



**LEVEL 4**

**SEMESTER 2**

**MODULE CODE: SHSS4064  
ASSESSING HEALTH AND FUNCTIONAL FITNESS**

**ASSESSMENT TYPE: COURSEWORK**

**ASSESSMENT/COMPONENT: 2**

**COMPONENT WEIGHTING: 75 %**

**WORD COUNT: 2000 words**

**MODULE TUTOR: Daniel Martin**

**SUBMISSION DETAILS:**

# School of Sport, Health & Outdoor Education

## Assessment Feedback Sheet

**Student No./Name:** 1903175 / Zen Redgrave

**Module:** Assessing Health & Functional Fitness

**Module Code:** SHSS4064

| <b>Personal Evaluation</b> – to support your academic progress please complete the section below <b>BEFORE</b> submitting your work.                                                                                                                                |                                                                                                                                                                                           |                                           |                |                          |                          |                  |                       |                       |                         |    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|----------------|--------------------------|--------------------------|------------------|-----------------------|-----------------------|-------------------------|----|
| What do you consider to be the best aspects of this work?                                                                                                                                                                                                           | <b>Considering the current limitations due to covid-19, the tests produced for the client are satisfying and well researched without physical access to university library facilities</b> |                                           |                |                          |                          |                  |                       |                       |                         |    |
| Which aspects do you consider could have been improved in this piece of work?                                                                                                                                                                                       | <b>With physical access to the university library, greater research could have been done via reference texts.</b>                                                                         |                                           |                |                          |                          |                  |                       |                       |                         |    |
| What have you found most satisfying whilst undertaking this submission?                                                                                                                                                                                             | <b>Understanding up to date criteria for resting heart rate and blood pressure in relation to health.</b>                                                                                 |                                           |                |                          |                          |                  |                       |                       |                         |    |
| ASSESSMENT CRITERIA                                                                                                                                                                                                                                                 | Learning                                                                                                                                                                                  | GRADE                                     |                |                          |                          |                  |                       |                       |                         |    |
|                                                                                                                                                                                                                                                                     |                                                                                                                                                                                           | Poor<br>< 20%                             | Weak<br>20-29% | Unsatisfactory<br>30-39% | Satisfactory<br>40 – 49% | Good<br>50 – 59% | Very Good<br>60 – 69% | Excellent<br>70 – 84% | Exceptional<br>85– 100% | %  |
| Introduction                                                                                                                                                                                                                                                        | 1,2                                                                                                                                                                                       |                                           |                |                          |                          |                  |                       |                       |                         | 20 |
| Theoretical review                                                                                                                                                                                                                                                  | 2,3                                                                                                                                                                                       |                                           |                |                          |                          |                  |                       |                       |                         | 20 |
| Summary                                                                                                                                                                                                                                                             | 1,2                                                                                                                                                                                       |                                           |                |                          |                          |                  |                       |                       |                         | 10 |
| Evaluation of data and recommendations                                                                                                                                                                                                                              | 2,3                                                                                                                                                                                       |                                           |                |                          |                          |                  |                       |                       |                         | 40 |
| Presentation clarity and format                                                                                                                                                                                                                                     | 3                                                                                                                                                                                         |                                           |                |                          |                          |                  |                       |                       |                         | 10 |
| It is expected that students will present work that is proof read, correctly referenced and adheres to the <b>Assessment Checklist</b> . Therefore a range of 0 – 10 marks will be deducted for non-completion of any of the points on the <b>checklist below</b> . |                                                                                                                                                                                           |                                           |                |                          |                          |                  |                       |                       |                         |    |
| <b>TUTOR COMMENTS:</b>                                                                                                                                                                                                                                              |                                                                                                                                                                                           |                                           |                |                          |                          |                  |                       |                       |                         |    |
| Submission date:<br>via Turnitin                                                                                                                                                                                                                                    |                                                                                                                                                                                           | Return date:<br>(at least within 4 weeks) |                |                          | Tutor:                   |                  |                       |                       | Mark:                   |    |



## Health and Fitness assessment

### Introduction

The client is a 48 year old male who has formerly participated in martial arts to a high level, including national level competition. The client has not recently been active in martial arts practice and is planning to return to training which would consist of two training sessions per week. A normal martial arts training session for the client would be of 1-1.5hrs duration and would involve a combination of training methods including drills on focus mitts, practicing forms, self defence drills, and sparring. As such the client is particularly interested in building a solid foundation of aerobic fitness and then developing speed and agility.

