

Lesson 5: Anthropometric Measurements and Estimating Energy Requirements

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**PERSONAL NUTRITION
COURSE**



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Let's Recap- Lesson 4

Eating For Energy

- Following a healthy, balanced diet is the first key to improving your energy levels
- It is important to eat regularly and not to leave long gaps between meals
- Breakfast is important for aiding weight loss and for long-term health benefits
- It is important to meet your energy requirements to ensure that you have optimal energy for the day
- Alcohol is a depressant and should be limited in a healthy diet
- Coffee is ok within recommended ranges
- Increasing your energy is easy with small, consistent changes to your diet



Tonight We Will Be Covering:

Anthropometric measurements and estimating energy requirements

- What are the measurements to be aware of
- What do the results mean
- What can you do to improve your health
- How do you carry out the measurements on your self and others
- Introduction to RDAs
- Why do nutrient requirements vary throughout the lifecycle
- How to work out your individual energy requirements



Thanks for your feedback on Twitter

 Shaw Academy retweeted



Callan Fay @CallanFay1 · Apr 23

@shawacademy I would say waist circumference, BMI is too general, it doesn't cater for muscle and body fat etc...

 Shaw Academy retweeted



Jess @jml4383 · Apr 22

@shawacademy Waist Circumference is more important!!
#personalnutrition #healthyliving

 Shaw Academy retweeted

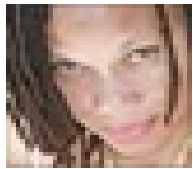


40S-Strong @elkekauder · Apr 22

@shawacademy I think waist circumference is more important than BMI.
Will find out in my next class! Really love my personal nutrition class



Thanks for your feedback on Facebook



Leslie Shaw ▶ **The Shaw Academy**

23 April at 20:46 · Cincinnati, OH, United States · 🌐

Just completed the 4th nutrition class. It has been very informative. To answer the question about BMI vs. Weight circumference. I read a few years ago that the BMI could be misleading especially when it comes to very muscular and athletic people. I would have to say that waste size would be most important. Thanks again The Shaw Academy

1 Like 1 Comment

Risk of NOT knowing these measurements

- May be at serious health risk
- At risk of metabolic syndrome
- Ignorance is not bliss when it comes to your health



What is Anthropometry??

External
measurement
of body
composition

Reflect both
health and
nutritional
status

Widespread and
important role
in assessing
nutritional
status

Can predict
performance,
health and
survival

Measure lean
body mass, fat
stores and body
water



The Scales Don't Tell Us Everything

Scales do not:

- Tell you if your weight is healthy or unhealthy
 - Tell you where your weight is- which is the biggest danger
 - Account for muscle mass
-
- **Never look at one measure in isolation!!**



Anthropometric Measurements

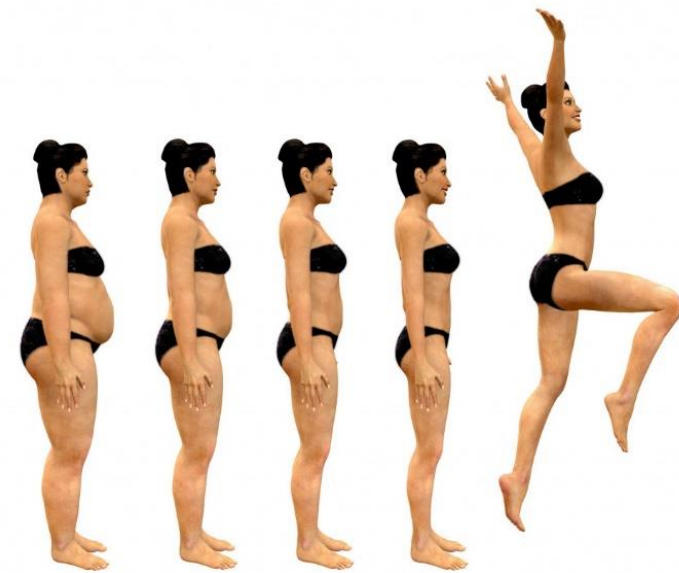


Scales alone does not tell us enough about a person's health

- ❖ % Weight Change
- ❖ Height
- ❖ Adiposity
- ❖ Muscle mass
- ❖ Estimates of body water content and body composition

1. % Weight Change

- A single body weight measurement is not very useful
- Recording weight at regular intervals-beneficial
- Does not differentiate between lean tissue, fat and fluid
- Can identify malnutrition or underlying disorder:
 - ❖ Unintentional weight loss >10% in 3-6 months
 - ❖ Or weight loss >5% in 3-6 month period when starting BMI is <20Kg/m²
 - ❖ >5% weight loss in 6-12months without trying
- Good for setting goals- losing 5-10% body weight is beneficial to health



Benefits of 5-10% Weight Loss

5-10% weight loss is achievable amount that can be kept off for good!!

Lower blood pressure

Improve control of blood glucose levels

Reduce risk of angina

Improve blood cholesterol levels

Ease lower back and joint pain

% Weight Change

$$\text{Weight change (\%)} = \frac{(\text{usual weight} - \text{actual weight}) \times 100}{\text{usual weight}}$$

