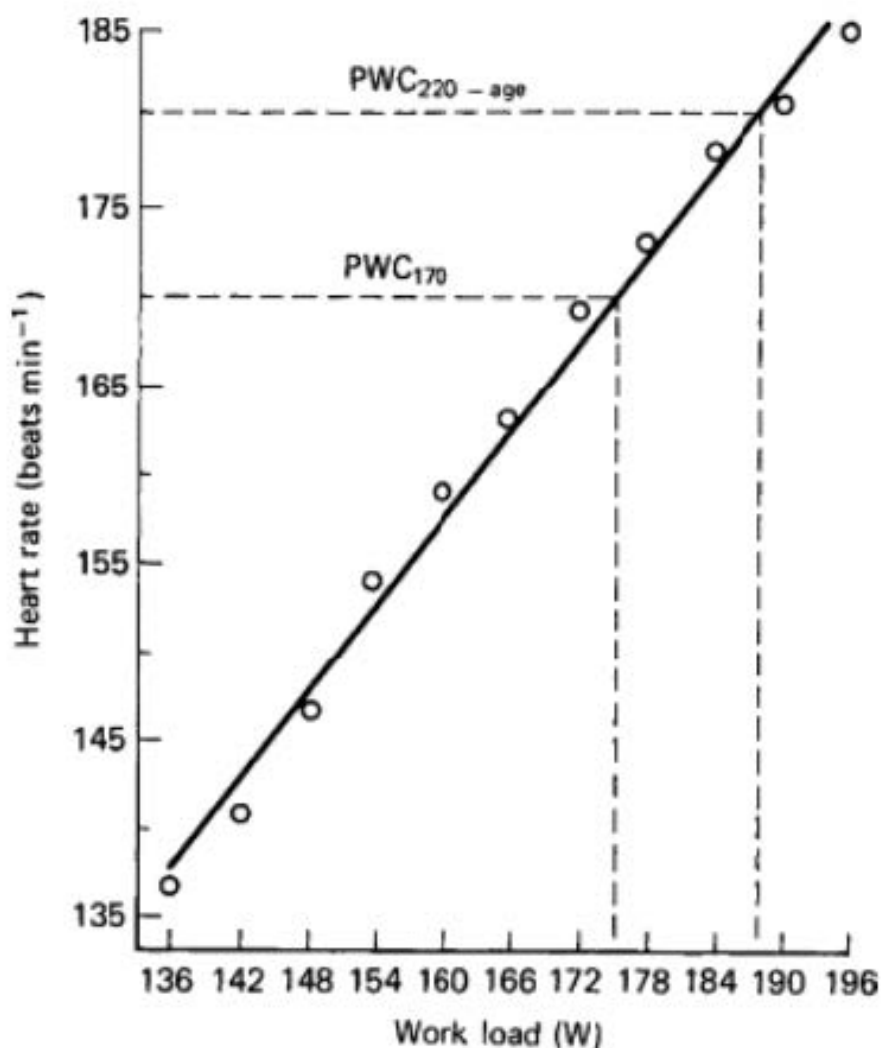
Step 1 – Cycle on a bike to an intensity of 100-115bpm using intervals of at least 3 - 4 minutes.

Step 2 – Once a constant heart rate is achieved, increase the workload to increase the heart rate to 115-130bpm, for at least 3 - 4 minutes.

Step 3 – Once a constant heart rate is achieved, increase the workload to increase the heart rate to 130-145bpm, for at least 3 - 4 minutes.

Scoring: The steady-state heart rate and workload are graphed with the line of best fit for the three points extrapolated to estimate the workload that would elicit a heart rate of 170 beats per minute (or 75% maximum HR for the PWC-75% test).

Normative Data: This test is solely independent to your client, however, below is an example of how a graph would look when using a cycle.



Chester Treadmill Police Run Test

Purpose: A multistage aerobic fitness test, specifically for armed response officers.

Equipment: Treadmill, Stopwatch & RPE Chart.

How to do: Treadmill is set to 6.5mph (10.4km/h) and remains at this speed throughout the test.

