

TOPIC

Nutrition

Lesson & location

Lesson - Classroom

Activities to be completed in this class

| Day 1 | | Day 2 | |
|----------------------------------|-------------|-------------------------------------|-------------|
| | <i>Mins</i> | | <i>Mins</i> |
| Foreword - Nutrition in Practice | 15 | | |
| General principles | 30 | Body Composition | 30 |
| A balanced diet & roleplay | 30 | Roleplay - WORKSHEET Part 1 | 45 |
| Break | 15 | Break | 15 |
| Diet Trends & Signs of nutrition | 30 | Body Image | 30 |
| Nutrients | 15 | Dietary Advice | 30 |
| Break | 15 | Break | 15 |
| Roleplay - WORKSHEET Part 1 | 30 | Roleplay - Provide nutrition advice | 45 |
| Chronic disease & Nutrition | 30 | | |

→ If there is any free or spare time students will be given option to work on case study or assignments

Foreword ~ Nutritional advice in practice

As part of this Certificate III of Fitness program, students are required to conduct and record details of providing a personal training service, over a period of time, with 3 of their own clients.

Within the case study students will be required to demonstrate they are able to provide basic nutritional information and advice to 3 clients, who have no dietary or nutritional concerns.

This lesson will help you complete this aspect of your case study.



Your student textbook Chapter 2 deals with Providing nutrition advice to clients in accordance with recommended guidelines and is another good resource for students.

Reading

Fundamental Principles of Healthy Eating

Just like a car, your body needs optimum fuel for its best performance and longevity.

What you eat and drink does matter both now, for maximum energy and comfort, and later, to help reduce the risk of certain diseases.

Here is a checklist of healthy eating principles:

- Maintain a healthy, balanced diet to maintain a healthy and active lifestyle
- Eat a wide variety of healthy, nutritious foods to suit your life stage
- Maintain your correct bodyweight by keeping physically active and eating according to your energy needs
- Keep a balanced diet with variety of foods
- Keep diet low in saturated fat and cholesterol
- Have a moderate intake of refined sugars
- Have a moderate intake of alcohol
- Ensure standard meal size
- Ensure standard meal frequency
- Spread of kilojoules over day
- Maintain a positive relationship between energy intake and energy expenditure
- Follow recommended intake of nutrients and relative proportion of nutrient intake



Discussion

Discuss each of these bullet points and discuss positive and negative examples of each. Example:

Principle of healthy eating : Keep balance diet with variety of foods

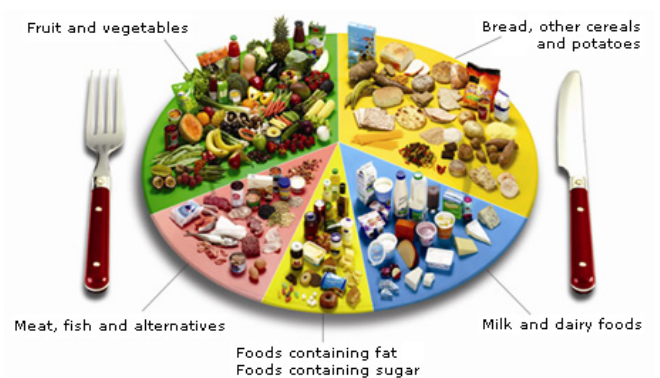
Positive example : eating food from all food groups, following guidelines

Negative example: undertake a fad diet with emphasis on heavy protein eating

The general features of balanced nutrition and diet

So what is a balanced diet?

- energy balance
- recommended daily intake of nutrients
- fuel for exercise
- fuel for minimising post-exercise fatigue and maximising recovery
- hydration levels
- Healthy eating should consist of a variety of foods from each food group:
 - Fruits and vegetables
 - Breads and cereals
 - Milk & milk based products (e.g. yoghurt)
 - Fats
 - Meats & meat alternatives





Role-play

Provide nutrition advice to clients

Students to work individually.

First read through the article – “**Dietary guidelines for healthy eating**”

Now consider your own diet.

Look through the 13 suggested *Dietary Guidelines for Australian Adults* listed in the article. For each guideline record:

- a) If you feel you do or do not meet these guidelines with your own dietary habits.
- b) Explain why in each case

Write notes and answers down. You will need to share these ideas in class for a peer and trainer review.

Dietary Trends

There is always strong trends in nutrition, that are not always good or positive for your clients.

Some of these can include:

‘Fad’ diets and ‘popular’ diets

There's never a shortage of new diet trends aimed at helping people lose weight.

There has been a strong recent trend for “ low-carb” diets. Some newer diet trends include:

- Whole-health diets.
- Back-to-basics eating plans.
- Exotic dietary influences.

Nutritional supplementation and ergogenic aids

A dietary supplement, also known as food supplement or nutritional supplement, is a preparation intended to provide nutrients, such as vitamins, minerals, fiber, fatty acids or amino acids, that are missing or are not consumed in sufficient quantity in a person's diet.

Some countries define dietary supplements as foods, while in others they are defined as drugs.

They can be taken for health reasons, athletic performance, fitness or weight loss.

The term ergogenic aid refers to a substance that can increase the capacity for bodily or mental labor, especially by eliminating fatigue symptoms.

Nutritional ergogenic aids refer to substances that enhance performance and are either nutrients, metabolic by-products of nutrients, food (plant) extracts, or substances commonly found in foods (e.g., caffeine and creatine) that are provided in amounts more concentrated than commonly found in the natural food supply.

Companies selling ergogenic aids often target different athlete populations, with some focusing on strength and power sports while others focus on improving aerobic endurance.

The fitness industry has an almost never-ending array of products in this category. Athletes should carefully consider the adequacy of their own diets before attempting to use ergogenic aids.

Signs of good and bad nutrition

Signs of Good Nutrition

- ✓ Healthy, shiny looking hair
- ✓ Clean skin and bright eyes
- ✓ A well-developed, healthy body
- ✓ An alert facial expression
- ✓ An even, pleasant disposition
- ✓ Restful sleep patterns
- ✓ Healthy appetite
- ✓ Regular elimination habits
- ✓ Appropriate body weight

Signs of Poor Nutrition

- ✗ Hair and eyes appear dull
- ✗ Irregular bowel habits
- ✗ Weight changes
- ✗ Osteoporosis and other diseases
- ✗ Lack of interest - mental slowdown
- ✗ Skin color and appearance poor

Nutrients

Nutrients are essential for our body to function.

The four classifications of nutrients include:

- **Fats** - provide energy, help body use certain vitamins, conserve body heat and protect organs from injury
- **Proteins** – build and repair tissue
- **Carbohydrates** - provide energy and fiber that help in bowel elimination
- **Vitamins and Minerals** - ingested through food and are necessary for carrying out and maintaining specific body functions

Note water is a solvent for nutrients and metabolic waste products. Key facts about water are:

- Found in all body tissue
- Essential for digestion of food
- Makes up most of blood plasma
- 6 to 8 glasses necessary per day
- Has no caloric value



Role-play

Nutrition WORKSHEET

Students to work individually.

Using resources available – lesson notes, handouts, text book – complete the first page of your nutrition WORKSHEET.

You will need to share your answers in class for a peer and trainer review.

Chronic disease & Nutrition

There is a strong connection between Nutrition and good health.

Chronic disease is widespread in the western world and factors which may contribute to many chronic diseases include:

- Making poor food choices
- Leading a sedentary lifestyle

This section will review some common chronic illnesses:

Coronary heart disease

Coronary heart disease is a disease of the arteries of the heart.

It is caused by a build-up of fatty deposits in the lining of the walls of arteries – a process known as atherosclerosis.

These fatty deposits can thicken, calcify and narrow the arteries not allowing enough blood flow. A blood clot can form at these plaques, abruptly stopping the flow through them resulting in no oxygen to the heart causing damage.

Atherosclerosis often runs in families, it's more common in people who smoke, have hypertension, are overweight, are diabetic, or have high levels of cholesterol in their blood. It is more common in men over the age of 45, and in both sexes over the age of 70.

Hypertension

Hypertension is the technical term for high blood pressure.

High blood pressure can cause gradual damage to many body organs. It is one of the causes of stroke, heart disease, and kidney failure.