For example

$$\frac{162\text{lbs} - 124\text{lbs} \times 100}{162\text{lbs}}$$



$$\frac{38 \times 100}{162} = 23.4\% \text{ weight loss}$$



Before

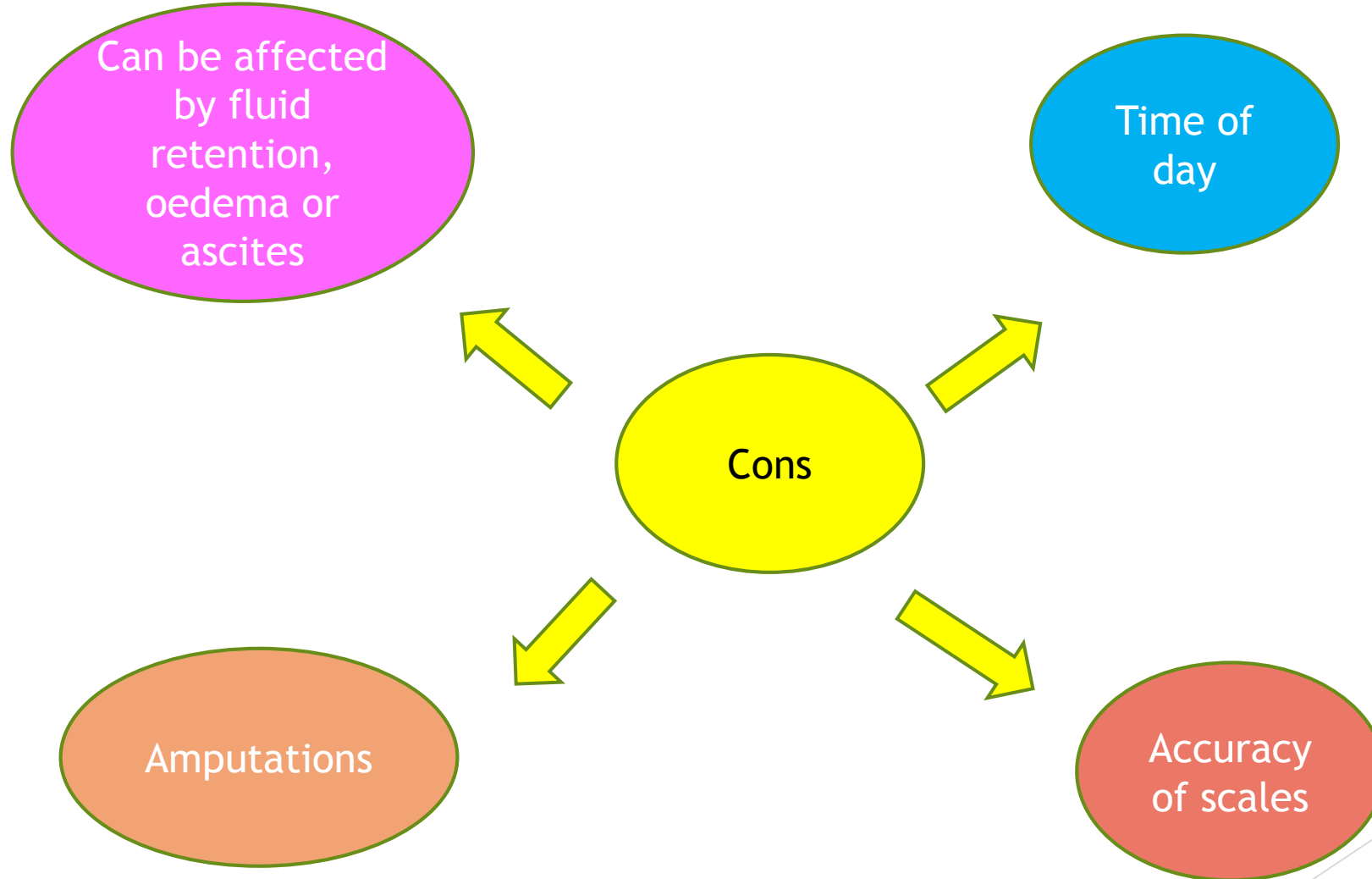
Scale wt.
162 lbs.
Body Fat%
37.92 %
Abdomen
33.5
Fat Mass
61.43

After

Scale wt.
124 lbs.
Body Fat%
24.36 %
Abdomen
27.5
Fat Mass
30.2



Factors Affecting Body Weight

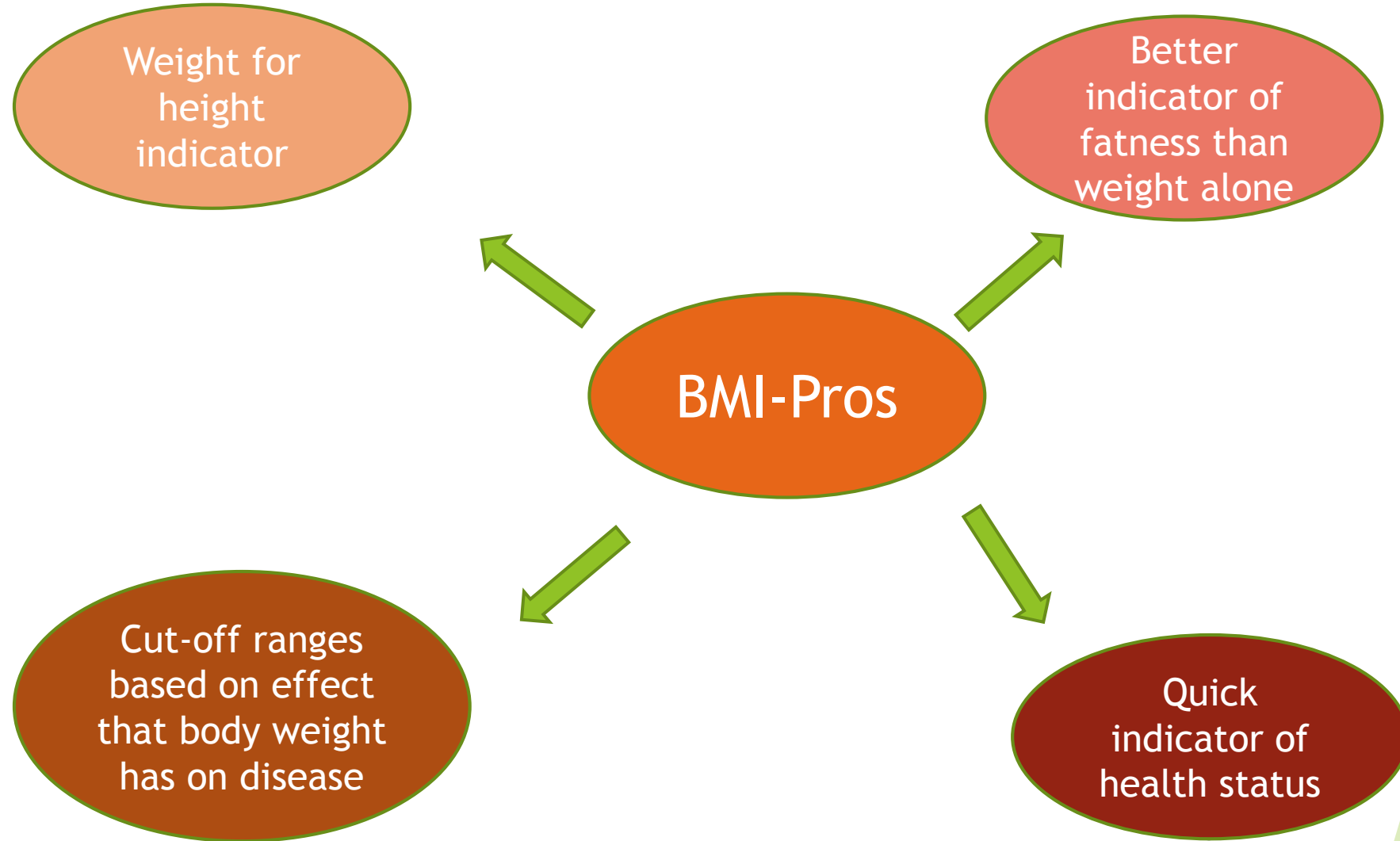


2. Height

- Height can be used to measure BMI
- Best measured using a stand alone stadiometer or one fixed to the wall
- Stand straight
- Heels against the wall
- Head straight
- Lower head plate until it lightly touches the top of head