Level 1 = 0-2 minutes at a gradient of 0%, after 2 minutes, check that the RPE is less than 8 (18 on the Borg scale), if so, increase the gradient to 2% to continue to level 2.

Level 2 = 2-4 minutes at a gradient of 2%. At the end of the level (4 mins) RPE is checked for being less than 8 (18 on the Borg scale), if so, increase the gradient to 4% and continue to level 3.

Level 3 = 4-6 minutes at a gradient of 4%. At the end of the level (6 mins) check RPE is less than 8 (18 on the Borg scale), if so, increase the gradient to 5% and continue to level 4.

Level 4 = 6-8 minutes at a gradient of 5%. At the end of the level (8 mins), check if RPE is less than 8 (18 on the Borg scale), if so and the client shows no signs of discomfort or distress, increase the gradient to 8% and continue to level 5.

Level 5 = 8-10 minutes at a gradient of 8%.

The test ends when the client reaches an RPE of 8 (18 on the Borg scale) or after a total of 10 minutes.

Scoring:

Treadmill Speed 10.4km/hr

Level	Time (mins)	Treadmill Gradient	O ₂ Cost (mlsO ₂ /kg/min)
1	0 - 2	0%	38
2	2 - 4	2%	41
3	4 - 6	4%	44
4	6 - 8	5%	46
5	8 - 10	8%	51

This test is specifically designed for armed response officers and minimum standards are as follows:

Armed response vehicle operators (ARV) – 46 mLsO₂/kg/min

Dynamic Intervention Authorised Firearm Officers – 51 mLsO₂/kg/min

2.4km Run Test

Purpose: The objective of this test is to test the development of a client's aerobic endurance.

Equipment: A 400m track or a treadmill, stopwatch, assistant.

How to do: The client is to first complete a 10 minute warm up. This test is designed to be conducted on a track with clearly marked distance, however, the test can be carried out on a treadmill but be sure to raise the incline to one degree to simulate outdoor running. The client is to begin running at their own pace and complete a distance of 2.4 km (6 laps of a 400m track) as fast as possible. Although walking is allowed, clients should be encouraged to run in order to complete the distance in the shortest possible time. The PT should keep the client informed of the number of laps/distance remaining to complete the test. PT to record the time taken for the client to run 2.4km. A cool down walk should be performed at the end of the test.

Scoring: Data for Males and Females 20-29 Years.

Rating	Males	Females
Very Poor	>16:01	>19:01
Poor	16:00 - 14:01	19:00 - 18:31
Fair	14:00 - 12:01	18:30 - 15:55
Good	12:00 - 10:46	15:54 - 13:31
Excellent	10:45 - 9:45	13:30 - 12:30
Superior	<9:44	<12:29

The Cooper VO₂ Max Test

Purpose: To measure a clients aerobic endurance and obtain an estimate of VO₂ max.

How to do: The Cooper 12-minute run test requires the person being tested to run or walk as far as possible in a 12-minute period. The objective of the test is to measure the maximum distance covered by the individual during the 12-minute period. This test is designed to be conducted on a track with clearly marked distance, however, the test can be carried out on a treadmill but be sure to raise the incline to one degree to simulate outdoor running. The PT should keep the client informed of the time remaining after each 400m and then record the distance covered at the end of the 12 minutes.

Scoring:

Male Athletes

Age	Excellent	Above Average	Average	Below Average	Poor
13 - 14	>2700m	2400 - 2700m	2200 - 2399m	2100 - 2199m	<2100m
15 - 16	>2800m	2500 - 2800m	2300 - 2499m	2200 - 2299m	<2200m
17 - 19	>3000m	2700 - 3000m	2500 - 2699m	2300 - 2499m	<2300m
20 - 29	>2800m	2400 - 2800m	2200 - 2399m	1600 - 2199m	<1600m
30 - 39	>2700m	2300 - 2700m	1900 - 2299m	1500 - 1999m	<1500m
40 - 49	>2500m	2100 - 2500m	1700 - 2099m	1400 - 1699m	<1400m
>50	>2400m	2000 - 2400m	1600 - 1999m	1300 - 1599m	<1300m