The client is a non-smoker, and consumes on average less than one unit of alcohol per week

A Par-Q form was completed by the client. An anonymised copy of the Par-Q and an informed consent form are shown in appendix one of this report. All of the answers on the Par-Q were “no” indicating that there is reasonable assurance that the client will be able to safely participate in the physical testing that would be recommended to assess basic health and fitness, and that there is no requirement to refer to a GP or other medical professional prior to conducting the health and fitness assessment.

The health and fitness tests selected for this client are based around assessing general health prior to a return to martial arts training, an assessment of flexibility, and an assessment of basic fitness that gives an estimate of VO<sub>2</sub>Max.

The tests selected are an assessment of resting pulse rate, blood pressure, Body Mass Index, Bodyfat levels, and a step test (Queens college methodology). The rationale for these are as follows.

Resting pulse: The accepted norm for resting pulse rate is between 60 - 100 beats per minute (National Health Service, 2018). However, recent research by Nanchen, reported in the British Medical Journal, suggests that this value should be revised to a resting heart rate of above 70 Beats per Minute for males being considered as abnormal. The report also suggested that a resting heart rate of below 60 beats per minute for males significantly reduced the risk of death due to cardiovascular issues, cancers, and other causes. As such testing the resting pulse provides a useful measure of cardiovascular and general health (Nanchen, 2018, pp. 1048-1049).

**Blood Pressure:** High blood pressure has been shown to increase the risk of cardiovascular disease, (heart attack) due to the increase load that is placed on the heart muscle for it to be able to pump blood around the body effectively (National Health Service, 2018). As such testing of blood pressure can be a useful indicator to overall heart health

**Body Mass Index:** BMI provides a ratio of overall body weight against height ( $\text{Kg/m}^2$ ). The ACSM note that death rates and obesity related disease increase in individuals who have a  $\text{BMI} \geq 30.0 \text{ Kg/m}^2$ . Interestingly the ACSM also cite a study by Arena and Lavie in 2010, which indicates that for individuals who experience congestive heart failure,  $\text{BMI} \geq 30.0 \text{ Kg/m}^2$  actually improves survival rates. It is also noted that BMI can give false indications of obesity in individuals who have high levels of muscularity combined with low body fat levels, as the test does not differentiate between lean body mass, bone mass, and fat mass. However, the client would not fall into this category and so it has been selected as a useful test (American College of Sports Medicine, 2018, pp.70-71).

**Bodyfat:** As has been mentioned with BMI, obesity has been shown to increase the risk of mortality and disease. However, BMI on its own does not provide a definitive assessment due to the limitations mentioned. Combining BMI with a measurement of bodyfat percentage allows for a greater understanding of body composition and weight in relation to health.

**Step test:** This has been selected as it provides a good correlation for estimating  $\text{VO}_2\text{Max}$  i.e. the amount of oxygen that the body can take up and utilise within a given period of time. Although this is a sub-maximal test and as such would not give the most accurate result possible, it does provide a repeatable, low cost, field type test that does not rely on expensive laboratory equipment to give an indication of cardio respiratory fitness. A 2003 study by Chatterjee et al concluded that the Queens college step test represented a valid testing method for estimating  $\text{VO}_2\text{Max}$  with high level of correlation to a laboratory based approach for  $\text{VO}_2\text{Max}$  when assessed on a cycle ergometer and using gas analysis to determine oxygen usage (Chatterjee et al 2004, pp.289-291) As such, this has been included as it can provide useful information relating the clients overall aerobic and cardio respiratory fitness.

**Results from testing and interpretation of results compared to normative data**

The following results were obtained from the physical tests performed.

**Resting Pulse:** A resting heart rate of 64 beats per minute measured over a 15 second period on the carotid pulse with the client having been seated for at least 5 minutes was measured.

This pulse rate falls within the NHS accepted normal range of 60-100 beats per minute (National Health Service, 2018). It is also noted that the result is below the 70 beats per minute recommended as a normal resting heart rate by Nanchen, although is slightly higher than the 60 beats per minute that was regarded by this study as representing a level at which risk from disease was significantly reduced (Nanchen, 2018, pp. 1048-1049).

