

## Step Test Protocol – Chester Step Test

### Equipment required:

- Chester Step Test Audio / Video instruction
- Step with height suited to applicant (see below).
- Metronome – refer to “How to Use a Metronome”:
- Heart rate monitor
- Stop watch
- Calculator
- Paperwork to graph VO2 Max Plot;

### Step Heights:

**12” (30cm) Step** – is generally suitable for those under 40 years of age who regularly take physical exercise and are used to moderately vigorous exertion.

**10” (25cm) Step** – is generally suitable for those over 40 years of age who regularly take physical exercise and are used to moderately vigorous exertion.

**8” (20cm) Step** – is generally suitable for those under 40 years of age who take little or no regular physical exercise and for those under-40’s who are moderately overweight.

**6” (15cm) Step** – is generally suitable for those over 40 years of age who take little or no regular physical exercise and for those under-40’s who are moderately overweight.

Note: For testing **over 60’s**, the lower step height of 15-20 cm is generally best suited.

### Prior to starting the test:

- Record resting HR (applicant should still be wearing the monitor)
- Ask applicant their age – circle on the testing paperwork
- Calculate 80% Max HR ( $220 - \text{Age} \times 0.8$ ) and record this on the paperwork
- Explain: *“This is the Chester Step Test which is designed to measure your aerobic fitness. You’ll be asked to step onto and off the step at a set rate. Every 2 minutes your heart rate and exertion level will be checked and the stepping rate will be increased slightly. You can change your lead leg if you wish. The test will continue in this progressive manner until your heart rate reaches around 80% of its maximum or until you feel that the intensity is moderately hard. You should then stop and recover. If at any time you feel overtired, breathless or dizzy then please stop and recover.”*
- Demonstrate to the applicant how to perform the test by stepping up and down on the step keeping in time with the beat of the metronome
  - The applicant can lead with either foot and is able to change the leading leg during testing, but **MUST** stay in time with the metronome.
  - The stepping must be UP / UP / DOWN / DOWN
  - Applicant’s should not be holding on to a railing / wall during the test

### Conduct testing:

- Have the applicant start testing at the same time as starting the stop watch
- Watch for uneven weight bearing between left / right legs, use of hands on thighs for support, forward flexed posture, signs of fatigue etc
- If the applicant deviates from the beat, instruct them a few times but if they keep slowing down due to fatigue, cease testing
- Metronome pace increases every 2 minutes
- At the conclusion of each 2 minute stage obtain RPE and HR
- 3 levels are required to be completed in order to determine an outcome

### Metronome pacing:

- Stage 1 = 15 steps per minute = 60 BPM
- Stage 2 = 20 steps per minute = 80 BPM
- Stage 3 = 25 steps per minute = 100 BPM
- Stage 4 = 30 steps per minute = 120 BPM
- Stage 5 = 35 steps per minute = 140 BPM

#### 1. Start test

**Start audio file or set metronome 60 bpm.**

After 2 minutes of stepping, check subject's heart rate and rating of perceived exertion (RPE) level and record on Chester Step Test data sheet.

2. Provided subject's heart rate is below 80%HRmax and RPE below 14, the subject should continue stepping at level 2 – a slightly faster rate.

**Start of Level 2 = 80 bpm.**

3. Check and record heart rate and RPE at 4 minutes or the end of level 2.

4. Provided subject's heart rate is below 80%HRmax and RPE below 14, the subject should continue stepping at level 3 – a slightly faster rate.

**Start of Level 3 = 100 bpm.**

5. Check and record heart rate and RPE at 6 minutes or the end of level 3.

Stop stepping. This is the end of the Chester Step Test.

### Scoring and Validating the Data Collected:

1. Whilst aerobic capacity may be predicted from only 2 exercise heart rates (i.e. completing only 2 Levels), the accuracy of the test will be improved if the subject completes a minimum of 3 Levels.

2. Prior to plotting the line of best fit on the graphical datasheet: Exclude heart rate data points if they are less than 50%HRMax | Exclude heart rate data points if they are greater than 85%HRMax

3. If the pre-test resting heart rate is above 100 beats/min, the subject is likely to be very anxious and nervous about performing the test. If this is the case you are advised to try to relax the person before conduction the test. You may also find that the HR at Level 1 is also elevated and including this data-point does not produce a straight line relationship with data-points from later levels (when anxiety factors tend to be minimized). If this is the case, it is therefore advisable to omit this first point from your visual line of best fit

4. Heart rate increases linearly with increasing work intensity between 50-85% HRMax, hence data plotted within this range should show an approximate straight line graph. If this is not that case it may be that a procedural error has occurred. For example, incorrect or erratic stepping rate, poor technique (e.g. not stepping to fully height), heart rate monitor giving erroneous readings, talking during the test affecting heart rate, readings not accurately monitored by the tester.

### Predicting Aerobic Capacity Using Graphical Datasheet

1. Mark the mlsO<sub>2</sub>/kg/min values for level 1, 2, and 3 for the step height used, the oxygen cost (mlsO<sub>2</sub>/kg/min) of stepping at Level 1=16, Level 2=21, Level 3=27, Level 4=32 and Level 5=37.
2. Plot the heart rates on the graph.
3. Use a ruler to draw the best visual straight line through the heart rate points and continue it up to the horizontal HR Max line.
4. Drop a perpendicular down from where the heart rate line crosses the HR Max line and read off the aerobic capacity score in mlsO<sub>2</sub>/kg/min and enter the score in the appropriate box.
5. Use the normative data tables to determine the candidate's fitness rating (see below).

<b>Male Age Groups</b>						
<b>Fitness Rating</b>	<b>15 - 19</b>	<b>20 - 29</b>	<b>30 - 39</b>	<b>40 - 49</b>	<b>50 - 59</b>	<b>60 - 65</b>
Excellent	60+	55+	50+	46+	44+	40+
Good	48 - 59	44 - 54	40 - 49	34 - 45	35 - 43	33 - 39
Average	39 - 47	35 - 43	34 - 39	32 - 36	29 - 34	25 - 32
Below Average	30 - 38	28 - 34	26 - 33	25 - 31	23 - 28	20 - 24
Poor	<30	<28	<26	<25	<23	<20

<b>Female Age Groups</b>						
<b>Fitness Rating</b>	<b>15 - 19</b>	<b>20 - 29</b>	<b>30 - 39</b>	<b>40 - 49</b>	<b>50 - 59</b>	<b>60 - 65</b>
Excellent	55+	50+	46+	43+	41+	39+
Good	44 - 54	40 - 49	36 - 45	34 - 42	33 - 40	31 - 38
Average	36 - 43	32 - 39	30 - 35	28 - 33	26 - 32	24 - 30
Below Average	29 - 35	27 - 31	25 - 29	22 - 27	21 - 25	19 - 23
Poor	<29	<27	<25	<22	<21	<19

### Cease Step Test Immediately if:

- The applicant reaches 80% heart rate max at any point during testing
- RPE = Moderately vigorous, i.e. 7+
- Unable to maintain metronome set pace
- Applicant reports needing to stop