High blood pressure often runs in families, it's more common in older people and in people who: are obese, don't exercise, eat a diet high in salt and saturated fat, drink a lot of alcohol.

Many people who have it not know they have it. Early detection and treatment can mean less damage

Treatment is usually simple and effective - by changing lifestyle habits or by taking medication to lower pressure.

Obesity

Obesity is an accumulation of excess body fat so as to have an adverse affect on health. Fat is deposited on our bodies when the energy (kilojoules) we consume from food and drink is greater than the energy used in activities and at rest. Small imbalances over long periods of time can cause you to become overweight or obese.

It is most commonly caused by a combination of excessive dietary calories, lack of physical activity, and genetic susceptibility.

It increases the risk of many diseases such as heart disease, type 2 diabetes, breathing difficulties during sleep, certain types of cancer, and osteoarthritis.

The primary treatment for obesity is dieting and physical exercise. If this fails, anti-obesity drugs may be taken to reduce appetite or inhibit fat absorption. In severe cases, surgery is performed or an intragastric balloon is placed to reduce stomach volume and or bowel length, leading to earlier satiation and reduced ability to absorb nutrients from food.

Obesity rates in Australia have more than doubled over the past 20 years. Around seven million Australians are now overweight or obese. Estimates taken in the year 2000 suggest that, while more men are overweight than women (67 per cent compared to 52 per cent), obesity is more common among women (22 per cent) than men (18 per cent).

Stroke

A stroke occurs when an artery in or near the brain is either blocked - cutting blood supply to brain tissue - or bursts, causing a bleed.

The damage to the arteries is caused by a build-up of fatty deposits in the lining of the walls of arteries, which can also lead to heart attack.

If a blood clot (called a thrombus) forms at the site of the plaque – due to clumping of sticky particles in the blood called platelets, as well as red and white blood cells – it can block the artery altogether. If it's severe and sudden enough, the brain tissue normally supplied by the artery can die from lack of oxygen. This is called a thrombotic or ischaemic stroke

The effect of the stroke depends on where in the brain the damage is located, and how much damage there is. Different parts of the brain have different functions, so the loss of a particular part means the loss of those particular functions.

The earlier a stroke patients gets to a hospital the better - the earlier they get there, the more effective treatment will be.

Treatment will vary depending on the type of stroke

Bowel Cancer

Bowel cancer usually begins in the lining of the colon or rectum. If untreated, it spreads deeper into the bowel sometimes spreading to other areas

The causes of bowel cancer are not clearly understood. However, the following risk factors make it more likely that a person will develop bowel cancer:

- Getting older – bowel cancer more commonly affects people over 50
- A personal or strong family history of bowel cancer
- Having ulcerative colitis (inflamed colon lining) for more than 8 to 10 yrs

Common symptoms are blood or mucus in the faeces, an unexpected change in bowel habit (e.g. diarrhoea or constipation for no obvious reason), general discomfort in the abdomen (feelings of

bloating, fullness and/or cramps), constant tiredness, weakness and paleness. In the early stages, bowel cancer may cause no symptoms.

To reduce your risk of bowel cancer:

- Eat a healthy diet - plenty of fruit & veges, limit animal fat
- Maintaining a healthy body weight
- Exercising regularly
- Not smoking

Surgery is the main treatment for bowel cancer

Diet and the management of body composition

Body composition is the percentage of your body make-up such as fat, lean muscle, bone and water content.

Body composition can be measured to give an indication of fitness and health. It is an evaluation process used to determine the *ratio* of the body fat against lean body mass.

Results aid in establishing individual nutrition and exercise programs.

It can be measured in many different ways including:

- Body Mass Index (BMI)
- Skin Fold
- Underwater weighing
- Electrical impedance
- 'ideal weight' — height/weight charts
- girth ratios such as waist/hip ratio, waist/height ratio

(Note these are explored in detail during fitness programming lessons)

Diet and Body Composition

Along with exercise, diet plays strong role in the management of body composition. Some key concepts include:

- Body composition maintenance should involve healthy eating and a physically active lifestyle
- Obesity can be avoided if kilojoule intake does not outweigh kilojoule expenditure
- The Heart Foundation and other leading authorities recommend at least 30 minutes of moderate-intensity physical activity on all or most days of the week
- An exercise program that includes resistance training will help improve lean body mass.
- Increasing metabolism will increase energy expenditure

Energy intake is refers to the amount of kilocalories per day that an individual consumes. Energy expenditure is the amount of energy, measured in calories, that a person uses e.g. during a particular activity or even just resting.



Reading

Read article – ***Kilojoules and calories explained***

Metabolism and metabolic rate

Metabolism is the the chemical activity that occurs in cells in our body. These processes require energy from food.

The amount of kilojoules (kJ) your body burns at any given time is regulated by your metabolism. You can't control your metabolism, but you can make it work for you when you exercise.

Your metabolic rate is the speed at which the body uses energy.



Read article – *Metabolism Explain*

Reading

Thermogenesis explained

Thermogenesis is the process by which the body generates heat, or energy, by increasing the metabolic rate above normal.

This rise in metabolic rate is referred to as the thermogenic effect, thermogenic response, or specific dynamic action (SDA).

Thermogenesis is activated by a few different mechanisms, including supplements, nutrition, exercise, and exposure to cold. Thermogenesis boost the body's metabolic rate, causing your body to burn calories faster plus curb the appetite.

Depending on whether they are initiated through locomotion and intentional movement of the muscles, thermogenic methods can be classified as one of the following:

- Exercise-associated thermogenesis (EAT)
- Non-exercise-associated thermogenesis (NEAT)
- Diet- induced thermogenesis (DIT)

Additional nutritional requirements when exercising

Do you have a client who is undertaking high level of training i.e. an athlete?

Then you should note daily dietary intake recommendations do not apply to athletes - they apply to sedentary people.

Persons who exercise will need to ensure adequate dietary intake above these guidelines.

Vitamin intake - Since most athletes ingest adequate amounts of calories, vitamin and mineral supplementation is only needed in special situations. A vegetarian or someone allergic to milk may need a supplement to make up for foods missed in the diet. Many athletes take megavitamin supplements, but there is no scientific study showing vitamin intake in excess of the Recommended Daily Allowance (RDA) will significantly enhance performance.

Because everyone is different e.g. training schedules, body type etc persons who exercise should always consult a dietician about their individual requirements



Role-play

Nutrition WORKSHEET

Students to work individually.

Using resources available – lesson notes, handouts, text book – complete the second page of your nutrition WORKSHEET.

You will need to share your answers in class for a peer and trainer review.

Body Image Issues

What is body image?

Your body image is how you think and feel about your body.

Body image involves your perception, imagination and emotions. It does not necessarily reflect what you see in the mirror or what other people see.

Keep in mind that your weight and body composition are determined by a number of factors. Some of these factors (such as your calorie intake and level of physical activity) can be manipulated. But other factors (such as your body type, bone structure, the way you store fat, and other genetic variables) cannot be manipulated.

Most people simply lack the raw materials to build the “ideal” body, regardless of how strict they are with their eating and exercise regimens.

Poor Body Image

Poor body image is often linked to dieting or eating disorders such as anorexia nervosa, bulimia and binge eating.

Our body image may not be accurate. Many people think they are overweight when they are not.

Some people think they are overweight when they are not. Here are some statistics:

- 45 per cent of women and 23 per cent of men in the healthy weight range think they are overweight.
- At least 20 per cent of women who are underweight think that they are overweight and are dieting to lose weight.
- Body image has some cultural links – for example, some research shows that Asian women, after moving to Australia, take on body image and diet habits that are not common in their own countries.

Body image and diets

Australians spend up to one million dollars a day on fad diets that have little effect on their weight. Even if you remain on a weight loss program, it is likely that you will regain your weight.

Dieting affects your health and your mental state. Women who diet frequently are more likely to:

- Binge eat

- Purge food (vomit)
- Restrict food intake too much
- Over exercise
- Have poor health
- Become depressed
- Develop an eating disorder such as anorexia nervosa or bulimia.

Poor body image - how to recognise it and what to do

As a fitness professional you will need to be able to recognise indicators of poor body image and discuss body satisfaction with clients, providing referral to an appropriate health professional, if required.