Blood pressure: The clients blood pressure was measured using a manual sphygmomanometer and stethoscope to record systolic and diastolic blood pressure. This was done immediately after the resting pulse measurement so that the client could remain seated and thus not risk an increase in blood pressure due to exertion. The values recorded from this were 124mmHg systolic and 82mmHg diastolic. This represents a value that is slightly elevated from the NHS accepted normal value of 90/60 mmHg – 120/80 mmHg (National Health Service, 2018). It also shows as elevated when compared to the normal values accepted by the American Heart Association and the American College of Cardiology of less than 120/80mmHg, as reported on the Harvard Health Publishing website (Harvard Health Publishing, 2018). It is noted that the NHS website would regard the readings obtained as representing a ‘risk of developing high blood pressure’ (National Health Service, 2018). By contrast, the Harvard Health Publishing website reporting the American Heart Association and the American College of Cardiology norm values would regard the diastolic reading of 82mmHg as representing stage 1 hypertension (Harvard Health Publishing, 2018). Although this on its own may not be enough to represent a reason to not test, especially when viewed with the test results from the other body composition test, it does validate the use of a submaximal estimation of  $VO_2\text{Max}$  to reduce the cardio-respiratory load that the client would experience. It would also be recommended that a referral to his GP is made for the client so that the results can be discussed and assessed in more detail, and appropriate measures taken. Tables showing normative data from the NHS and Harvard Medical School websites are included as appendices two & three respectively.

Body Mass Index: The clients body weight was measured using a digital scale and recorded as 60.1Kg. The client’s height was measured as 1.86m Using the equation for calculating BMI of  $\text{Weight (Kg)}/\text{Height (m}^2\text{)}$  the clients BMI was calculated as 17.37Kg/m<sup>2</sup>. This indicates that the client would be classified as underweight as the BMI value is lower than 18.5 Kg/m<sup>2</sup>. A table showing normative data for BMI is included as appendix four of this report.

Body composition/bodyfat%: The body composition of the client was assessed using a seven point skin fold test. Measurements were taken of skin fold at the client's chest, midaxillary, triceps, subscapular, abdominal, suprailliac, and thigh positions. Detailed descriptions of these sites and the method used for taking the readings are included as appendix five of this report. The table below details the results obtained from the measurements

| Measurement site         | Skinfold reading in mm |
|--------------------------|------------------------|
| Chest                    | 4                      |
| Midaxillary              | 4                      |
| Triceps                  | 3                      |
| Subscapular              | 5.5                    |
| Abdominal                | 6.5                    |
| Suprailliac              | 3                      |
| Thigh                    | 5                      |
| Total skinfold thickness | 31                     |

These results were then used as inputs to the following formula to allow a calculation of body density, which can then ultimately be used as an input to the formula shown below to get an estimate of body fat percentage.

Body density =  $1.112 - 0.00043499(\text{sum of seven skinfolds}) + 0.00000055 (\text{sum of seven skinfolds})^2 - 0.00028826 (\text{age})$  (American College of Sports Medicine, 2018, p.76)

From this it was calculated that the clients body density was 1.08520738.

To convert this to % body fat the equation of  $((4.95/\text{body density}) - 4.50) \times 100$  was used (American College of Sports Medicine, 2018, p.78).

This gave a value of 6.13% body fat for the client. When compared to the normative values as shown in the ACSM testing guidelines, it was found that the client would have been above the 99<sup>th</sup> percentile for his age group. This is consistent with the low BMI readings that were calculated. A copy of the normative values for % body fat is included as appendix six of this report (American College of Sports Medicine, 2018, p.79).

Queens college step test: The queens college step test was used to assess the cardio respiratory fitness of the client and give an estimate of  $\dot{V}O_2\text{Max}$ .

The procedure used for this step test is detailed in appendix seven of this report.

At completion of the test, the client's pulse was measured via the carotid artery over the required 15 second duration and gave a value of 37 and thus an overall heart rate of 148 beats per minute.

This was then used as an input to the following equation to estimate  $\dot{V}O_2\text{Max}$ .

$$\dot{V}O_2\text{Max (estimate)} = 111.33 - (0.42 \times \text{heart rate})$$

From this equation it was calculated that the  $\dot{V}O_2\text{Max}$  for the client was 49.7 mL/Kg/min

When compared to the normative data for  $\dot{V}O_2\text{Max}$  as detailed in the ACSM testing guidelines it was found that the client would fall between the 80<sup>th</sup> and 85<sup>th</sup> percentile and would be classified as excellent. A copy of the normative data table is included as appendix eight of this report (American College of Sports Medicine, 2018, p.93).