3. Body Mass Index- BMI



How to Calculate BMI

BMI equation

$$\frac{\text{Weight in kg}}{(\text{Height in m}^2)}$$

e.g. An adult who weighs 64kg and whose height is 1.62m.....

e.g. $\frac{64\text{kg}}{(1.62\text{ m} \times 1.62\text{m})} = 24.3 \text{ kg/ m}^2$ (healthy weight)

**See supplementary materials for BMI calculator*



How To Convert Measurements

- Kilograms = pounds divided by 2.2.
- Pounds = Kilograms x 2.2
- Meters = inches multiplied by .0254.
- Inches = meters / 0.0254
- 1 foot = 12 inches
- 1 stone = 14 lbs or 6.6kg

- Example
- 140lbs = $(140/2.20) = 63.6$ kg
- 5 foot 4 inches = $(5 \times 12 = 60 + 4 = 64 \text{ inches} \times 0.0254 = 1.62\text{m})$

Interpretation of BMI

BMI (kg/m ²)		Weight Categories	Health Risk
WHO	Asian		
30 & above	27.5 & above	Obese	High risk of developing heart disease, high blood pressure, stroke and diabetes
25 to 29.9	23 to 27.4	Overweight	Moderate risk of developing the above diseases
18.5 to 24.9	18.5 to 22.9	Healthy Range	Low risk of developing the above diseases
Below 18.5	Below 18.5	Underweight	At risk of developing nutritional deficiency diseases and osteoporosis

World Health Organisation (WHO); <https://www.who.int/bmi>

BMI	CLASSIFICATION
18.5–24.9	normal weight
25.0–29.9	overweight
30.0–34.9	class I obesity
35.0–39.9	class II obesity
Over 40.0	class III obesity

Is BMI the Answer?



Considered good way to determine if a healthy weight



Does not take into account muscle mass



Quick, simple, effective
Applies to adult men & women



Not a measure of body fatness



Don't have to be **EXACT** weight to be in normal **RANGE**



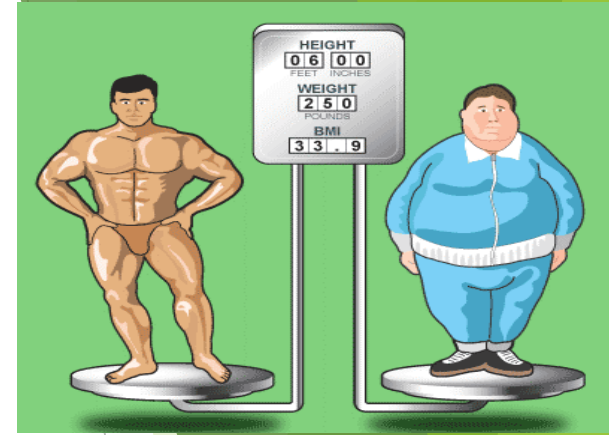
Not appropriate for pregnant women



Good for giving advice to groups of people



Excessive abdominal fat more detrimental to health



4. Waist Circumference

➤ Where you carry your weight is important !!

- Central Obesity or “Apple Shape” - very dangerous to health
- Use along side BMI
- Independent risk factor
- ✓ **High result can indicate risk of:**
 - ✓ **hypertension**
 - ✓ **Dyslipidaemia**
 - ✓ **Type 2 Diabetes**
 - ✓ **CVD**
- Better indicator of health than BMI for elderly people and those of various ethnicities
- Little value when BMI $>35\text{kg/m}^2$
- Very simple and effective



Measuring Waist Circumference

How to Measure

1. Measure at halfway point between lowest rib and hip bone (if you can not find this point measure at the “fattest” part of your tummy)
2. Use a tape measure and measure against skin
3. Breathe out and relax
4. Don't hold the tape tightly around tummy. It should be snug but not tight
5. Record measurements particularly as you lose weight- Motivation!!



Repeat measurement 3 times to get an average

Interpreting Waist Circumference Values

Waist Girth and Health Risk

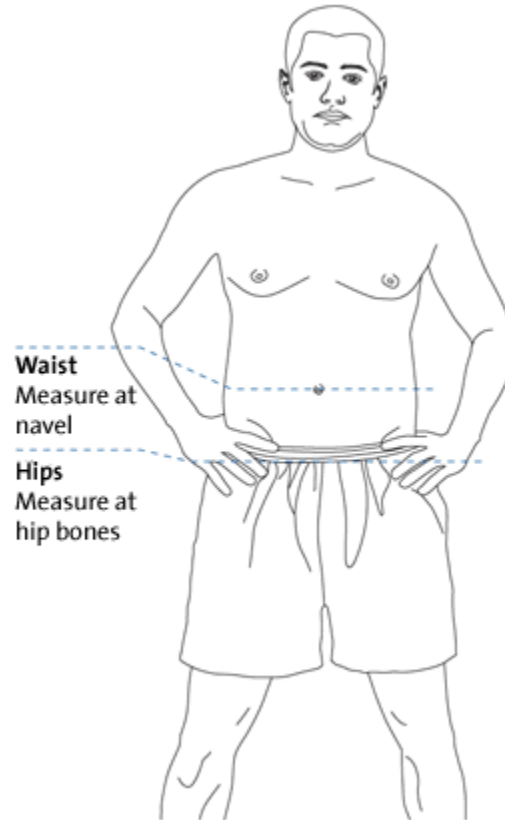
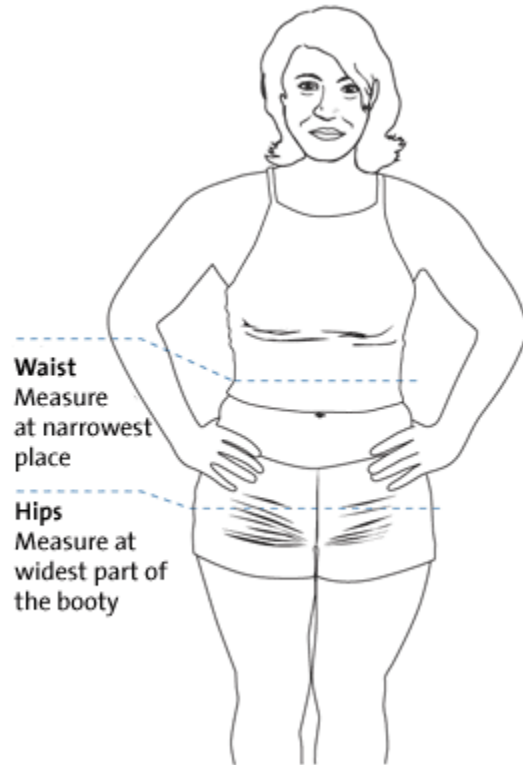
	Men	Women
Normal	78-94cm	64-80cm
Overweight (Elevated Risk)	94-102cm	80-88cm
Obese (High Risk)	>102cm	>88cm