If your client has poor body image here are some strategies:

- De-emphasize weight measurements. Weight isn't the best indicator of health or fitness. Your eating habits, exercise patterns, and other lifestyle choices are more important.
- Explain to your clients there is no such thing as one "ideal body weight" based on your height. Each one of us has a healthy weight based on our body type, bone structure, muscle mass, genetics, what weight we feel our best at, and what weight our body tends to want to maintain at.
- Explain there is a physiological limit to how muscular you can get naturally. Many of the supermuscular male bodies you see in the media are just the products of drugs. It is not possible to be that muscular and that lean without chemical assistance.
- Think personal best - instead of thinking of a "limit" refer to it as your personal best.
- Suggest they invest time and money in yourself, rather than the diet and supplement industry. Spend your extra money on flattering clothes, fitness equipment, haircuts, massages, and other personal indulgences--not on diets.
- Tell clients to stop comparing yourself to others.
- Move and enjoy your body. In addition to training, tell client to go and enjoy their increased fitness by playing sport, dancing, etc.
- Suggest your client surrounds themselves with people who have a healthy relationship with food, weight, and their bodies. It will make a difference in how they feel about themselves.
- Reclaim your own inner strength. Focus on the unique qualities and personality traits that make them a special and successful person.
- Examine the degree to which self-esteem depends upon your appearance. Although it may seem natural to wish you looked like a fashion model or a body builder, basing your happiness on this desire may lead to failure. Unrealistic goals can prevent you from exploring ways to enhance your life.
- Develop a positive attitude to food and eating. For those who are or have ever suffered from an eating disorder, attitudes towards food can be very important and at times extremely negative and misplaced. It is imperative for these people and those who are beginning to have an unhealthy relationship with food to understand the role it plays in life and how to achieve a happy association and a positive attitude towards it

Provide dietary recommendations

When providing dietary advice as a fitness trainer, your advice must be *general*.

Unless you have had adequate training it is always best to recommend that your client see a dietician.

Understanding limitations in providing nutritional information

As a fitness trainer you will need to become familiar with the clients current nutritional intake and physical activity. In other sections this course you will be learning about client screening and questionnaires to obtain this information. It is also important,

- A fitness trainer has limitations when it comes to offering nutritional advice
- The advice you give should always be based on the general guidelines that are consistent with the current recommendations published by the Commonwealth Ministry of Health
- Nutritional information should be limited to the fundamentals of good nutrition and health

EXAMPLE: If a client wants to reduce body fat levels?

Suggesting to reduce body fat include:

- ✓ See their doctor or a dietitian
- ✓ Reduce saturated fat intake
- ✓ Reduce salt intake
- ✓ Reduce intake of processed foods
- ✓ Eat small meals regularly rather than large meals sporadically
- ✓ Eat breakfast to stimulate metabolism, provide energy for the day and to help avoid overeating during the day
- ✓ Choose mostly low-moderate glycaemic index carbohydrates
- ✓ Keep treats to a minimum
- ✓ Drink plenty of water, more if exercising or in hot weather

EXAMPLE: If a client wants to increase lean body mass:

In addition to the list above, advise that clients ensure that their:

- ✓ protein levels are adequate for the exercise program they are involved in
- ✓ meals help them replenish fuel stores lost during exercise

Medical conditions and Diet

As a fitness trainer you will need to become familiar with some common medical conditions which can affect nutritional intake.

If a client mentions they suffer from any of the following during your screening process, they may not be absorbing nutrients from food effectively and you should refer them to their doctor :

- gastrointestinal reflux
- ulcers
- inflammatory bowel disease
- irritable bowel syndrome
- coeliac disease
- lactose intolerance

Other nutritional or dietary concerns to be aware of include:

- anorexia
- bulimia
- Obesity
- nutritional deficiencies including iron, calcium
- dehydration



Discussion

Discuss if the following situations and they are within the role of a qualified fitness trainer OR if they are beyond the scope of the fitness trainer and should be left to more professional advisors. Discuss why in each case:

- The Department of Health sends your gym nutritional guidelines flyers, you decide to give a copy to one of your clients.
- An amateur body builder in your gym asks you to write a diet plan for them to lose body fat and contains only minimal carbohydrates.
- A client who trains all the time, asks what is the best food to eat before a workout. You advise them that daily dietary intake recommendations do not necessarily apply to athletes - they apply to sedentary people. So persons who exercise will need to ensure adequate dietary intake above these guidelines.
- Your gym sells protein bars at the gym.
- You tell your clients that this protein bar is a good meal replacement food.
- A client explains during screening that they suffer from ulcers, you suggest they stop eating foods containing lots of spices and chillis and say that should stop the problem.
- You note a client is very obese and despite being a member of the gym for over 6 months they have actually gained more mass. You recommend in a 6 month review session they should see their doctor to discuss obesity and related issues.

Referring to suitable medical professionals

- The best places to start are professional bodies, who you can contact to recommend qualified nutritionists or dietitians in your area
- Once you have been working in the industry for some time, you will build a list of possible referral contacts
- Consider the local GP also for referral
- **Nutrition Australia** - www.nutritionaustralia.org
- **Dietitians Association of Australia** - www.daa.asn.au
- Government organisations, e.g. National Health and Medical Research Council, State Departments of Health
- Health organisations, e.g. Heart Foundation of Australia
- Nutrition peak bodies, e.g. Nutrition Australia, Nutrition Society of Australia
- Dietician peak bodies, e.g. Dietitians Association of Australia



Role-play

Provide nutrition advice to clients

Students to work in pairs.

Now, assume your group is working for a fitness centre. They currently do NOT offer any nutritional information for the diverse client base they have which includes older adults, office workers and young persons.

The manager of the facility has asked your group to lead a team to explain and promote the principles of nutrition to your members.

This is to become a new feature of your fitness centre and you are asked to build a long term program that includes both education and services.

In your groups, develop your "Nutrition Program". You will need to discuss and devise strategies for the following:

- What are all the ways you communicate the features of balanced nutrition to your clients. Brainstorm at least 5 and how they would be implemented.
- How will you ensure your communication choices above suits the client types and needs?
- What sort of programs will you run to cover the following topics: (choose 1 different program for each topic listed below):
 - The adverse affects of poor nutrition
 - The interaction of nutrition intake and physical activity
 - The benefits of good nutrition
 - Current dietary trends
 - Providing basic information about body composition and nutrition
 - Referral advice to other allied health providers
- What strategies can you implement to promote and discuss body satisfaction or dissatisfaction. Give a detailed answer for at least 2 strategies. Explain why these strategies will be effective.

Part A

Discuss each of the 4 bullet points above and write notes and answers down. You will need to share these ideas in class for a peer and trainer review.

Part B

Using the paper and pens provided you are now to create to 'awareness posters' for 2 of the topics in the third bullet point. These posters are to be displayed in your gym and give information to your members.

Enjoy a wide variety of nutritious foods

- Eat plenty of vegetables, legumes and fruits
- Eat plenty of cereals (including breads, rice, pasta and noodles), preferably wholegrain
- Include lean meat, fish, poultry and/or alternatives
- Include milks, yoghurts, cheeses and/or alternatives. Reduced-fat varieties should be chosen, where possible
- Drink plenty of water

and take care to:

- Limit saturated fat and moderate total fat intake
- Choose foods low in salt
- Limit your alcohol intake if you choose to drink
- Consume only moderate amounts of sugars and foods containing added sugars