## Summary of assessment findings

The table below provides a summary of the results from the testing performed with the client.

| Test                   | Result                 | Normative value for age, gender, and ethnicity                                    | Interpretation                                                                                  |
|------------------------|------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Resting pulse          | 64 bpm                 | 60 - 100 bpm                                                                      | Acceptable although below 60 would be ideal                                                     |
| Blood Pressure         | 124/82 mmHg            | Range of 90/60mmHg - 120/80mmHg                                                   | Diastolic reading would represent stage 1 hypertension - refer to GP for further investigation. |
| Body Mass Index        | 17.37Kg/M <sup>2</sup> | 18.5 - 24.9 Kg/M <sup>2</sup> regarded as normal                                  | BMI indicates client is underweight                                                             |
| % body fat             | 6.13%                  | 99th percentile for age is 9.5%                                                   | Classified as very lean although above the recommended minimum of 3%                            |
| $\dot{V}O_2\text{Max}$ | 49.17mL/Kg/min         | Excellent category 46.7 - 49.3 mL O <sub>2</sub> /Kg/min (80th - 85th percentile) | Classified as excellent                                                                         |

## Evaluation and recommendations

The testing results indicate that the client has acceptable/good levels of fitness for their age group. It is noted however that some of the test results fall outside of the accepted normative values and may need further investigation. The body mass index readings and % body fat readings show that the client is very lean and underweight. It would be possible for the client to increase bodyweight to and increase % bodyfat levels slightly to fall within what would be regarded as a more normal range without affecting athletic performance once he returns to

martial arts training. However, when viewed with the blood pressure results, which from the American College of Cardiology values as reported on the Harvard School of medicine website, would represent stage one hypertension based on the elevated diastolic reading, it would be recommended to the client that they review this result with their GP and potentially monitor this over a period of time. It would also be recommended to the client that to achieve the weight gain to move them out of the underweight category and into the normal classification, that they refer to a sports nutritionist to get specific advice on how to make any dietary modifications required whilst also potentially positively reducing their blood pressure readings, following consultation with their GP. Training methods that would be recommended for the client would be to include resistance based training within the 8 – 12 rep range at 67 – 85% 1RM load as this will provide the ideal for muscular hypertrophy and thus weight gain (American College of Sports Medicine, 2018, pp. 164-165). Inclusion of aerobic style of training would also be recommended to the client such that they can work to lower their resting heart rate below 60 bpm as recommended by Nanchen (Nanchen, 2018, pp. 1048-1049). This would be moderate intensity exercise with a recommended duration of 45 mins twice per week thus allowing for, with the inclusion of the specific martial arts training, of more than the 150 minutes of moderate activity per week, as recommended by the UK chief medical officer (Department of Health and Social Care, 2019)

Word count: 2193

## References

- American College of Sports Medicine. (2018) *Guidelines for Exercise Testing and Prescription*. 10<sup>th</sup> edn. Philadelphia: Wolters Kluwer.
- Chatterjee et al. (2003) 'Validity of Queen's College step test for use with young Indian men', *British Journal of Sports Medicine*, 38, pp.289-291.
- Department of Health and Social Care (2019) *UK Chief Medical Officers' Physical Activity Guidelines*. London: Department of Health and Social Care.
- Harvard Health Publishing (2018) *Reading the new blood pressure guidelines*. Available at: <https://www.health.harvard.edu/heart-health/reading-the-new-blood-pressure-guidelines> (Accessed 06 April 2020)
- Nanchen, D. (2018). 'Resting heart rate: what is normal?' *Heart*, 104(13), pp. 1048–1049.

National Health Service (2018) *How Do I Check My Pulse*. Available at <https://www.nhs.uk/common-health-questions/accidents-first-aid-and-treatments/how-do-i-check-my-pulse/> (Accessed 06 April 2020).

National Health Service (2018) *Understanding Your Blood Pressure*. Available at <https://www.nhs.uk/conditions/blood-pressure-test/#understanding-your-blood-pressure-reading> (Accessed 06 April 2020).

# Appendices

## Appendix one: Par -Q and Informed consent form

### Physical activity readiness questionnaire (PAR-Q)

Name: #1 Age: 48 Gender: Male  
Contact number: Email: @gmail.com  
Next of kin: Contact number:

This PAR-Q is designed to help you to help yourself. Many benefits are associated with regular exercise, and completion of the PAR-Q form is a sensible first step to take if you are planning to increase the amount of physical activity in your life.  
For most people, physical activity should not pose a problem or hazard.