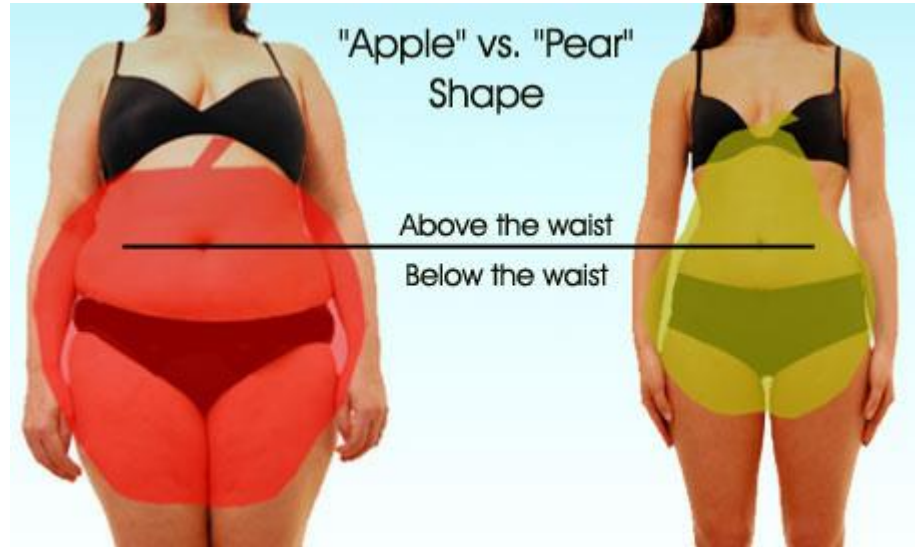
5. Waist To Hip Ratio

How to work it out:

Waist (cms)
Hips (cms)

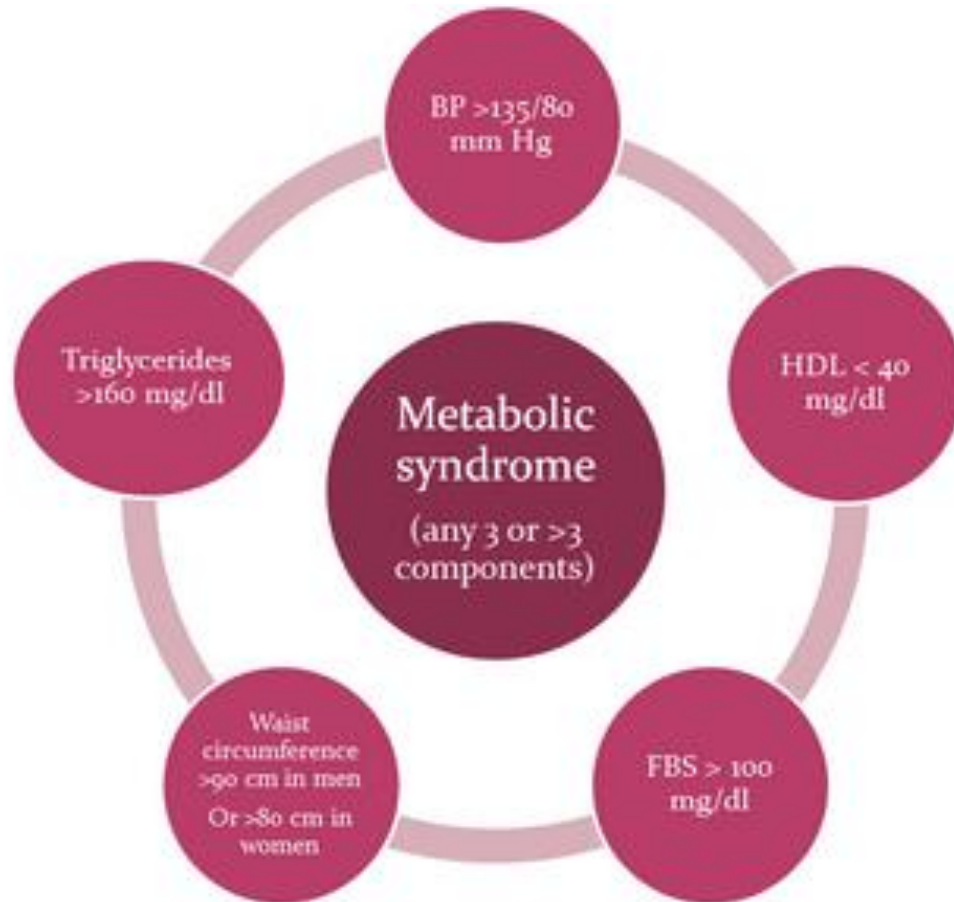


Interpretation Of Waist To Hip Ratio



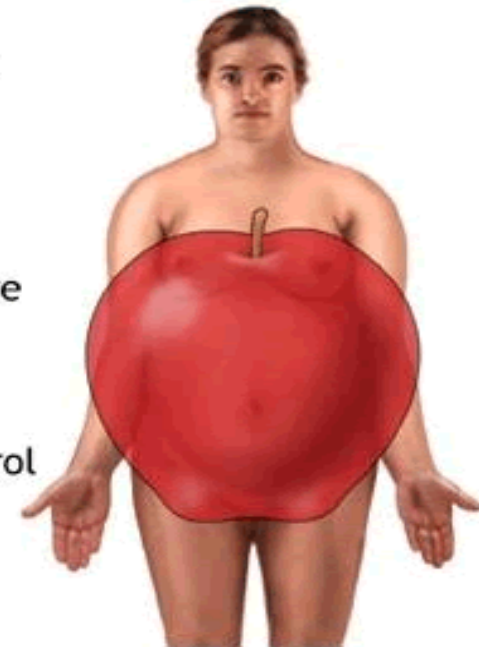
Man	≥ 0.90 cm	Increased Health risk
Woman	≥ 0.85 cm	Increased Health risk