Prevent weight gain: be physically active and eat according to your energy needs

Care for your food: prepare and store it safely

Encourage and support breastfeeding

Enjoy a wide variety of nutritious foods



Prevent weight gain

Prepare and store food safely



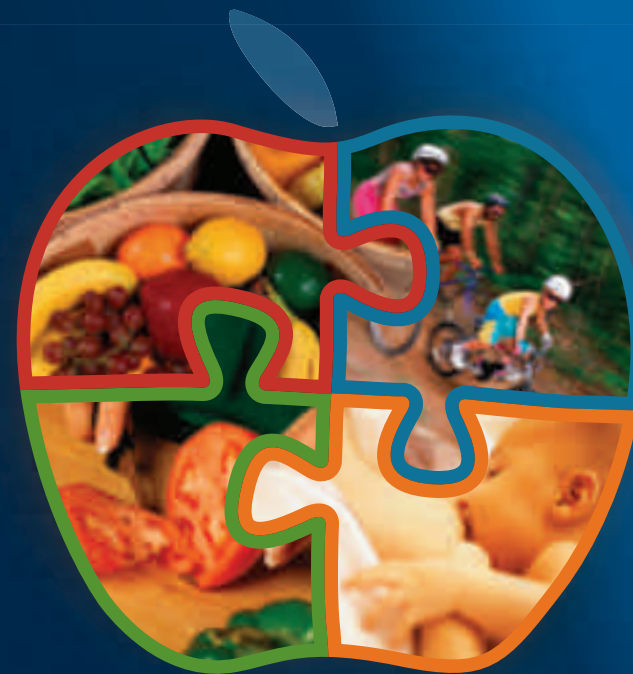
Encourage and support breastfeeding

To obtain copies of this booklet contact
1800 020 103 extension 8654 (toll free number) or
email phd.publications@health.gov.au



Australian Government
Department of Health and Ageing
National Health and Medical Research Council

Food for health



Dietary Guidelines for
Australian Adults

A guide to healthy eating

Dietary Guidelines for Australian Adults

Nutritious foods and an active lifestyle can help achieve optimal health throughout life. Recently the Australian government asked the National Health and Medical Research Council to review the scientific links between nutrition and health. Many of Australia's leading nutritionists worked on the task. The result is the new Dietary Guidelines for Australian Adults – sensible advice about food and nutrition that you can trust.

The Dietary Guidelines highlight the groups of foods and lifestyle patterns that foster good nutrition and health. No guideline is more important than another. Each guideline is like a piece of a puzzle. When all the pieces come together, the puzzle of good nutrition and health is solved.

Nutritional needs differ at different stages of life and these are reflected in the Dietary Guidelines. For the

new-born, there is no better food than breast milk. Older children need a balance of foods to ensure good growth and development.

The scales are tilted differently for adults who often need to balance eating and physical activity to prevent weight gain. For both children and adults, some principles always remain the same – the need to enjoy a wide variety of nutritious foods and to ensure that food is well handled and safe to eat.

The Dietary Guidelines for Australian Adults are your best guide to food, nutrition and health. The guidelines for children and adolescents are in an accompanying pamphlet

The picture to the right shows the Australian Guide to Healthy Eating which is a guide to daily food choices. More details are given inside the pamphlet.



Dietary Guidelines for Australian Adults

Enjoy a wide variety of nutritious foods and drink plenty of water

How many serves of these foods should we eat on average each day? This depends a little on your body size and activity level but aim for the following:



| Women | | | | | | |
|----------------|------|-----|---|---|----|------|
| 19–60 years | 4–9 | 5 | 2 | 2 | 1 | 0–2½ |
| 60+ years | 4–7 | 5 | 2 | 2 | 1 | 0–2 |
| Pregnant | 4–6 | 5–6 | 4 | 2 | 1½ | 0–2½ |
| Breast feeding | 5–7 | 7 | 5 | 2 | 2 | 0–2½ |
| Men | | | | | | |
| 19–60 years | 6–12 | 5 | 2 | 2 | 1 | 0–3 |
| 60+ years | 4–9 | 5 | 2 | 2 | 1 | 0–2½ |

What is a serve? Here are some examples

| Cereals, breads etc | | |
|---|--|-----------------------------------|
| 2 slices of bread | 1 medium bread roll | 1 cup cooked rice, pasta, noodles |
| 1 cup porridge | 1 cup breakfast cereal flakes | or ½ cup muesli |
| Vegetables and legumes (choose a variety) | | |
| Starchy vegetables | | |
| 1 med potato/yam | ½ medium sweet potato | 1 medium parsnip |
| Dark green leafy vegetables | | |
| ½ cup cabbage, spinach, silverbeet, broccoli, cauliflower or brussels sprouts | | |
| Legumes and other vegetables | | |
| 1 cup lettuce or salad vegetables | ½ cup broad beans, lentils, peas, green beans, zucchini, mushrooms, tomatoes, capsicum, cucumber, sweetcorn, turnips, swede, sprouts, celery, eggplant etc | |
| Fruit | | |
| 1 piece medium sized fruit eg apple, orange, mango, mandarin, banana, pear, etc | | |
| 2 pieces of smaller fruit (apricots, kiwi, plum, figs) | About 8 strawberries | |
| About 20 grapes or cherries | ½ cup fruit juice | ¼ med melon (eg. rockmelon) |
| Dried fruit (4 dried apricots) | 1½ tblspn sultanas | 1 cup diced pieces/canned fruit |
| Milks, yoghurt, cheese & alternatives | | |
| 250 ml glass or one cup of milk (can be fresh, longlife or reconstituted milk) | | |
| ½ cup evaporated milk | 40g (2 slices) cheese | 250ml (1 cup custard) |
| 200g (1 small carton) of yoghurt, plain or fruit, <i>or, as an alternative try:</i> | | |
| cup of calcium-fortified soy milk | 1 cup almonds | ½ cup pink salmon with bones |
| Meat, fish, poultry & alternatives | | |
| 65–100gm cooked meat/chicken (eg ½ cup mince/2 small chops/2 slices roast meat) | | |
| 80–120g cooked fish fillet, <i>or, as an alternative try:</i> | | |
| 2 small eggs | ½ cup cooked dried beans, lentils, chick peas, split peas or canned beans | 1/3 cup peanuts/almonds |
| Extras Foods which we can occasionally include for variety. They are generally higher in fat and/or sugar, kilojoules, salt etc | | |
| 1 med piece of plain cake/1 bun | 3–4 sweet biscuits | Half a chocolate bar |
| 60g jam, honey (1 tablespoon) | 30g potato crisps | Slice pizza = 2 extras |
| 1 can soft drink/2 glasses cordial | 2 scoops icecream | 1 meat pie/pasty = 3 extras |
| 2 standard glasses of alcohol (for adults only) | | |
| 1 tablespoon (20g) butter, margarine, oil | | |

Prevent weight gain: be physically active and eat according to your energy needs

There has been a dramatic increase in the number of overweight people in Australia over the last 20 years. Overweight places a strain on the body, raising blood pressure and triglycerides and increasing the risk of type 2 diabetes, heart disease, back problems and some cancers. Losing just a small amount of weight can improve health significantly.

Why are we getting fatter? The natural balance between food intake and physical activity has been lost. Falling levels of physical activity and more time spent sitting watching computer and television screens are major underlying causes. Modern foods and drinks are part of the problem too. Sugary drinks have become increasingly popular. Many fatty foods are rich in kilojoules too. Foods and drinks are now very tasty and portion sizes have increased. The combination of too little activity and too much food has inevitable effect – increasing body fat.



Be active every day

There is no secret to preventing weight gain. It's a matter of finding the balance between food intake and physical activity. The best approach is to make permanent changes to both food and activity habits. Increasing physical activity burns off body fat. Aim to be active every day. A minimum of 30 minutes of moderate physical activity each day is recommended. Many people find walking easy and enjoyable.

Eat smart

Not putting too much fuel in your body is vital to getting the balance right. The guide to eating a variety of nutritious foods is a good place to start when planning your meals. Include plenty of wholegrains, vegetables and fruits. Pay special attention to fats, alcohol and sugar. Cutting back on these will limit your fuel intake. Sugary and alcoholic drinks are sometimes called 'empty kilojoules' – they provide plenty of fuel without many essential nutrients to go with them. Needless to say, keep portions moderate in size and leave excess food on your plate.

Care for your food: prepare and store it safely

Australia has one of the safest food systems in the world. Nevertheless, care still needs to be taken to ensure food does not become contaminated with bacteria. The effects of eating infected food vary widely. Healthy adults may simply get an upset stomach. However, the health risks to the young, the sick and the elderly can be severe.

Food may be contaminated if the raw ingredients are 'off' to start with, if kitchen equipment is unclean, if food is poorly cooked or if food is kept warm for long periods. Poor personal hygiene is also a hazard.

Careful storage handling and preparation of food and high standards or personal hygiene will help keep risks to a minimum.