The PAR-Q has been designed to identify the small number of people for whom physical activity might be inappropriate or for those who should seek medical advice concerning the type of activity most suitable for them. Common sense is your best guide for answering these questions.

|                                                                                                                                     |        |
|-------------------------------------------------------------------------------------------------------------------------------------|--------|
| 1. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor? | YES/NO |
| 2. Do you feel pain in your chest when you do physical activity?                                                                    | YES/NO |
| 3. In the past month, have you had chest pain when you were not doing physical activity?                                            | YES/NO |
| 4. Do you lose your balance because of dizziness or do you ever lose consciousness?                                                 | YES/NO |
| 5. Do you have a bone or joint problem (for example, back, knee or hip) that could be made worse by a change in physical activity?  | YES/NO |
| 6. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?                | YES/NO |
| 7. Do you know of any other reason why you should not do physical activity?                                                         | YES/NO |

If you have answered YES to any of the above questions, then you are required to gain consent from your doctor before participating in the gym-based exercise programme.

If you have answered NO to all of the above questions and you have reasonable assurance of your suitability for:

A gym-based exercise programme – which will include; a warm up, cardiovascular training using equipment, fixed weights, using resistance machines, free weights, using dumbbells and barbells, body weight exercises and cool down stretches.

You are advised to postpone entry into the programme if you feel unwell or have a temporary illness. You must inform your gym instructor of any changes to your health status, whilst engaged in your training programme.

Client signature: Date: 23/03/2020  
Witness signature: Date: 23/03/2020

## Informed consent

### Informed consent form for exercise prescription

#### Programme objectives and procedures

I understand that the purpose of the exercise programme is to provide safe and individualised exercise to improve health and fitness. Exercises may include:

- Cardiovascular machine activities – treadmill walking or jogging, rowing, upright or recumbent cycling, stair climbing and other such activities
- Resistance training activities using resistance machines, free weights or body weight to improve muscular strength or endurance
- Cool down and flexibility exercises to improve movement around the joints and range of motion

#### Potential risks

The exercise programme is designed to place a gradually increasing workload on the cardiovascular and muscular systems and thereby improve their function. The reaction of the cardiovascular and muscular system to such exercise cannot always be predicted with complete accuracy. There is a risk of certain changes that might occur during or following the exercise. These changes could relate to blood pressure or heart rate.

#### Potential benefits

I understand that a programme of regular exercise has been shown to be beneficial. Some of these benefits include:

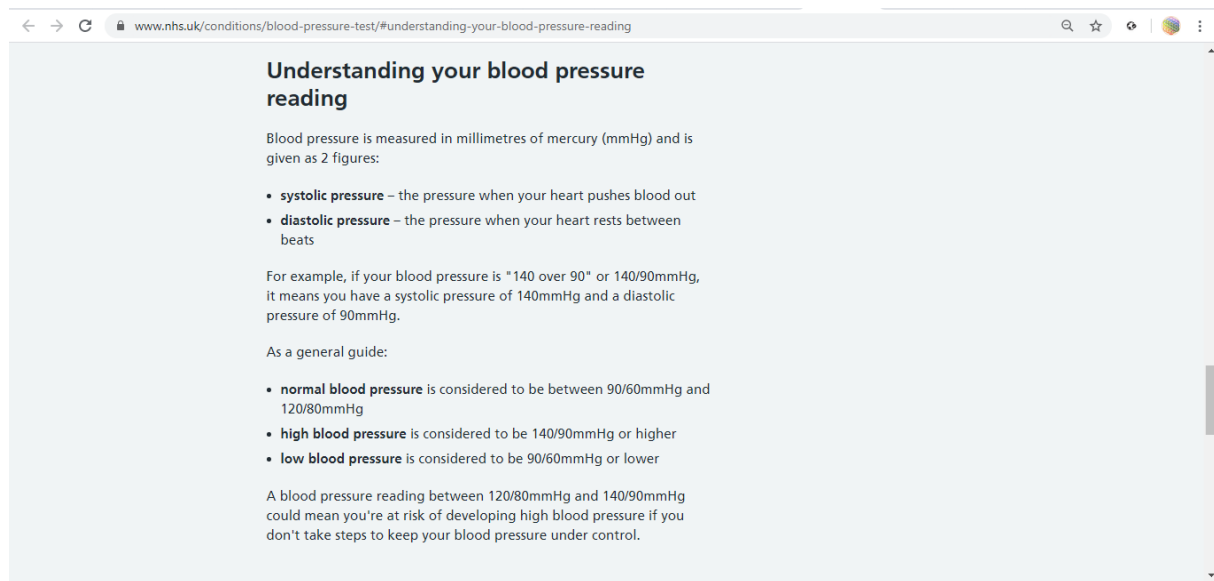
- A decrease in risk of heart disease
- A decrease in body fat
- Improved blood pressure
- Improvement in psychological function
- Improvement in aerobic fitness