Female Athletes

Age	Excellent	Above Average	Average	Below Average	Poor
13 - 14	>2000m	1900 - 2000m	1600 - 1899m	1500 - 1599m	<1500m
15 - 16	>2100m	2000 - 2100m	1700 - 1999m	1600 - 1699m	<1600m
17 - 19	>2300m	2100 - 2300m	1800 - 2099m	1700 - 1799m	<1700m
20 - 29	>2700m	2200 - 2700m	1800 - 2199m	1500 - 1799m	<1500m
30 - 39	>2500m	2000 - 2500m	1700 - 1999m	1400 - 1699m	<1400m
40 - 49	>2300m	1900 - 2300m	1500 - 1899m	1200 - 1499m	<1200m
>50	>2200m	1700 - 2200m	1400 - 1699m	1100 - 1399m	<1100m

An estimate of VO₂ max can be calculated as follows:

$$\text{VO}_2 \text{ max} = (\text{Distance covered in metres} - 504.9) \div 44.73$$



RESISTANCE TESTS

% Max Reps - P.24

1 Rep Max - P.25

%1RM Muscle Fibre - P.26

YMCA Bench Press - P.26-27

Wall Sit - P.27-28

Maximal Pull-Up Test - P.28-29

Isometric Back Strength - P.29

Press-Up Test - P.30

Abdominal Curl - P.31

Hang Test - P.32

O R I G Y M

Level 3

% Max Reps

Purpose: To discover a client's 10 rep max. 1RM may not be suitable or safe this is a better test to use for more general population groups.

Equipment: Any equipment relevant to the exercise being performed, Spotter.

How to do:

Step 1: The client warms-up with a light resistance that allows for 5-10 repetitions.

Step 2: Allow a 1-minute rest.

Step 3: Estimate a warm-up load that will now allow the client to perform the exercise for 10 repetitions – this is achieved by adding:

Upper Body = 2.5-5kg or 2.5-5%

Lower Body = 5-10kg or 5-10%

Step 4: Allow a 2-minute rest

Step 5: Estimate a conservative load that will now allow the client to perform the exercise for 10 repetitions – this is achieved by adding:

Upper Body = 2.5-5kg or 2.5-5%

Lower Body = 5-10kg or 5-10%

Step 6: Allow a 2-4 minute rest

Step 7A: Make a load increase, by adding:

Upper Body = 2.5-5kg or 2.5-5%

Lower Body = 5-10kg or 5-10%

Step 7B: Instruct the client to attempt a 10 repetition maximum

Step 8A: If successful: allow 2-4 minutes rest and repeat Step 7

Step 8B: If unsuccessful: Allow 2-4 minutes rest and **decrease** the load by:

Upper Body = 1-2.5kg or 1-2.5%

Lower Body = 2.5-5kg or 2.5-5%

NB: Continue until the client achieves 10 repetitions with correct form.
Ideally, this is achieved within 3-5 testing sets.

Scoring: The result is individual to the client therefore it is a measurement of their current ability. Testing would repeat after several sessions to see if any improvements have been made.

1-Rep Max Test

Purpose: To test a client's 1 rep max on any given exercise.

Equipment: Anything relevant to the exercise being used, spotter.

How to do:

Step 1: The client warms-up with a light resistance that allows for 5-10 repetitions.

Step 2: Allow a 1-minute rest.