Metabolic Syndrome

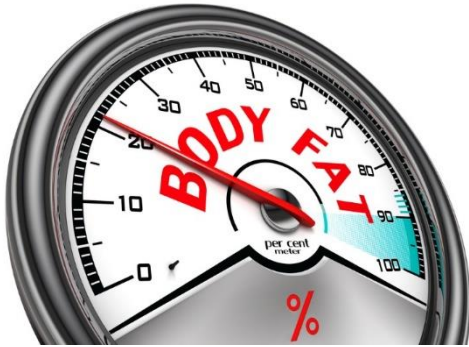


Metabolic syndrome (Syndrome X)

- Central obesity
- High blood pressure
- High triglycerides
- Low HDL-cholesterol
- Insulin resistance



6. % Body Fat



Total fat Mass / Total Body Mass

Body Fat has 2 components

1. Essential
2. Stored

% Essential varies with gender

Women 10-13%

Men 2-5%

Stored Fat accumulates in adipose tissue

Numerous methods to measure

% Body Fat Measurement

Skinfold Thickness



Take measurement from **4 sites**

Repeat each site 3 times to get an average

Site 1: Triceps skinfold

Site 2: Subscapular skinfold

Site 3: Biceps skinfold

Site 4: Suprailiac skinfold

Triceps and Biceps Skinfold

How to measure:

- Non-dominant arm
- Bend at a right angle
- Find mid-point from elbow to shoulder
- Let arm hang loosely
- Grab skinfold at mid-point level on back of arm over triceps muscle or at front of arm over bicep
- Place calipers on the skinfold below where you are grabbing skinfold
- Take reading
- Repeat 2-3 times and record average

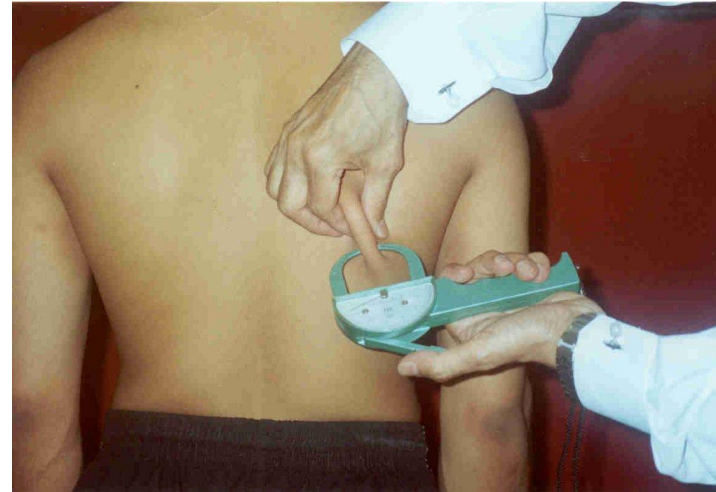


Skinfold Thickness:

Subscapular

Where to measure:

- Across the back, below the shoulder blade



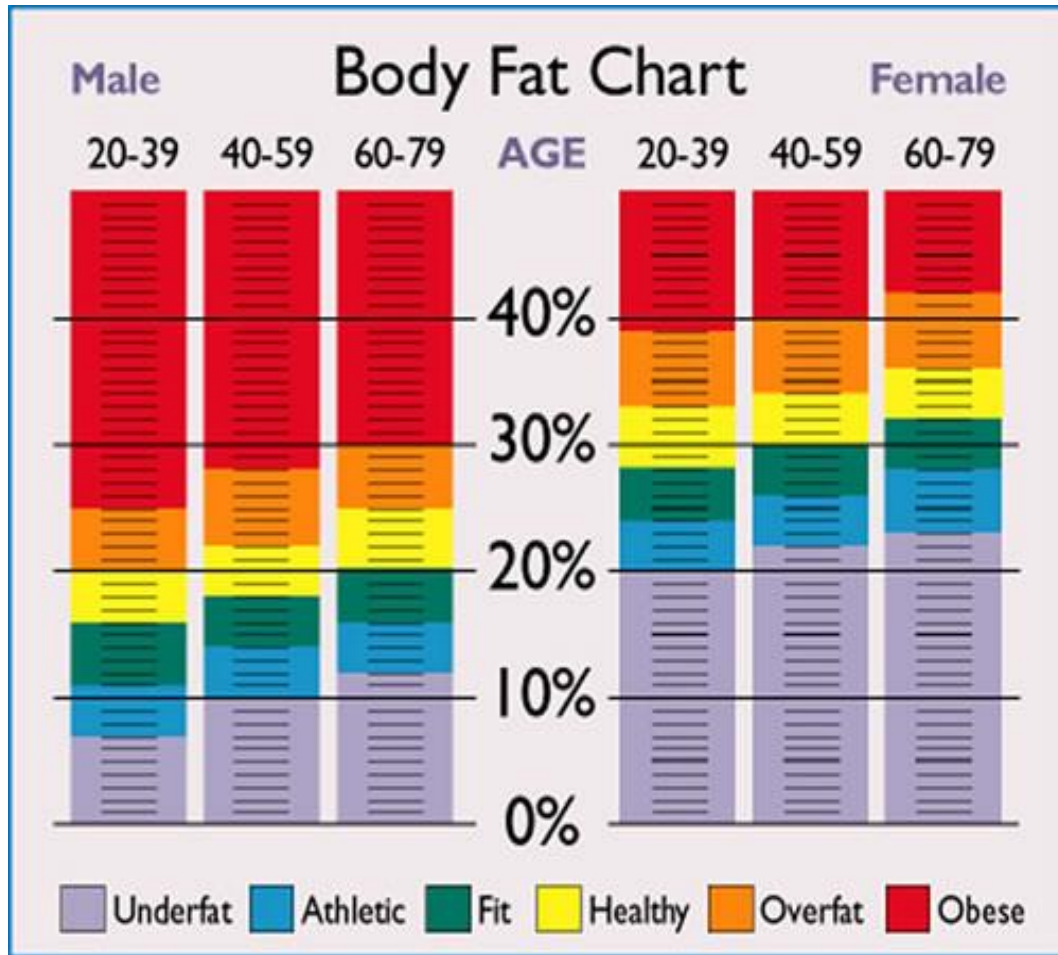
Supra-iliac

Where to measure:

- Grab skinfold just above the hip bone



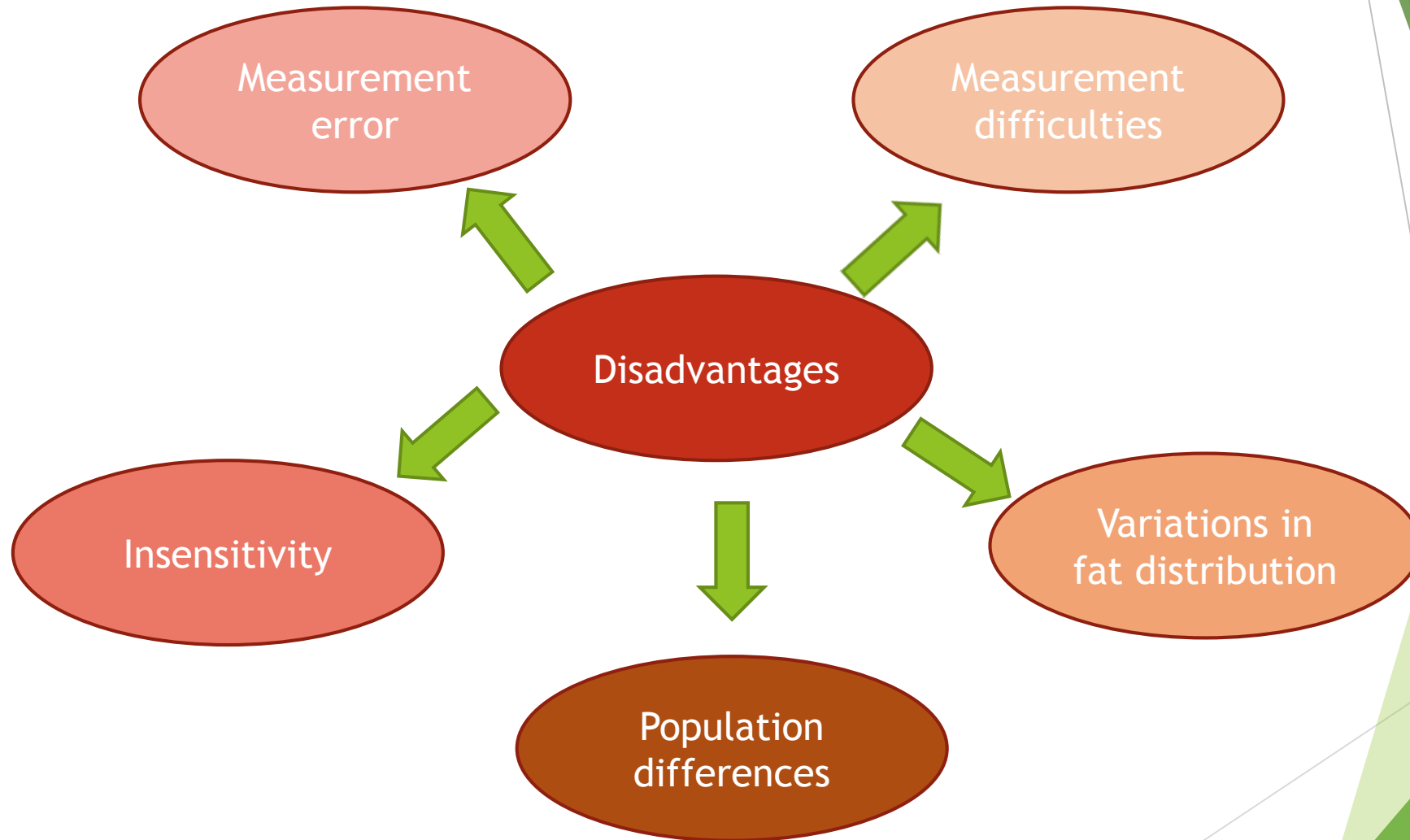
% Body Fat Chart



General Body Fat Percentage Categories

Classification:	Women:	Men:
Essential Fat	10 - 12%	2 - 4%
Athletes	14 - 20%	6 - 13%
Fitness	21 - 24%	14 - 17%
Acceptable	25 - 31%	18 - 25%
At Risk	32% plus	25% plus

Skinfold Thickness: Disadvantages



Energy requirements

The unit of energy is the kilojoule (kJ) or mega joule (1 MJ = 1,000 kJ)
4.18 kilojoules are equal to 1 kilocalorie.

A graphic with a dark blue background. At the top, the text "ENERGY NEEDS..." is written in large, white, bold, sans-serif capital letters. Below this, a wind turbine is shown in silhouette against a lighter blue sky, with its blades blurred to indicate motion. At the bottom, the text "What Are Your Calorie Requirements?" is written in white, sans-serif font.

What Are Your Calorie Requirements?

Age	19-50 years		51+ years	
Gender	Men	Women	Men	Women
Activity Levels	Kcal			
Active	2400-2800	2000-2200	2200-2400	1800
	Kcal			
Sedentary	2000	1800	2000	1600