The gym-based exercise programme has been explained to me and my questions regarding the programme have been answered to my satisfaction. I understand that I am free to withdraw at any time. The information obtained will be treated as private and confidential.

Signature of client: ..... Date:.....23/03/2020.....

Witness signature: .....  ..... Date:.....23/03/2020.....

## Appendix two: NHS normative data for blood pressure.



The screenshot shows a web browser window with the URL [www.nhs.uk/conditions/blood-pressure-test/#understanding-your-blood-pressure-reading](https://www.nhs.uk/conditions/blood-pressure-test/#understanding-your-blood-pressure-reading). The page content is as follows:

### Understanding your blood pressure reading

Blood pressure is measured in millimetres of mercury (mmHg) and is given as 2 figures:

- **systolic pressure** – the pressure when your heart pushes blood out
- **diastolic pressure** – the pressure when your heart rests between beats

For example, if your blood pressure is "140 over 90" or 140/90mmHg, it means you have a systolic pressure of 140mmHg and a diastolic pressure of 90mmHg.

As a general guide:

- **normal blood pressure** is considered to be between 90/60mmHg and 120/80mmHg
- **high blood pressure** is considered to be 140/90mmHg or higher
- **low blood pressure** is considered to be 90/60mmHg or lower

A blood pressure reading between 120/80mmHg and 140/90mmHg could mean you're at risk of developing high blood pressure if you don't take steps to keep your blood pressure under control.

(National Health Service, 2018)

## Blood Pressure Categories



| BLOOD PRESSURE CATEGORY                                          | SYSTOLIC mm Hg<br>(upper number) |               | DIASTOLIC mm Hg<br>(lower number) |
|------------------------------------------------------------------|----------------------------------|---------------|-----------------------------------|
| <b>NORMAL</b>                                                    | <b>LESS THAN 120</b>             | <b>and</b>    | <b>LESS THAN 80</b>               |
| <b>ELEVATED</b>                                                  | <b>120 – 129</b>                 | <b>and</b>    | <b>LESS THAN 80</b>               |
| <b>HIGH BLOOD PRESSURE<br/>(HYPERTENSION) STAGE 1</b>            | <b>130 – 139</b>                 | <b>or</b>     | <b>80 – 89</b>                    |
| <b>HIGH BLOOD PRESSURE<br/>(HYPERTENSION) STAGE 2</b>            | <b>140 OR HIGHER</b>             | <b>or</b>     | <b>90 OR HIGHER</b>               |
| <b>HYPERTENSIVE CRISIS<br/>(consult your doctor immediately)</b> | <b>HIGHER THAN 180</b>           | <b>and/or</b> | <b>HIGHER THAN 120</b>            |

(Harvard Health Publishing, 2018)

## Appendix four: Normative data table for Body Mass Index

| Classification of Disease Risk Based on Body Mass Index (BMI) |                          |                                                     |
|---------------------------------------------------------------|--------------------------|-----------------------------------------------------|
| Classification                                                | BMI (kg/m <sup>2</sup> ) | Disease Risk <sup>a</sup> Relative to Normal Weight |
| Underweight                                                   | <18.5                    | -                                                   |
| Normal                                                        | 18.5 - 24.9              | -                                                   |
| Overweight                                                    | 25.0 - 29.9              | Increased                                           |
| Obesity, class                                                |                          |                                                     |
| 1                                                             | 30.0 - 34.9              | High                                                |
| 2                                                             | 35.0 - 39.9              | Very high                                           |
| 3                                                             | ≥40.0                    | Extremely high                                      |

Dashes (-) indicate that no additional risk at these levels of BMI was assigned.