Step 3: Estimate a warm-up load that will now allow the client to perform the exercise for 10 repetitions – this is achieved by adding:

Upper Body = 5-10kg or 5-10%

Lower Body = 10-20kg or 10-20%

Step 4: Allow a 2-minute rest

Step 5: Estimate a conservative load that will now allow the client to perform the exercise for 2-3 repetitions - this is achieved by adding:

Upper Body = 5-10kg or 5-10%

Lower Body = 10-20kg or 10-20%

Step 6: Allow a 2-4 minute rest

Step 7A: Make a load increase, by adding:

Upper Body = 5-10kg or 5-10%

Lower Body = 10-20kg or 10-20%

Step 7B: Instruct the client to attempt a 1 repetition maximum

Step 8A: If successful: allow 2-4 minutes rest and repeat Step 7

Step 8B: If unsuccessful: Allow 2-4 minutes rest and **decrease** the load by:

Upper Body = 2.5-5kg or 2.5-5%

Lower Body = 5-10kg or 5-10%

NB: Continue until the client achieves 1 repetition with correct form.
Ideally, this is achieved within 3-5 testing sets.

Scoring: The weight that determines your client 1 rep max will be the target to surpass with correct resistance training programmes. The score is completely individual to the client.

%1RM Muscle Fibre Composition

Purpose: To estimate what the most predominant muscle fibre is for a muscle group associated to an exercise.

Equipment: Anything relevant to the exercise that is being used, spotter.

How to do: 1 rep max must be determined before this test is completed. 15 minutes after the 1 rep max has been achieved the client is to lift 80% of their 1RM, for as many reps as possible.

Scoring:

Number of reps at 80% muscle fibre type:

<7 Reps	>50% fast twitch (FT)
7 to 12	Reps equal proportion of fibre type
>12 Reps	>50% slow twitch (ST)

YMCA Bench Press Test

Purpose: To measure upper body push endurance.

Equipment: Flat bench, Barbell, Weights, Clips, Timer (metronome) & Spotter.

How to do: Ensure that the client is fully warmed up prior to the test. Set the barbell load for men to 80 pounds (36kg) and for women 35 pounds (16kg). Set the metronome to 60 bpm (30 repetitions per minute). The client lies on the bench, feet on floor, with a spotter ready, and uses standard bench press form. The bar is started in the down position (the weight is on the client's chest) and the client performs full repetitions until fatigue or until the cadence cannot be kept. The number of consecutive repetitions is recorded.

Scoring:

Male Results:

Rating	Age (Years)					
	18 - 25	26 - 35	36 - 45	46 - 55	55 - 65	>65
Excellent	44 - 64	41 - 61	36 - 55	28 - 47	24 - 41	20 - 36
Good	34 - 41	30 - 37	26 - 32	21 - 25	17 - 21	12 - 16
Above Average	29 - 33	26 - 29	22 - 25	16 - 20	12 - 14	10
Average	24 - 28	21 - 24	18 - 21	12 - 14	9 - 11	7 - 8
Below Average	20 - 22	17 - 20	14 - 17	9 - 11	5 - 8	4 - 6
Poor	13 - 17	12 - 16	9 - 12	5 - 8	2 - 4	2 - 3
Very Poor	0 - 10	0 - 9	0 - 6	0 - 2	0 - 1	0

YMCA Bench Press Test (Continued)

Female Results:

Rating	Age (Years)					
	18 - 25	26 - 35	36 - 45	46 - 55	55 - 65	>65
Excellent	42 - 66	40 - 62	33 - 57	29 - 50	24 - 42	18 - 30
Good	30 - 38	29 - 34	26 - 30	20 - 24	17 - 21	12 - 16
Above Average	25 - 28	24 - 28	21 - 24	14 - 18	12 - 14	8 - 10
Average	20 - 22	18 - 22	16 - 20	10 - 13	8 - 10	5 - 7
Below Average	16 - 18	14 - 17	12 - 14	7 - 9	5 - 6	3 - 4
Poor	9 - 13	9 - 13	6 - 10	2 - 6	2 - 4	0 - 2
Very Poor	0 - 6	0 - 6	0 - 4	0 - 1	0 - 1	0

Wall Sit

Purpose: To test the endurance of the lower body.

Equipment: Flat non slip floor, wall, stopwatch.

How to do: With their back against the wall and their feet up to 2 feet away from the wall, the client is to sit into a squat position until their knees are 90 degrees. Knees to be in line with ankles and thighs are parallel to the floor. Once position is attained the timer starts.

Scoring: Score attained is completely individual to the client and a retest is performed after several training sessions to see if it has improved.