Basal Metabolic Rate

45-70% of daily energy expenditure

Synthesis, secretion and metabolism of enzymes and hormones

Maintenance of body temperature

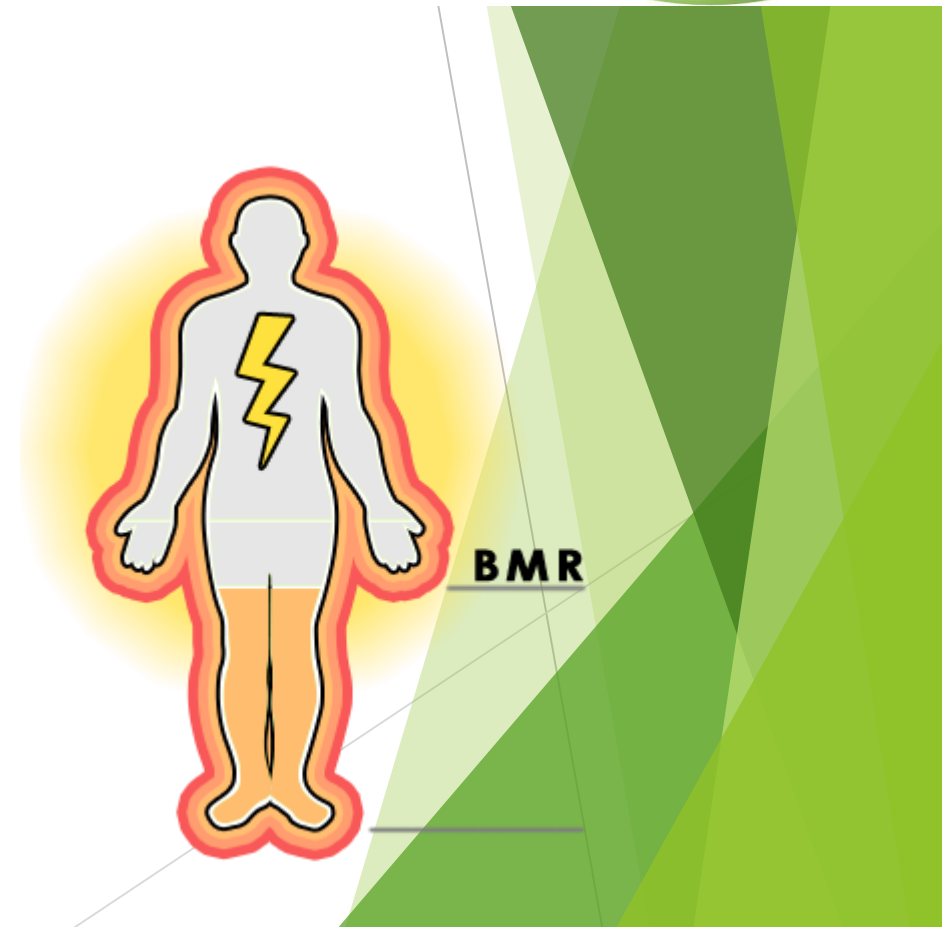
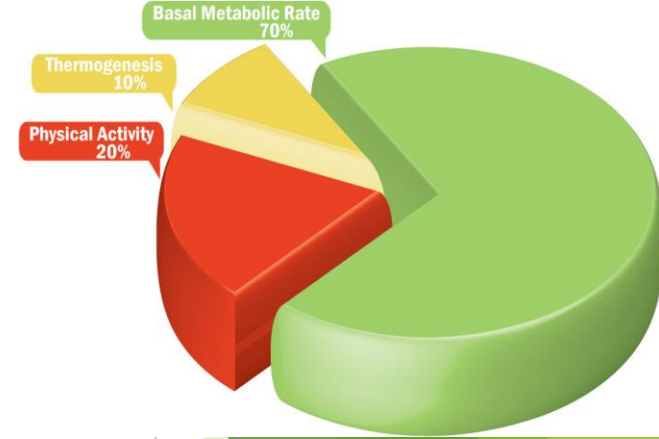
Brain function

Work of cardiac and respiratory muscles

Cell function and replacement

Factors Which Affect Energy Requirements

1. Metabolic response to food- ingestion, digestion, absorption, transport
 - ❖ Dietary induced thermogenesis 10% of energy expenditure
2. Physical activity- varies the most
3. Growth- varies throughout lifecycle



Estimating Energy Requirements

Helps to
achieve and
maintain a
healthy weight



Sufficient
vitamins and
minerals
provided

Sufficient
intake of
macronutrients

Provide all the
benefits of
good energy
levels

Schofield Equation



- Most commonly used for estimating energy requirements
- Use age, gender and weight to predict BMR
- Original equation derived on a study of 5000 healthy adults

- Method
 - 1. Estimate BMR using appropriate equation
 - 2. Multiply by a PAL factor for exercise
 - Add or subtract 400-1000calories/day to increase or decrease body weight

Schofield Equation: Estimate BMR

****Reference table to calculate BMR by age and gender***

Age Range	BMR (Kcal/24 hours)	
Years	Males	Females
10-17	$(17.7 \times \text{kg body wt}) + 657$	$(13.4 \times \text{kg body wt}) + 692$
18-29	$(15.1 \times \text{kg body wt}) + 692$	$(14.8 \times \text{kg body wt}) + 487$
30-59	$(11.5 \times \text{kg body wt}) + 873$	$(8.3 \times \text{kg body wt}) + 846$
60-74	$(11.9 \times \text{kg body wt}) + 700$	$(9.2 \times \text{kg body wt}) + 687$
75+	$(8.4 \times \text{kg body wt}) + 821$	$(9.8 \times \text{kg body wt}) + 624$

**Taken from Manual Dietetic Practise*

What is your PAL?

Sedentary or light activities:

Sedentary occupation and lifestyle-
Eating, Sleeping, Working, Cooking
Sitting



Men and
women 1.4

Active or moderately active:

sedentary occupations but do
regular physical activity 1 hour



Women 1.6
Men 1.7

Vigorous active lifestyles:

Regular strenuous work or leisure
activity for several hours



Women 1.8
Men 1.9

Calculate Energy Requirements

Your daily Calorie Intake = Your BMR x Your PAL value

EXAMPLE

28 year old woman weighs 65kg

BMR equation (14.8 x kg body wt) + 487

(14.8 x 65kg) + 487 = 1, 449 Kcals

She is moderately active- **PAL 1.6**

BMR (1,449) x PAL (1.6) = 2,318Kcals/ day

She wants to lose 1lb a week

2,318Kcals -500Kcals = 1,818Kcals/ day to lose 1 lb a week

Schofield And Obesity

- Schofield equation tells you how many calories you need to eat to maintain current weight.
- This is not the desired result where $BMI > 30 \text{ kg/m}^2$
- Tend to overestimate requirements where $BMI > 30 \text{ kg/m}^2$
- May precipitate the metabolic effects of overfeeding such as hyperglycaemia and respiratory distress (NICE 2006)
- For $BMI > 25 \text{ kg/m}^2$ minus 400-1000Kcals to encourage a decrease in energy stores and obtain a healthy weight
- **Remember to re-evaluate energy requirements as you lose weight**