<sup>a</sup> Disease risk for Type 2 diabetes, hypertension, and cardiovascular disease.

(American College of Sports Medicine, 2018, pp.70-71).

## Appendix five a: Body composition measurement sites.

| Skinfold Site |                                                                                                                                                                                                               |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Chest         | Diagonal fold; One-half the distance between the anterior axillary line and the nipple (men), or one third of the distance between the axillary line and the nipple (women).                                  |
| Midaxillary   | Vertical fold; on the midaxillary line at the level of the xiphoid process of the sternum. An alternate method is a horizontal fold taken at the level of the xiphoid/sternal border on the midaxillary line. |
| Triceps       | Vertical fold; on the posterior midline of the upper arm, half-way between the acromion and olecranon processes, with the arm held freely to the side of the body.                                            |
| Subscapular   | Diagonal fold (45-degree angle); 1-2 cm below the inferior angle of the scapula.                                                                                                                              |
| Abdominal     | Vertical fold; 2cm to the right side of the umbilicus.                                                                                                                                                        |
| Suprailliac   | Diagonal fold; in line with the natural angle of the iliac crest taken in the anterior axillary line immediately superior to the iliac crest.                                                                 |
| Thigh         | Vertical fold; on the anterior midline of the thigh, midway between the proximal border of the patella and the inguinal crease (hip).                                                                         |

Standardized description of skinfold sites and procedures (ACSM, 2018, pp75)

## Appendix five b: Measurement method using skinfold calipers.

- All measurements should be made in the right side of the body with the subject standing upright.
- Caliper should be placed directly on the skin surface, 1cm away from the thumb and finger, perpendicular to the skinfold, and halfway between the crest and the base of the fold.
- Pinch should be maintained while reading the caliper.
- Wait 1 – 2 seconds before reading the caliper.
- Take duplicate measurements at each site and retest if duplicate measurements are not within 1 – 2 mm.
- Rotate through measurement sites or allow time for skin to regain normal texture and thickness.

Standardized description of skinfold sites and procedures (ACSM, 2018, pp75)

Appendix six: Fitness Categories for Body Composition (% Body Fat) For Men by Age.

| %  |                        | Age (year) |         |         |         |         |         |
|----|------------------------|------------|---------|---------|---------|---------|---------|
|    |                        | 20 - 29    | 30 - 39 | 40 - 49 | 50 - 59 | 60 - 69 | 70 - 79 |
| 99 | very lean <sup>a</sup> | 4.2        | 7.3     | 9.9     | 11.0    | 11.9    | 13.6    |
| 95 |                        | 6.4        | 10.3    | 12.9    | 14.8    | 16.2    | 15.5    |
| 90 | Excellent              | 7.9        | 12.4    | 15.0    | 17.0    | 18.1    | 17.5    |
| 85 |                        | 9.1        | 13.7    | 16.4    | 18.3    | 19.2    | 19.0    |
| 80 |                        | 10.5       | 14.9    | 17.5    | 19.4    | 20.2    | 20.1    |
| 75 | Good                   | 11.5       | 15.9    | 18.5    | 20.2    | 21.0    | 21.0    |
| 70 |                        | 12.6       | 16.8    | 19.3    | 21.0    | 21.7    | 21.6    |
| 65 |                        | 13.8       | 17.7    | 20.1    | 21.7    | 22.4    | 22.3    |
| 60 |                        | 14.8       | 18.4    | 20.8    | 22.3    | 23.0    | 22.9    |
| 55 | Fair                   | 15.8       | 19.2    | 21.4    | 23.0    | 23.6    | 23.7    |
| 50 |                        | 16.6       | 20.0    | 22.1    | 23.6    | 24.2    | 24.1    |
| 45 |                        | 17.5       | 20.7    | 22.8    | 24.2    | 24.9    | 24.7    |
| 40 |                        | 18.6       | 21.6    | 23.5    | 24.9    | 25.6    | 25.3    |
| 35 | Poor                   | 19.7       | 22.4    | 24.2    | 25.6    | 26.4    | 25.8    |
| 30 |                        | 20.7       | 23.2    | 24.9    | 26.3    | 27.0    | 26.5    |
| 25 |                        | 22.0       | 24.1    | 25.7    | 27.1    | 27.9    | 27.1    |
| 20 |                        | 23.3       | 25.1    | 26.6    | 28.1    | 28.8    | 28.4    |
| 15 | Very poor              | 24.9       | 26.4    | 27.8    | 29.2    | 29.8    | 29.4    |
| 10 |                        | 26.6       | 27.8    | 29.2    | 30.6    | 31.2    | 30.7    |
| 5  |                        | 29.2       | 30.2    | 31.3    | 32.7    | 33.3    | 32.9    |
| 1  |                        | 33.4       | 34.4    | 35.2    | 36.4    | 36.8    | 37.2    |
| n= |                        | 1,844      | 10,099  | 15,073  | 9,255   | 2,851   | 522     |