Encourage and Support Breastfeeding

Breast milk is the best and most natural food for infants. It is ideally suited to their needs. Breast milk provides hygienic food and drink as well as special growth factors and protection against infection and disease. Breastfeeding has the added advantage of being convenient and inexpensive. The ideal nutritional start to life is breast milk, and nothing else, for the first six months of life.

Although most Australian mothers start breastfeeding, few do so exclusively for six months. New mothers need support to maintain breastfeeding, not just from health workers but from workmates, friends and family members. Encouragement and support from the father of the child is especially important.



Metabolism explained

Metabolism refers to the countless chemical processes going on continuously inside the body that allow life and normal functioning. These processes require energy from food. The amount of kilojoules (kJ) your body burns at any given time is regulated by your metabolism. You can't control your metabolism, but you can make it work for you when you exercise.

Two processes of metabolism

Hormones (chemical 'messages' secreted by the glands of the endocrine system) and the nervous system control your body's metabolism. Your metabolism can be upset by a variety of events, including genetic disorders and hormonal problems.

There are two complementary parts to your metabolism, which are carefully monitored to make sure they remain in balance. They are:

- **Catabolism** - the breakdown of food components (such as carbohydrates, proteins and fats) into their simpler forms, which can then be used to create energy. This immediate form of energy can be converted into heat or burned by cells.
- **Anabolism** - energy is stored in fat cells or used to help build and repair structures of the body.

Metabolic rate (or total energy expenditure)

Your body's metabolic rate (or total energy expenditure) can be divided into three components:

- **Basal metabolic rate (BMR)** - is the amount of kilojoules burned at rest and contributes 50-80 per cent of your energy used.
- **Energy used during physical activity** - this is the amount of kilojoules burned during movement and physical activity; in a normally active person, this component contributes 20 per cent of daily energy use.
- **Thermic effect of food** - this is the energy you use to eat, digest and metabolise food. It contributes about 5-10 per cent of your energy use.

Basal metabolic rate (BMR)

The BMR refers to the amount of energy your body needs to maintain itself. This accounts for 50-80 per cent of your total energy use. Total lean mass, especially muscle mass, is largely responsible for the BMR. So, anything that reduces lean mass will reduce BMR. That's why it's important to preserve muscle mass when you try to lose weight, since the BMR accounts for so much of the energy we use.

An average male may have a BMR of around 7,100kJ per day, while an average female may have a BMR of around 5,900kJ per day. Energy expenditure is continuous, but the rate varies throughout the day. The lowest rate of energy expenditure is usually in the early morning.

Energy used during physical activity

During heavy physical exertion, the muscles may burn through as much as 3,000kJ per hour. Energy used during exercise is the only form of energy expenditure that you have any control over.

The energy expenditure of the muscles makes up only 20 per cent or so of the total energy expenditure at rest but, during strenuous exercise, the rate of energy expenditure of the muscles may go up 50-fold or more.

The following lists the amount of energy used during various activities.

Activity Energy (kJ/kg/h)

Sitting quietly 1.7

Writing 1.7

Standing relaxed 2.1
Driving a car 3.8
Vacuuming 11.3
Walking rapidly 14.2
Running 29.3
Swimming (4km/hour) 33
Rowing in a race 67

Thermic effect of food

Your BMR rises after you eat because you use energy to eat, digest and metabolise the food you've just eaten. The rise occurs soon after you start eating and peaks two to three hours later. This rise in the BMR can range between 2-3 per cent and up to 25-30 per cent, depending on the size of the meal and the types of foods eaten. For example:

- **Fats** - raise the BMR 4 per cent
- **Carbohydrates** - raise BMR 6 per cent
- **Proteins** - raise BMR 30 per cent
- **Hot spicy foods** - these can also have a significant thermic effect: for example foods containing chilli, horseradish and mustard.

Factors affecting the BMR

Your BMR is influenced by a number of factors working in combination, including:

- **Body size** - larger adult bodies have more metabolising tissue and a larger BMR.
- **Age** - metabolism slows with age, due to a loss in muscle tissue but also due to hormonal and neurological changes.
- **Growth** - infants and children have higher energy demand per unit of body weight due to the energy demands of growth and the energy needed to maintain their body temperature.
- **Gender** - generally, men have faster metabolisms than women because they tend to be larger and have less body fat.
- **Genetic predisposition** - your metabolic rate may be partly decided by your genes.
- **Amount of lean muscle tissue** - muscle burns kilojoules voraciously.
- **Amount of body fat** - fat cells are sluggish and burn far fewer kilojoules than most other tissues and organs of the body.
- **Hormonal and nervous controls** - BMR is controlled by the nervous and hormonal systems; hormonal imbalances can influence how quickly or slowly the body burns kilojoules.
- **Dietary deficiencies** - for example, a diet low in iodine reduces thyroid function, which slows the metabolism.
- **Environmental temperature** - if temperature is very low or very high, the body has to work harder to maintain its normal body temperature; this increases the BMR.
- **Infection or illness** - BMR increases because the body has to work harder to build new tissues and to create an immune response.
- **Crash dieting, starving or fasting** - eating too few kilojoules encourages the body to slow the metabolism to conserve energy; BMR can drop by up to 15 per cent. There is also loss of lean muscle tissue, which further contributes to the drop in BMR.
- **Amount of physical activity** - hard-working muscles need plenty of energy to burn. Regular exercise increases muscle mass and 'teaches' the body to burn kilojoules at a faster rate, even when at rest.
- **Drugs** - some drugs, like caffeine or nicotine, can increase the BMR.

Age-related weight gain

Muscle tissue has a voracious appetite for kilojoules. The more muscle mass you have, the more kilojoules you will burn. People tend to put on fat as they age - this is because the body slowly loses muscle.

It's not clear whether this muscle loss is a result of the ageing process or because many people are less active as they age. However, it probably has more to do with becoming less active, as research has shown that strength and resistance training can reduce or prevent this muscle loss.

If you are over 40 years, have a pre-existing medical condition or haven't exercised in some time, see your doctor before embarking on any new fitness program.

Hormonal disorders

Hormones help to regulate the metabolism. Some of the more common hormonal disorders are concerned with the thyroid. This gland secretes hormones to regulate many metabolic processes, including energy expenditure (the rate at which kilojoules are burned). Disorders include:

- **Hypothyroidism** - or underactive thyroid. The metabolism slows because the thyroid gland doesn't release enough hormones. A common cause is the autoimmune condition Hashimoto's disease. Some of the symptoms of hypothyroidism include unusual weight gain, lethargy, depression and constipation.
- **Hyperthyroidism** - or overactive thyroid. The gland releases greater quantities of hormones than necessary and speeds the metabolism. The most common cause of this condition is Graves' disease. Some of the symptoms of hyperthyroidism include increased appetite, weight loss, nervousness and diarrhoea.

Genetic disorders of metabolism

Sometimes a faulty gene affects part of the metabolic process and stops the body from using food components, such as carbohydrates, in the normal way. In most cases, these disorders can be managed under medical supervision, with strict attention to diet. Some genetic disorders of the metabolism include:

- **Fructose intolerance** - the inability to break down fructose, which is a type of simple sugar found in fruits, fruit juices, sugar (for example, cane sugar) and certain vegetables.
- **Galactosaemia** - the inability to convert the carbohydrate galactose into glucose. Galactose is not found in nature; it is produced when lactose is broken down by the digestive system into glucose and galactose. Sources of lactose include milk and milk products, such as yoghurt and cheese.
- **Phenylketonuria (PKU)** - the inability to convert the amino acid phenylalanine into tyrosine. High levels of phenylalanine in the blood can cause brain damage. High protein foods must be avoided.

Where to get help

- Your doctor
- An accredited practising dietitian, contact the Dietitians Association of Australia

Things to remember

- Metabolism refers to the countless chemical processes going on continuously inside the body that allow life and normal functioning.
- The amount of kilojoules your body burns at any given time is regulated by your metabolism.
- The metabolic rate is influenced by many factors, including age, gender, muscle-to-fat ratio, amount of physical activity and hormone function.

This page has been produced in consultation with, and approved by:

Deakin University - School of Exercise and Nutrition Sciences

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Kilojoules and calories explained

We eat food to fuel our bodies for energy, growth and repair. Carbohydrates, proteins and fats are broken down by the digestive system into their simplest components: simple sugars, amino acids and fatty acids.