Male Results:

Score	Number of Seconds
Excellent	> 100
Good	75 - 100
Average	50 - 75
Below Average	25 - 50
Poor	< 25

Wall Sit (Continued)

Female Results:

Score	Number of Seconds
Excellent	> 60
Good	45 - 60
Average	35 - 45
Below Average	20 - 35
Poor	< 20

Maximal Pull-Up Test

Purpose: To test upper body (back) strength and endurance.

Equipment: Overhead bar and stool/bench.

How to do: Standing on the stool the client grips the overhead bar using a pronated grip (supinated grip can be used as an alternate option), remove the stool and ensure the clients arms are fully extended. The client raises the body by flexing at the elbows and pulling the body upwards until the chin clears the top of the bar. The client then lowers the body under control until the arms are fully extended again. The pull ups are performed in a smooth motion, swinging the body or kicking and bending the legs is not permitted. Client performs as many pull ups as possible and the total number correctly completed is recorded.

Scoring:

Standards for Average Male Lifters:

Strength Level	Reps
Beginner	<1
Novice	6
Intermediate	14
Advanced	24
Elite	35

Maximal Pull-Up Test (Continued)

Standards for Average Female Lifters:

Strength Level	Reps
Beginner	<1
Novice	<1
Intermediate	6
Advanced	13
Elite	22

Isometric Back Strength Test

(The Biering-Sorenson Test)

Purpose: To test the current ability of the lower back.

Equipment: Bench.

How to do: Client is in a prone position on a bench, with the upper body from the waist hanging over the edge of the bench. The trainer holds the client's feet down and the clients arms are by their sides or hands clasped behind the back. Once in position, the client raises their upper body to a horizontal position and holds for a set period (e.g. 45 seconds).

Scoring: The test is a pass/fail depending if the client can hold the position for set time. The time that the horizontal position is held can be varied and lengthened to test the clients ongoing ability.

Age	Mean Hold Time in Seconds (SD)*Males	Mean Hold Time in Seconds (SD)*Females
19 - 29	140 ⁵	130 ⁵
30 - 39	140 ⁵	120
35 - 39	97 (43) ²	93 (55) ²
40 - 44	101 (57) ²	80 (55) ²
40 - 49	110 ⁵	90 ⁵
45 - 49	99 (58) ²	102 (64) ²
50 - 54	89 (55) ²	69 (60) ²
50 - 59	90 ⁵	80 ⁵
60+	80 ⁵	90 ⁵

Press-Up Test

Purpose: Measures the muscular endurance of the upper body muscles pectoralis major, anterior deltoids and triceps.

Equipment: Non-slip surface, assistant.

How to do:

- The client adopts the start position for a full press up (alternatives also apply)
- The client lowers to 90 degrees of elbow flexion and returns to the start position
- The test aims for the total number of completed press ups before failure

Scoring:

Male results:

Age (years)	Excellent	Good	Average	Fair	Poor
20 - 29	>54	45 - 54	35 - 44	20 - 34	<20
30 - 39	>44	35 - 44	25 - 34	15 - 24	<15
40 - 49	>39	30 - 39	20 - 29	12 - 19	<12
50 - 59	>34	25 - 34	15 - 24	8 - 14	<8
60+	>29	20 - 29	10 - 19	5 - 9	<5

Female results:

Age (years)	Excellent	Good	Average	Fair	Poor
20 - 29	>48	34 - 38	17 - 33	6 - 16	<6
30 - 39	>39	25 - 29	12 - 24	4 - 11	<4
40 - 49	>34	20 - 34	8 - 19	3 - 7	<3
50 - 59	>29	15 - 29	6 - 14	2 - 5	<2
60+	>19	5 - 19	3 - 4	1 - 2	<1

Abdominal Curl Test

Purpose: Measures abdominal endurance, this is important for back support and core stability.

Equipment needed: Non-slip surface, Mat, Assistant.

