

## BODY COMPOSITION

What is meant by body composition? Describe 1 method of measuring body composition.

(5)

### Body composition (sub max 1):

1.	Fat mass and lean body mass OR % of body weight that is fat (adipose tissue) and weight of the rest of the body (bone, muscle, organs)
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### Assessing body composition (sub max 4):

2.	Hydrostatic weighing
3.	Obtain subject's scale weight (out of water)
4.	Totally immersed in a tank of water
5.	Find their underwater weight (must remain motionless)
6.	Calculate the difference between scale weight and underwater weight
7.	Greater the difference between the dry and wet weights, the more fat the person has
8.	Density of water/trapped air in lungs may be taken into account
9.	Bioelectrical Impedance Spectroscopy/BIS
10.	Use body fat scales
11.	(Low, safe) electrical current is sent through the body
12.	Passes freely through muscle
13.	Encounters resistance (when it passes through fat/adipose tissue this is called bioelectrical impedance)
14.	When set against height and weight, % body fat can be calculated
15.	Skinfold Measures
16.	Skin fold callipers are used (not pinchers/grabbers)
17.	These measure (in millimetres) the (subcutaneous) fat below the skin

18.	At selected sites on the body/these sites can vary/more detailed tests use more sites
19.	but common sites include triceps/biceps/subscapular/suprailiac (regions of the body)
20.	Sites can be gender specific/fat is distributed differently in males and females
21.	The sum of these skin folds is used to estimate % body fat
22.	Bod Pod
23.	Fitted clothing must be worn by subject/hair covered (in swim cap)
24.	Weight of subject is measured
25.	BodPod is calibrated
26.	Subject sits inside the BodPod
27.	Twice/for 50 seconds
28.	Test results can be printed from the computer

Calculate the BMI of an 80kg adult who is 2m tall. Describe 3 effects of obesity on involvement in physical activity.

(5)

### Calculation (sub max 2):

1.	$\frac{80}{4}$
2.	20 (kg/m <sup>2</sup> /BMI)

### Effects (sub max 3):

3.	Increased risk of injury
4.	More load bearing on joints joint pain
5.	Decreased (joint) flexibility/mobility
6.	Likely to tire/suffer fatigue more quickly
7.	Long term stress on the cardio vascular/respiratory system may make exercise dangerous / may be better doing low-impact activities
8.	Ought to seek medical advice before embarking upon any exercise regime
9.	May not wish to get involved in exercise because of the potential for ridicule / lack of confidence

What is meant by the term obesity? To what extent does being obese impact on the health of an individual?

(6)

**Sub max 2 marks (def obesity)**

- 1 a condition where there is excess body weight due to an abnormal accumulation of fat/eating more calories than are used over a period of time
- 2 defined as a body mass index (BMI) of 30 or more

**Sub max 5 marks (how obesity affects health)**

- 3 excess weight makes it more difficult to exercise (as the body has to work harder to carry additional weight)
- 4 contributes to CHD/heart attacks/problems/angina/stroke
- 5 build up of low density lipoproteins (LDL)/cholesterol
- 6 this can lead to development of fatty plaques in arteries / atherosclerosis/arteriosclerosis
- 7 raises risk of cancer
- 8 more likely to develop (type 2) diabetes / overweight people develop insulin resistance / high blood glucose
- 9 develop fatty liver disease/fat accumulates round the liver leading to inflammation
- 10 increases risk of hypertension/high blood pressure/arteries become partially blocked by fatty deposits/narrows lumen of artery/greater peripheral resistance
- 11 develop deep vein thrombosis
- 12 develop respiratory problems, breathlessness/sleep apnoea
- 13 back pain/immobility/lordosis/posture
- 14 joint degeneration/osteoarthritis
- 15 some athletes are considered obese because of high BMI;
- 16 leads to low self-esteem/psychological problems/bullying

What is meant by the term MET? How can knowledge of METs be useful to a performer?

(6)

**Sub max 3 marks – what is meant by**

- 1 MET/metabolic equivalent is a way of expressing energy cost
- 2 is the ratio of the work metabolic rate to the resting metabolic rate
- 3 it estimates the energy cost of an activity by amount of oxygen consumed
- 4 one MET is equivalent to the resting  $\text{VO}_2$  (3.5 ml/kg/min)
- 5 one MET is equal to a specific calorific amount (0.0175kcal/kg/min or 1kcl/kg/hr)

**sub max 2 marks – how it helps the performer**

- 6 low intensity activity will be equivalent to small number of METS (eg walking is 2METS)/high intensity activity higher number of METS/to know how hard they are working
- 7 can calculate the overall energy cost of a training session/workload
- 8 can adjust diet according to the number of calories burned
- 9 can use METS to estimate BMR

State the meaning of obesity and describe how it is measured.

Explain the health implications of being involvement obese and how this affects involvement in physical activity.

Explain how knowledge of energy expenditure and intake can help prevent obesity.