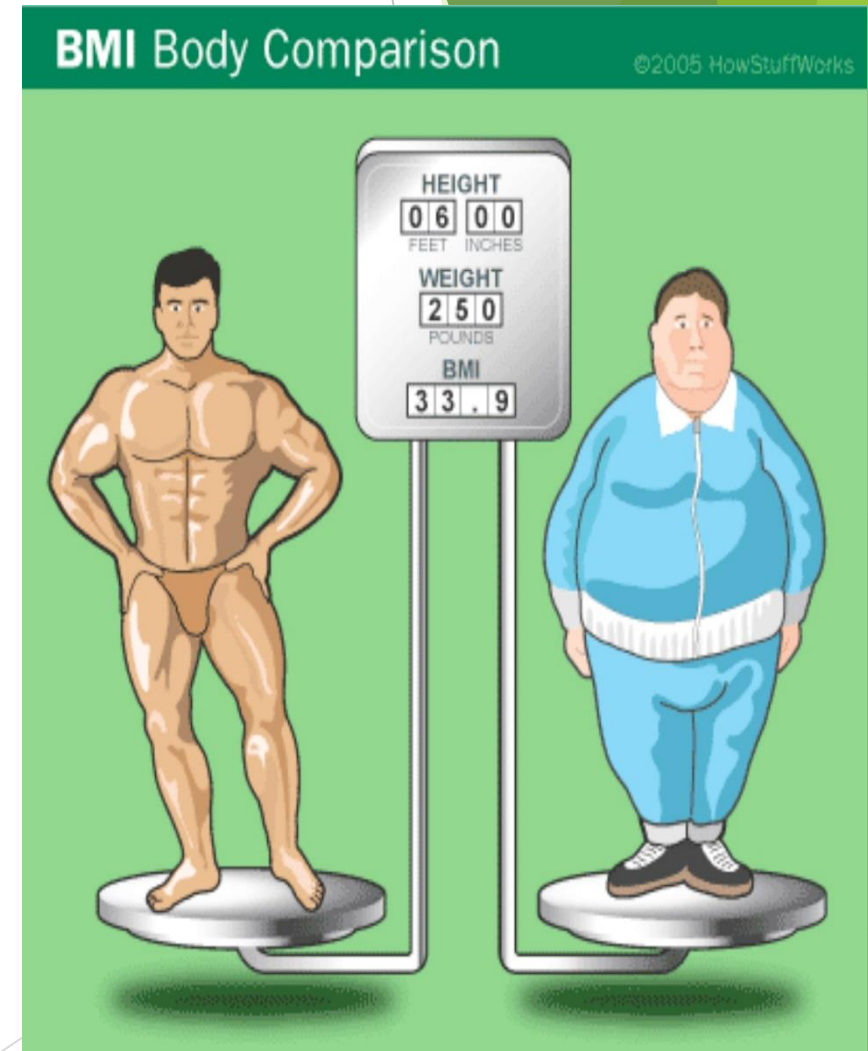
In Conclusion

- Anthropometric measurements help us to determine if a person is a healthy weight and body composition
- Anthropometrics assess weight, height, adiposity and fluid mass
- Measurements you can do at home are % weight change, BMI, Waist to hip circumference and skinfold thickness
- Waist circumference is the best indicator of Metabolic Syndrome
- Having Metabolic Syndrome increases your likelihood to develop Type 2 Diabetes and CVD
- You can estimate your energy requirements using the Schofield equation
- Weight loss should be accounted for if $BMI > 25 \text{ kg/m}^2$



Rewards and Benefits

- Now you know how to determine if your body shape and weight is healthy or unhealthy
- Now you can carry out these measurements yourself!
- You can now determine your body shape
- You should now begin to understand that weight loss is not achieved overnight
- You now know that your nutrient intake needs to be adjusted as you go through the life cycle
- Now you have the power to help yourself!



Next Steps

- **Try attend all of the sessions live and see your knowledge grow**
- Please complete assignment 5
- Recordings are uploaded within 24 hours of the completion of each live session
- Remember to attend live to be in with a chance to win a free advanced course worth €2,500 - announced at lesson 8



What is Next- Lesson 6??

- Weight loss and Fad diets
- Paleo diet
- Atkins diet
- Intermittent fasting diet
- Very low calorie diet
- Learn how to lose weight and keep it off



Follow Us on Twitter for Updates

Let us know- would you recommend a fad diet to someone who wanted to lose weight??

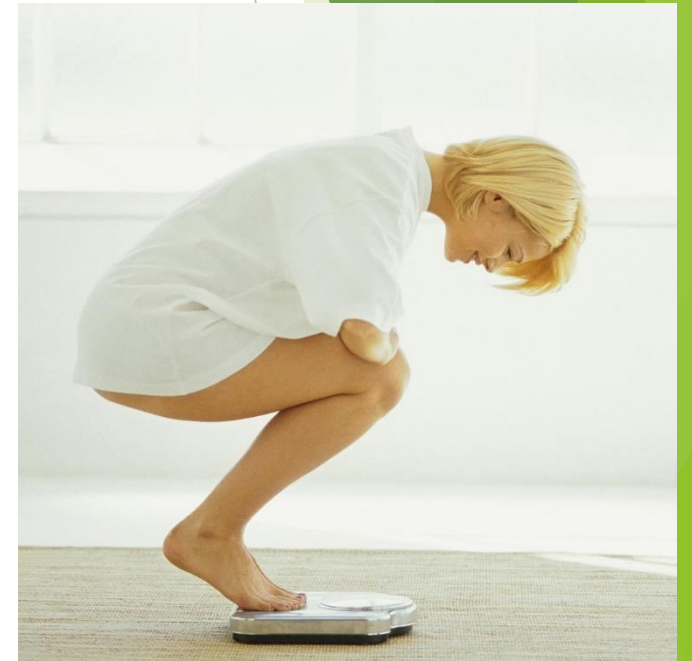
If so, why?

Interact with your fellow students

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Stay involved with the Shaw Academy and your programme of study

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Or my direct dial 00353766036424

Next lesson:

Lesson 6
Weight loss and
fad diets

Wednesday at
7pm GMT



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Keep Learning!



Further reading

World Health Organisation: Waist to hip ratio

http://apps.who.int/iris/bitstream/10665/44583/1/9789241501491_eng.pdf

Schofield equation:

<http://www.fao.org/docrep/007/y5686e/y5686e07.htm>

Anthropometric Measurements

<http://www.cdc.gov/nchs/data/nhanes/nhanes3/cdrom/NCHS/MANUALS/ANTHRO.PDF>

American Heart Association- Metabolic Syndrome

http://www.heart.org/HEARTORG/Conditions/More/MetabolicSyndrome/Metabolic-Syndrome_UCM_002080_SubHomePage.jsp

Jackson & Pollock Body Fat Equations

<http://www.topendsports.com/testing/density-jackson-pollock.htm>

FAO- Human Energy requirements- Schofield equation

<http://www.fao.org/docrep/007/y5686e/y5686e07.htm>