How to do:

- The client lies supine with knees bent to 90 degrees
- Straight arms by side with palms facing down
- A line marked three inches away from tips of fingers in resting position
- The test aims for the total number of completed abdominal curls where fingers reach the line or beyond

Scoring:

Male results:

Classification	<35 Years	35 - 45 Years	>45 Years
Excellent	60	50	40
Good	45	40	25
Fair	30	25	15
Poor	15	10	5

Female results:

Classification	<35 Years	35 - 45 Years	>45 Years
Excellent	50	40	30
Good	40	25	15
Fair	25	15	10
Poor	10	6	4

Hang Test (Extended Position)

Purpose: To test upper body endurance, specifically the clients grip, shoulder and arm abilities.

Equipment: Overhead bar, stool, stopwatch.

How to do: Standing on the stool the client is to grip the bar overhead using a pronated grip. The stool is then removed, and the client ensures that their elbows and knees are fully extended. Once all swaying has stopped the timer begins.

Scoring:

Score:	Males:	Females:
Untrained	<30 Seconds	<10 Seconds
Beginner	30 - 60 Seconds	10 - 30 Seconds
Good	60 - 100 Seconds	30 - 60 Seconds
Elite	2minutes or more	1minute or more



FLEXIBILITY TESTS

Sit and Reach - P.34

Toe Touch - P.35

Back Scratch - P.36

Lateral Side Bending - P.37

Shoulder/Neck Mobility - P. 38

Groin Flexibility - P.38

O R I G Y M

Level 3

Sit and Reach

Purpose: To test the clients lower back and hamstring flexibility.

Equipment: Vertical board, ruler or specific sit and reach apparatus.

How to do:

1. The client should warm-up before attempting the test.
2. The client removes shoes and any clothing that will restrict their joint movement
3. Their feet should be placed against the vertical board with straight legs and back
4. The client slowly reaches forward maintaining a straight back for as long as possible
5. Instructor records the distance at the point where the client starts to flex their spine
6. Client continues to reach forward as far as possible stretching fingers to the furthest point on the sit and reach box.

Scoring:

	Males		Females	
Rating	(inches)	(cm)	(inches)	(cm)
Excellent	>28	>70	>24	>60
Very Good	24 - 28	61 - 70	20 - 24	51 - 60
Above Average	20 - 24	51 - 60	16 - 20	41 - 50
Average	16 - 20	41 - 50	12 - 16	31 - 40
Below Average	12 - 16	31 - 40	8 - 12	21 - 30
Poor	8 - 12	21 - 30	4 - 8	11 - 20
Very Poor	<8	<21	<4	<11

Toe Touch Test

Purpose: An alternative to the sit and reach test. Tests lower back and hamstring flexibility.

Equipment: Flat surface, ruler.

How to do: Stood up straight and barefoot, the client flexes at the waist aiming to touch the floor with extended hands and fingers. A ruler is placed on the ground with the zero mark touching the floor. Knees must be kept straight, and the measurement is taken at the point that form is broken. For clients who can easily touch the floor, you will need to increase the height by adding platforms for the client to stand on. All platform tests are measured as negative. For example -5cm, -10cm.

Scoring:

Male results:

Test Type	Equipment Required	Male	
Toe Touch Test 2 (Advanced)	Raised Platform (20 - 30cm)	Outstanding	>27
		Excellent	17 - 26
Toe Touch Test 1 (Intermediate)	Raised Platform (15 - 20cm)	Good	6 - 16
		Average	0 - 5
Standard Toe Touch Test Assessment	Floor	Fair	-1 - -8
		Poor	-20 - -9
		Very Poor	< -20
		Distance from the ground (cm)	

Female results:

Test Type	Equipment Required	Female	
Toe Touch Test 2 (Advanced)	Raised Platform (20 - 30cm)	Outstanding	>30
		Excellent	21 - 29
Toe Touch Test 1 (Intermediate)	Raised Platform (15 - 20cm)	Good	11 - 20
		Average	1 - 10
Standard Toe Touch Test Assessment	Floor	Fair	-7 - 0
		Poor	-15 - -8
		Very Poor	< -15
		Distance from the ground (cm)	

Back Scratch Test

Purpose: To measure the range of motion (ROM) of the shoulder.