(20)

	<b>Obesity and how it is measured</b>
1	<b>(Obesity / Body composition)</b> <ul style="list-style-type: none"> <li>Relative amount of body fat compared to lean mass</li> <li>Norm Av values; males = 12–18% and females 22–29%</li> <li>Obese values; 20–25% + men and 30–35% + female</li> <li>Obesity described as extreme body fatness.</li> </ul>
2	<b>(Measurement using)</b> <ul style="list-style-type: none"> <li>hydrostatic weighing : water displacement when submerged in water tank</li> <li>skin fold callipers – measured at different sites &amp; fat % calculated</li> <li>bio–electrical impedance ; resistance to an electrical current passing through body calculated fat%</li> </ul> <b>BMI</b> <ul style="list-style-type: none"> <li>weight in kg divided by height in metres squared.</li> </ul>
3	<b>(Body Mass Index)</b> <ul style="list-style-type: none"> <li>BMI between 25–29.9 =overweight</li> <li>BMI over 30 = obese</li> <li>BMI predicts body composition/does NOT directly measure body composition (fat)</li> <li>although simple/practical it is not suitable for athletes with larger muscle mass.</li> </ul>
	<b>Explanation of health implications</b>
4	<b>Increased risk of CHD/vascular diseases</b> <ul style="list-style-type: none"> <li>Arteriosclerosis – hardening of coronary arteries</li> <li>Atherosclerosis – narrowing of coronary arteries</li> <li>Angina – partial blockage of coronary artery</li> <li>Heart attack – larger blockage of coronary artery possibly leading to death</li> <li>Stroke –blockage of artery to/within the brain</li> <li>Hypertension –long term high blood pressure</li> <li>Varicose veins/deep vein thrombosis.</li> </ul>
5	<b>(Others)</b> <ul style="list-style-type: none"> <li>Increased risk of; diabetes/renal/gall bladder disease/increased surgical risk/temperature regulation/cancers/respiratory problems.</li> <li>Shorter life-expectancy</li> </ul>

6	<b>Psychological</b> <ul style="list-style-type: none"> <li>Social stigma/ridicule/staring/bullying of unacceptable body shape/size</li> <li>Negative self image/stress/depression.</li> </ul>
7	<b>Musculo-skeletal</b> <ul style="list-style-type: none"> <li>Overload on joints (especially lower body)</li> <li>Poor posture and alignment leading to;</li> <li>Muscular/joint pain/injuries</li> <li>eg; lower back pain, lumbar lordosis of spine.</li> </ul>
	<b>Effect of obesity</b>
8	<b>Performance in physical activity</b> <ul style="list-style-type: none"> <li>Higher fat %/obesity decreases performance</li> <li>low fat % is a main characteristic of successful performance</li> <li>especially significant in aerobic activity as fat mass needs to be carried wasting energy expenditure inducing earlier fatigue</li> <li>decreases power to weight ratio potential (weight is only valuable if it adds power).</li> </ul>
9	<b>Involvement in physical activity</b> <ul style="list-style-type: none"> <li>physical increased energy expenditure for any given activity</li> <li>increased load bearing on joints/muscles</li> <li>increased risk of injury</li> <li>decreased joint mobility/flexibility economy of movement</li> <li>Low fatigue resistance/lethargy.</li> </ul>
10	<b>psychological</b> <ul style="list-style-type: none"> <li>negative view of anything physical</li> <li>negative view/perception of self and others.</li> </ul>
11	<b>inactivity</b> <ul style="list-style-type: none"> <li>preventing any involvement in physical activity.</li> </ul>
12	<b>other</b> <ul style="list-style-type: none"> <li>under performance in both physical and mental work</li> <li>eg education.</li> </ul>

	<b>Explain how the knowledge of energy expenditure &amp; intake can help prevention</b>
13	<b>increased energy intake</b> <ul style="list-style-type: none"> <li>• increase in food consumption/calories.</li> </ul>
14	<b>decreased energy expenditure</b> <ul style="list-style-type: none"> <li>• inactivity/sedentary lifestyle/lack of exercise.</li> </ul>
15	<b>Obesity</b> <ul style="list-style-type: none"> <li>• occurs as a result of an imbalance between energy expenditure and energy intake</li> <li>• termed a <b>positive</b> energy balance if energy intake exceeds expenditure energy is stored as fat increasing weight.</li> </ul>
	<b>Preventing obesity</b>
16	<b>energy balance</b> <ul style="list-style-type: none"> <li>• <b>negative</b> energy balance needs to be achieved</li> <li>• where energy expenditure exceeds energy intake</li> <li>• increase energy expenditure eg more physical activity</li> <li>• decrease energy intake eg consume less food/calories.</li> </ul>
17	<b>Practical guidance</b> <ul style="list-style-type: none"> <li>• exercise programme for a BAHL/low impact/weight bearing aerobic activity eg swimming/cycling</li> <li>• adopt a more balanced diet/ eg reduced fat/calories</li> <li>• Calculating energy intake eg Calorie counting</li> <li>• Calculating energy expenditure eg RMR &amp; MET's.</li> </ul>

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