Carbohydrates are the body's preferred fuel, although proteins and fats can also be converted into energy. Food energy is measured in kilojoules (kJ). The common term for this used to be 'Calorie', but 'kilojoule' is the term now accepted internationally. This unit of measurement allows us to talk about how much energy a food contains and how much energy is burned up during exercise.

Energy value

A kilojoule is a unit of measure of energy, in the same way that kilometres measure distance. Food energy can also be measured in terms of the nutritional or 'large' Calorie. One Calorie (Cal) has the same energy value as 4.186 kilojoules (kJ). This should not be confused with the 'small' or gram calorie, which is used by scientists to measure the amount of energy required to heat water. There are 1,000 (small) calories in one (large) Calorie, which is why it is also sometimes known as a 'kilocalorie'. The terms 'calorie' and 'Calorie' are often used interchangeably, which can be confusing.

4.184 kilojoules = 4,184 joules = 1 Calorie = 1 kilocalorie = 1,000 calories

Kilojoules in food

The foods we eat provide energy, which is measured in kilojoules. Just how much energy depends on the amount of carbohydrate, protein and fat the food contains. Fats and alcohol are by far the most energy-dense foods. This is why they should only be consumed in moderation, particularly if you are overweight or obese.

The energy value **per gram** of various food components includes:

- **Fat** – 37kJ (9 Cal) – not all fatty acids may provide the same amount of energy
- **Alcohol** – 29kJ (7 Cal)
- **Carbohydrates** – 16kJ (4 Cal) – not all carbohydrates may provide the same amount of energy
- **Protein** – 17kJ (4 Cal)
- **Dietary fibre** – 13kJ (3 Cal) – if fermented by bacteria in the large intestine
- **Water** – 0kJ (0 Cal).

Research into energy values of food is ongoing

Research into fat and carbohydrate metabolism is changing our understanding about the energy values of different types of fats and carbohydrates. Research indicates that how the body metabolises (breaks down) different foods may be important. It appears that not all fats or carbohydrates have the same energy value as their chemical analysis in the test tube might indicate.

Some fats move on faster than others

Animal studies show that polyunsaturated, mono-unsaturated and saturated fatty acids are broken down differently in the body and may not be used in the same way. Some fats, like polyunsaturated fats (especially omega-3 fatty acids from fish oils), may be more easily used up from fat stores during exercise than fats from other animal sources.

This suggests that saturated fat may be more likely to go into and stay in fat cells than some forms of polyunsaturated fat and possibly mono-unsaturated fat.

Sugars and carbohydrates

Carbohydrates are broken down by the body into sugars or 'glucose'. Some carbohydrate foods are metabolised faster than others; these are known as foods with a high glycaemic index (GI). Some research suggests that a diet dominated by carbohydrate foods with a high glycaemic index is associated with greater body fatness.

Our energy requirements are variable

Energy requirements differ from one person to the next because of genetic predisposition, build, gender, age, metabolism, environment and amount of regular physical activity. An individual's energy requirements can also differ from one day to the next and as we grow older. For example:

- Young children and adolescents require high amounts of energy to fuel their growth and development.
- Women need more energy during certain stages of their reproductive lives, such as pregnancy and breastfeeding. It is thought that daily energy needs increase on average by about 1,800kJ for pregnant women and around 2,500kJ during breastfeeding.
- Muscle tissue has a big appetite for kilojoules. The more muscle mass you have, the more kilojoules you will burn.
- Men generally have higher energy requirements than women because they have more muscle tissue.
- As we age activity levels are often reduced, which causes a loss of muscle tissue, and so our energy requirements tend to decrease. Various other age-related changes to the metabolism also contribute to the reduced energy requirements. It's not clear how much of the muscle lost during ageing is a result of the ageing process or due to reduced activity. Strength and resistance training in older adults (even the very old and frail) seems to help reduce or prevent the decline in muscle mass generally observed with ageing.

Too many kilojoules

When we regularly eat more energy than our body needs, the excess is stored inside fat cells. Just 1kg of body fat contains the equivalent of 37,000kJ. To lose 1kg of body fat in a week, you would need to burn an additional 37,000kJ, or around 5,000kJ a day.

How to lose excess weight

The best way to lose excess weight is to switch to a high fibre, low fat diet and, most importantly, to exercise regularly. Exercise not only uses up stored energy but also helps to stimulate muscle development. Remember, the more muscle tissue you have, the more kilojoules you can burn.

If you are over 40, have a pre-existing medical condition or you haven't exercised for some time, see your doctor before starting a new fitness program.

Where to get help

- Your doctor
- An accredited practising dietitian, contact the Dietitians Association of Australia
- Nutrition Australia www.nutritionaustralia.org

Things to remember

- A kilojoule (or Calorie) is a unit of energy.
- The kilojoule content of foods depends on the amount of carbohydrates, fats and proteins present in the food.
- If we regularly eat more kilojoules than our body needs, the excess will be stored as body fat.

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Energy expenditure

Energy

Humans oxidise (metabolise) carbohydrate, protein, fat (and alcohol) to produce energy. The energy is needed:

- To maintain body functions - to breathe, to keep the heart beating, to keep the body warm and all the other functions that keep the body alive
- For physical activity - for active movement - muscle contraction
- For growth and repair, which require new tissues to be made.

Energy intake

Energy can be measured in either joules or calories. A joule (J) can be defined as the energy used when 1 kilogram (kg) is moved 1 metre (m) by the force of 1 newton (N). A calorie (cal) can be defined as the energy needed to raise the temperature of 1 gram of water from 14.5 to 15.5°C. In practice, both units are used just as different units are used to measure liquids, eg pints, litres. One calorie is equivalent to 4.184 joules.

People use large amounts of energy so nutritionists use larger units, called kilojoules

- 1 kilojoule (kJ) = 1,000 joules
- 1 megajoule (MJ) = 1,000,000 joules
- 1 kilocalorie (kcal) = 1,000 calories or 1 Calorie (Cal)

To convert from one unit to another:

- 1 kcal = 4.184 kJ
- 1 MJ = 239 kcal

The average daily energy intake in the UK is 10250kJ (2450 kcal) for men and 7030kJ (1680 kcal) for women. The energy in the diet is provided by carbohydrate, protein, fat and alcohol. The amount of energy made available to the body by each of these varies. A gram of carbohydrate (starch or sugar) provides 16kJ (3.75 kcal), protein provides 17kJ (4 kcal) per gram, fat provides 37kJ (9 kcal) per gram and alcohol provides 29kJ (7 kcal) per gram.

The source of energy in the diet has been implicated as a risk factor in certain diseases. Current recommendations from the Committee on Medical Aspects of Food and Nutrition Policy (1991) are shown in Table 1.0

Table 1.0 Suggested population averages for protein, carbohydrate and fat as a percentage of dietary energy.

| | |
|--------------------------------------|------------|
| Protein | 15 |
| Total Carbohydrate | 50 |
| Non milk extrinsic sugars* | 1 |
| Total fat | 35 |
| Saturated fatty acids | 11 |
| Polyunsaturated fatty acids** | 6.5 |
| Trans fatty acids | 2 |
| Monosaturated fatty acids | 13 |

*NMES - free sugar not bound in foods, eg table sugar, honey and sugars in fruit juices, but excluding milk sugar.

** An individual maximum of 10% applies (with an individual minimum of 0.2% from linolenic acid, and 1% linoleic acid).

Alcohol should provide no more than 5% of energy in the diet.

Energy expenditure

The energy expenditure (EE) of a man or woman over a whole day is often divided into different components, which can be individually determined. These are: basal metabolic rate (BMR), diet induced thermogenesis (DIT) and physical activity (PA) see Figure 1.0.

Basal Metabolic Rate (BMR)

BMR is the minimum amount of energy that a body requires when lying in physiological and mental rest. BMR is measured under standardised conditions, conducted with the subject in a post-prandial state (fasted for at least 12 hours), at complete rest in a thermoneutral environment (not too hot or cold). If one of these conditions is not met (e.g. shorter time interval for fasting) the measurement is usually termed resting metabolic rate (RMR).