Equipment: Ruler or yardstick.

How to do: In a standing position put the left hand behind the head and reach down the middle of the back as much as possible, palm is facing the body and fingers are pointing down. Place the right hand, palm facing away, fingers extended behind the lower back and then move up the middle back to meet the other hand by touching fingertips.

The test is then repeated on the other side.

Scoring: Scoring is based on each arm and not combined. If fingertips touch the score is zero and is a positive result. Any distance is a negative result. Mark to the nearest inch or cm.

Male results:

Age	Below Average (cm)	Normal (cm)	Above Average (cm)
20 - 29	< -4	0	> 5
30 - 39	< -9	-3	> 3
40 - 49	< -15	-8	> 0
50 - 59	< -18	-11	> -4
60 - 65	< -23	-16	> -10

Female results:

Age	Below Average (cm)	Normal (cm)	Above Average (cm)
20 - 29	< -4	1	> 7
30 - 39	< -2	2	> 6
40 - 49	< -8	-2.5	> 4
50 - 59	< -9	-5	> 0
60 - 65	< -12	-6	> 0

Lateral Side-Bending Test

Purpose: To measure the lateral flexion of the lumbar spine and pelvis.

Equipment: Tape to mark the ground, ruler/tape measure.

How to do: Client stands on two lines that are at a right angle to the wall, the lines are 15cm apart. Arms are extended at the side of the body. The position of the middle finger is placed onto the client's thigh. Keeping the back against the wall the client is to laterally flex to one side and the end position is marked with a horizontal line on the side of the thigh. Repeat the test for the other side, the distance between the first and last position of the middle finger is recorded.

Scoring: The test is individual to your clients, you would do this again after a set amount of training hoping to improve the range.

Percentile Values for Side-Bending Distance, cm (in) Points by Age Range and Repetitions

Percentile	Age Range		
Men	30 - 39	40 - 49	50 - 59
80th	24.1 (9.5)	23.1 (9.1)	20.6 (8.1)
60th	22.1 (8.7)	21.6 (8.5)	18.7 (7.4)
50th	20.2 (8.0)	19.8 (7.8)	17.1 (6.7)
20th	18.5 (7.3)	15.5 (6.1)	14.7 (5.8)
Women			
80th	23.7 (9.3)	22.5 (8.9)	20.1 (7.9)
60th	21.8 (8.6)	19.9 (7.8)	18.6 (7.3)
50th	21.1 (8.3)	18.6 (7.3)	16.9 (6.7)
20th	17.8 (7.0)	16.1 (6.3)	15.6 (6.5)

Shoulder/Neck Mobility

Purpose: To provide a rough estimate of the shoulder and neck mobility of a client.

Equipment: Wall.

How to do: Client stands with their glutes, back and shoulders against a wall, their feet are 1.5 feet away from the wall. The client's arms are fully extended by their sides with the thumbs pointing up they raise their arms so that they are overhead. Once overhead, the client rotates their hands so that the dorsal side can be placed on the wall. Elbows and wrists must be kept straight.

Scoring:

- **5 points** = the whole dorsal side of the hand is in contact with the wall (no restriction of range of motion)
- **3 points** = only fingers reach the wall (moderate restriction of range of motion)
- **1 points** = no hand contact with the wall (severe restriction of range of motion)

Groin Flexibility Test

Purpose: To test flexibility of the adductor muscles.

Equipment: Rule or tape measure.

How to do: Sitting on the floor, have your knees bent, your feet flat and legs together. Let your knees drop sideways as far as possible keeping your feet together. Then put the soles of your feet together, facing each other. Grab hold on to your ankles with both hands and pull them as close to your body as possible. Measure the distance from your heels to your groin.

Scoring: Convert the score measurement to a rating. The smaller the score, the better your flexibility.

Ratings	Score
Excellent	5cm
Very Good	10cm
Good	15cm
Fair	20cm
Poor	25cm