Total  $n = 39,644$

<sup>a</sup>Very Lean, no less than 3% body fat is recommended for men.

Fitness categories for body composition (% body fat) for men by age, (ACSM, 2018, pp79)

## Appendix seven: Queens college step test procedure.

- Use a step height of 16.25 inches.
- Test subjects should avoid exercise for preceding 24 hrs and should avoid using any substances that may alter heart rate i.e. caffeine, alcohol, heart medication such as beta-blockers (unless prescribed by a medical doctor).
- Use a metronome set to 96 beats per minute to generate 24 step cycles per minute (88 beats per minute generating 22 step cycles for women).
- Test is conducted over 3 minutes exercise duration.
- The leading leg should be altered at least once during the test to prevent muscle fatigue on the leading leg.
- At completion of the 3 minutes the participant should sit. At 3 mins and 5 seconds, the tester should start counting the number of heart beats over a 15 second duration i.e. 3 mins 5 seconds to 3 mins 20 seconds.
- This value is then multiplied by 4 and used as the input to the equation shown below
- $V_{O_2}Max \text{ (estimate)} = 111.33 - (0.42 \times \text{heart rate})$

Appendix eight: Cardiorespiratory Fitness Classifications (VO<sup>2</sup>Max) by Age and Sex.

| VO <sub>2</sub> Max (m lO <sub>2</sub> /kg/min) |           |            |         |         |         |         |
|-------------------------------------------------|-----------|------------|---------|---------|---------|---------|
| %                                               |           | Age (year) |         |         |         |         |
|                                                 |           | 20 - 29    | 30 - 39 | 40 - 49 | 50 - 59 | 60 - 69 |
| 95                                              | Superior  | 66.3       | 59.8    | 55.6    | 50.7    | 43.0    |
| 90                                              | Excellent | 61.8       | 56.5    | 52.1    | 45.6    | 40.3    |
| 85                                              |           | 59.3       | 54.2    | 49.3    | 43.2    | 38.2    |
| 80                                              |           | 57.1       | 51.6    | 46.7    | 41.2    | 36.1    |
| 75                                              | Good      | 55.2       | 49.2    | 45.0    | 39.7    | 34.5    |
| 70                                              |           | 53.7       | 48.0    | 43.9    | 38.2    | 32.9    |
| 65                                              |           | 52.1       | 46.6    | 42.1    | 36.3    | 31.6    |
| 60                                              |           | 50.2       | 45.2    | 40.3    | 35.1    | 30.5    |
| 55                                              | Fair      | 49.0       | 43.8    | 38.9    | 33.8    | 29.1    |
| 50                                              |           | 48.0       | 42.4    | 37.8    | 32.6    | 28.2    |
| 45                                              |           | 46.5       | 41.3    | 36.7    | 31.6    | 27.2    |
| 40                                              |           | 44.9       | 39.6    | 35.7    | 30.7    | 26.6    |
| 35                                              | Poor      | 43.5       | 38.5    | 34.6    | 29.5    | 25.7    |
| 30                                              |           | 41.9       | 37.4    | 33.3    | 28.4    | 24.6    |
| 25                                              |           | 40.1       | 35.9    | 31.9    | 27.1    | 23.7    |
| 20                                              |           | 38.1       | 34.1    | 30.5    | 26.1    | 22.4    |
| 15                                              | Very poor | 35.4       | 32.7    | 29.0    | 24.4    | 21.2    |
| 10                                              |           | 32.1       | 30.2    | 26.8    | 22.8    | 19.8    |
| 5                                               |           | 29.0       | 27.2    | 24.2    | 20.9    | 17.4    |
| n=                                              |           | 513        | 963     | 1,327   | 1,078   | 593     |

Cardiorespiratory Fitness Classifications (VO<sub>2</sub>Max) by Age and Sex, (ACSM, 2018, pp79)