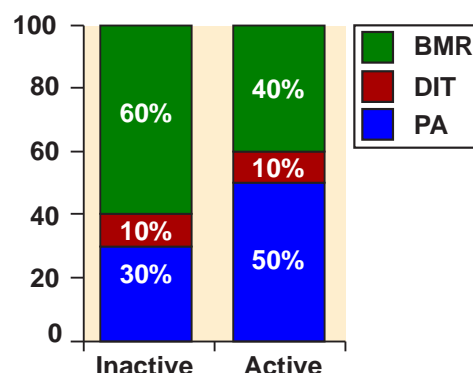


Figure 1.0 Total energy expenditure

BMR represents around 60-75% of total EE in many people. The main determinant of BMR is body weight and body composition. There is little evidence to support the claim that obesity is associated with a lower BMR. Infants and young children have a proportionately high BMR for their size due to their rapid growth and development. Men usually have a higher BMR than women since they tend to have more muscle. Older adults usually have a lower BMR than the young since the amount of muscle tends to decrease with age. BMR accounts on average for about three-quarters of an individual's energy needs.

Diet Induced Thermogenesis (DIT)

Also called post-prandial thermogenesis (PPT) or the thermic effect of food (TEF). DIT accounts for about 10% of total energy intake (EI) for a mixed western diet. This is the amount of energy utilised in the digestion, absorption and transportation of nutrients.

Physical Activity (PA)

PA is the most variable component of EE in humans. It includes the additional EE above RMR and TEF due to muscular activity and comprises minor physical movement (such as shivering and fidgeting) as well as purposeful gross muscular work or physical exercise. On average it accounts for 15 to 30% of total daily EE but can vary more in very active persons.

The total amount of energy required by individuals depends on the level of activity and on their body weight. The more active and heavier they are, the more energy they require. Table 2.0 shows the energy used up in various activities.

Table 2.0 Energy required for a variety of activities

| Everyday Activities | KJ/min |
|---|--------|
| Sitting | 6 |
| Standing | 7 |
| Washing, dressing | 15 |
| Walking slowly | 13 |
| Walking moderately quickly | 21 |
| Walking up and down stairs | 38 |
| Work and Recreation | |
| Light (most domestic work, golf, lorry driving, carpentry, bricklaying) | 10-20 |
| Moderate (gardening, tennis, dancing, jogging, cycling, digging) | 21-30 |
| Strenuous (cross-country running, football, swimming [crawl]) | >30 |

Source: Ministry of Agriculture, Fisheries and Food. Manual of Nutrition. London: HMSO, 1992.

The rates of EE during physical activity vary depending on intensity, duration, and frequency of the activity and on the body mass and fitness of the person performing the activity. There is currently a secular trend towards decreased physical activity in work time, which means that physical activity EE during leisure time is becoming more dominant in determining total EE. Thus physiology, behaviour and lifestyle play major roles in determining energy expended in activity.

The suggestion that the obese are more slothful than the lean has been reviewed, however, several analyses have shown that absolute daily energy expended by the obese is higher than that expended by the lean. This is, however, accounted for by the fact that the obese have to expend more energy in performing an identical task than the lean, since they must carry around additional weight. There is little evidence that obese subjects have low levels of PA compared to the lean, until fatness induces mobility problems. This tends to reflect the sedentary nature of modern lifestyles.

Measuring energy expenditure

Resting metabolic rate (ventilated hood) by indirect calorimetry

The term indirect calorimetry describes a method of estimating heat production based on the determination of gaseous exchange. Indirect calorimetry is based on the laws of thermodynamics, which firstly state that, “when the chemical energy content of a system changes, the sum of all forms of energy given off or absorbed by the system must be equal to the magnitude of the changes” (Dubois 1954).

The second basic principle of indirect calorimetry (Hess’s law of constant heat summation), states that, “heat produced in a chemical reaction is the same regardless of whether the process is direct or has intermediary steps”. This enables the enthalpy of oxidation of the fuel sources of the body to be calculated as the amount of molar oxygen consumed (e.g. kJ/l O₂ consumed), carbon dioxide produced and nitrogen excreted.

BMR can be measured by indirect calorimetry using a ventilated hood system (Deltatrac II, MBM - 200, Datex, Instrumentarium Corporation, Helsinki, Finland Figure 1.0). Subjects should be measured in the morning after an overnight sleep at the lab. They are required to refrain from any PA prior to measurement. Subjects are asked to rest for 10 minutes on the measurement bed, after which the ventilated hood is placed over the head during a 30-40 minute measurement period. Respiratory gases are measured at one-minute intervals and results recorded onto a floppy disc. Subjects are instructed to lie still but not to fall asleep.



Figure 1.0 Human Nutrition Unit volunteer undergoing a measurement

Heart rate monitoring to calculate total daily energy expenditure

The resulting values for oxygen uptake (VO_2) and carbon dioxide production (VCO_2) are automatically converted into energy values, calculated as:

$$RMR \text{ (kJ/24 hr)} = [15.818 \text{ } VO_2 \text{ (l/min)} + 5.176 \text{ } VCO_2 \text{ (l/min)}] \times 1440.$$

Where 15.818 and 5.176 are the energy equivalents of oxygen and carbon dioxide

Minute-to-minute heart-rate (HR) monitoring can be used to determine total EE because it has been shown that an increase in HR during physical activity is associated with a linear rise in oxygen consumption. Thus, from continuously monitoring HR, VO_2 can be estimated as shown in figure 2.0 and using standard indirect calorimetric equations a relationship between HR and EE can be established for an individual.



mouthpiece collecting breathing samples

Figure 2.0 Subject undergoing fitness test in the Human Nutrition Unit.

In periods of inactivity, factors such as emotional state, ambient temperature, humidity or smoking can easily alter heart rate without affecting VO_2 . Thus the correlation between heart rate and VO_2 which is true for sub-maximal muscular work can not be applied for more sedentary activities such as sitting, lying, standing at rest.

Figure 3.0 below shows a graph of HR at four increasing workloads, exercising on an exercise bike. It shows that as workload increases, oxygen consumption increases and HR increases. At the bottom of the graph, it shows that the person's resting heart rate while standing and sitting, was between 68 – 78 beats per minute. This was increased to around 138 bpm during exercise.

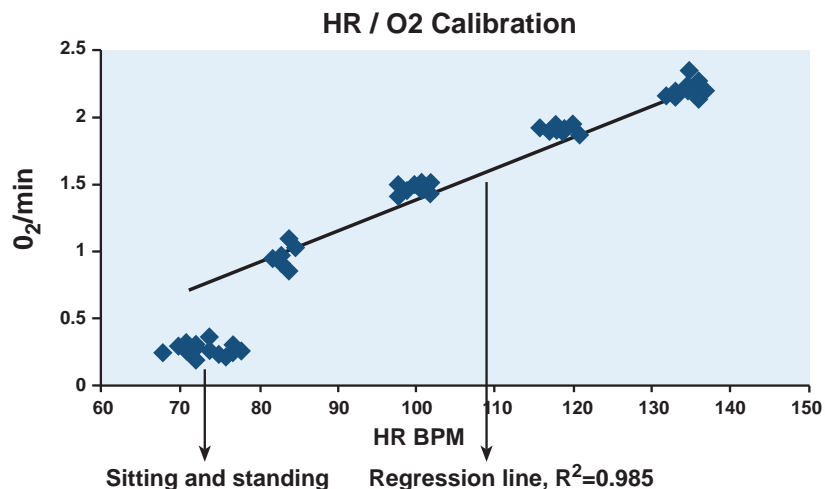


Figure 3.0. A typical example of the data collected during individual calibration of the HR-monitors

How a HR calibration against oxygen consumption is carried out:

- 5 minutes sitting
- 5 minutes standing up
- 5 minutes cycling at the lowest possible resistance (50 watts) @60 rpm
- 5 minutes cycling to raise HR further (e.g. 75 watts)@ 60 rpm
- 5 minutes cycling to raise HR further (e.g. 100 watts)@ 60 rpm
- 5 minutes cycling to raise HR further (e.g. 125 watts)@ 60 rpm

Pedal speed remains constant at 60 revolutions per minute (RPM) throughout the test and resistance is gradually increased to elevate HR. During the last two minutes of each step when the HR was adjusted to the workload and was stable, breath-by-breath VO_2 and VCO_2 are measured with indirect calorimetry (Vmax29 metabolic cart, Sensor Medics, USA) using a mouthpiece and noseclip.

Total daily EE (TEE) can then be estimated according to the following equation:

$$TEE = SEDEE + SEE + AEE$$

Where: SEDEE = sedentary energy expenditure
SEE = sleeping energy expenditure (taken as 95% RMR)
AEE = activity energy expenditure

Subjects wear the heart rate monitor (HRM) continuously during waking hours during every day of the protocol. They do not wear the monitor during sleep at night. SEE is calculated as 95% of RMR and is applied to the time when the HR monitor is not worn (i.e. during sleep). SEDEE is assumed to be equal to the mean EE from the RMR, sitting and standing measurements during the calibration. EE is calculated using the treatment-specific regression equation (AEE) for each individual. Unphysiological high pulse rates (>220 BPM, which indicated interference) and zero values are removed and replaced by the average of the previous and subsequent values. It should be noted that there are considerable limitations to the use of HR monitors to estimate daily EE.

Physical activity and adults in Scotland

Physical activity levels are falling and there are major health concerns about the effects of physical inactivity. The majority of the Scottish population are either inactive, or only occasionally engage in light activity. Only 32% men and 22% women (1995) are achieving the moderate activity guidelines.

Physical activity makes an important contribution to health:

- Coronary Heart Disease - Physically inactive people have about double the risk of CHD.
- Stroke - Physical inactivity may be responsible for up to a three-fold increase in the risk of stroke.
- Osteoporosis - Regular activity reduces the risk of hip fractures by about 50%.
- Blood Pressure- Regular activity reduces blood pressure in those with hypertension.

Current Activity/Fitness Levels and Perceptions

The majority of the population don't do enough physical activity to benefit their health. 64% of men and 76% of women in the UK are either sedentary or are moderately active on an irregular basis only. Half of all adults think they do enough activity to keep fit. The Allied Dunbar National Fitness Survey, 1992 measured the physical activity levels and fitness levels of a representative sample of over 4000 English adults. This indicated that levels of cardio-respiratory fitness in the population were extremely low. Few people were routinely active at work, and only 20% men and 10% of women were in occupations requiring vigorous or moderately vigorous physical activity.

- ▶ Two-thirds of women and one-third of men find it difficult to walk briskly up a slight slope for several minutes.
- ▶ 25% of those who were active between the ages of 14 and 19 were still active, compared with only 2% who were inactive at that age.
- ▶ 80% of both men and women incorrectly believed they did enough exercise to keep fit.

How Much Physical Activity is Needed ?

Research has led to a consensus that an inactive life leads to increased risk of coronary heart disease, stroke and other health problems. The benefits of vigorous activity (activities that build up a sweat and some shortness of breath) are well known, and offers the best cardio protection, however there is a growing international consensus that regular moderate activity also confers health benefits. Studies have shown that moderate intensity activity is associated with improved fitness and lower risk of coronary heart disease.

The new government recommendation is intended to encourage the majority of the population, who do not exercise on a regular basis, to build physical activity of a moderate intensity into their daily routines.

Guidelines

In terms of intensity and duration, the strategy for the promotion of physical activity is: to encourage those people currently taking no physical activity to aim for one period of at least 30 minutes of moderate activity a week to encourage more people to take 30 minutes of moderate activity on a daily basis (at least five days a week), and to encourage those people already taking some vigorous activity, to take on average, three periods of vigorous activity of 20 minutes duration, a week.

| | Vigorous Activity | Moderate Activity Message |
|------------|--|---|
| Message | 20 mins of vigorous activity, 3 times a week | 30 mins of moderate activity on most days |
| Definition | Activity that leaves you sweaty and out of breath. | Activity that raises your heart rate and leaves you a little out of |
| Examples | Running, cycling, football, tennis, exercise class | Brisk walking, dancing, gardening, golf, bowling. |

STUDENT NAME : _____

Give a brief description of the food groups listed below and how these relate to dietary guidelines:

| | |
|--|--|
| Fats, oils, sweets | |
| Dairy | |
| Meat, poultry, fish, eggs, nuts, legumes | |
| Fruit and vegetables | |
| Breads and cereals | |

For each of the groups below, give a definition of what they are, explain their role and state the recommended daily intake:

| | |
|------------------------|--|
| Carbohydrates | |
| Lipids | |
| Protein | |
| Minerals | |
| Vitamins | |
| Fluid and Electrolytes | |

Explain the concept of nutritional supplementation

Explain the concept of metabolism

Explain the concept of energy. In your answer explain energy intake and expenditure

Explain changes to body composition including fat loss and muscle gain



Original article: <http://mydr.com.au/nutrition-weight/dietary-guidelines-for-healthy-eating>

Dietary guidelines for healthy eating

Here are some quick tips to help keep your diet healthy.

Follow the NHMRC Dietary Guidelines

By following the National Health and Medical Research Council's updated *Dietary Guidelines for Australian Adults* (2003) and *Nutrient Reference Values for Australia and New Zealand Including Recommended Dietary Intakes* (2006), your diet should be healthy and balanced against your level of daily physical activity.

1. Enjoy a wide variety of nutritious foods.
2. Eat plenty of vegetables, legumes and fruit.
3. Eat plenty of cereals (preferably wholegrain), including breads, pasta, rice and noodles.
4. Include lean meat, fish, poultry and/or alternatives.
5. Include milks, yoghurts, cheeses (and/or alternatives), preferably reduced-fat varieties.
6. Drink plenty of water.
7. Limit saturated fat, and moderate your total fat intake.
8. Choose low-salt foods.
9. If you drink alcohol, limit your intake to no more than 2 standard drinks per day.
10. Eat only a moderate amount of sugars and foods containing added sugars.
11. Maintain a healthy body weight by being physically active and eating according to your energy needs.
12. Care for your food: prepare and store it safely.
13. For infants, the NHMRC encourages and supports breast feeding for a healthy nutritional intake.

Eat the right amounts of fruit and vegetables

The NHMRC recommend that adults eat a minimum of 5 servings of vegetables and 2 serves of fruit every day.

Examples of a serve of vegetables are: half a cup (75 g) of cooked vegetables or green leafy vegetables such as spinach or broccoli, one cup of salad vegetables or one medium potato.

A sample serve of fruit would be a medium apple, banana, orange or pear, a cup of diced pieces of fruit or canned fruit, or 4 dried apricots.

Cereals: the bulk of your diet

In the NHMRC dietary guidelines, cereals include grains like rice, oats and corn, breads, breakfast cereals, pasta, noodles and flour. Their recommendation is that women eat 4-9 serves of cereals a day, and that men eat 4-12 serves a day. Select a number of serves of cereals that is balanced against your level of physical activity.

One serve of cereals can be 2 slices of bread, 1 cup of porridge or breakfast cereal, 1 medium bread roll or 1 cup of cooked pasta, rice or noodles. To achieve the suggested intake of cereals, you might consider having some bread with every meal, eating breakfast cereal everyday, adding wholegrain cereal to extend soups and casseroles, and serving rice or pasta to accompany hot dishes.

Chew the fat in moderation

Most Australians have a diet that is relatively high in fat compared to world standards. Too much fat can make us fat, especially if combined with a low level of physical activity. Eating too much of certain types of fat, especially saturated fat and trans fats, can increase our risk of heart disease and a number of other diseases.

Total fat (saturated, monounsaturated and polyunsaturated) accounts for around one-third of the total food energy intake of Australian adults.

The NHMRC recommends that anyone who is overweight should reduce the total fat in their diet so that it makes up only 20-25 per cent of their total food energy intake.

In Australia, our current intake of saturated fat is about 12.5 per cent of total energy intake, higher than the recommended maximum level of 10 per cent. It is slightly higher in children. Among the major sources of saturated fat in the adult diet are cheese, butter, cream, meat, chocolate and potato chips.

Trans fatty acids are made when hydrogen is added to vegetable oil in a process called hydrogenation. This makes the fat more solid and less likely to go rancid. Unfortunately, trans fats are an even worse risk for heart disease than saturated fats, because not only do they increase our levels of 'bad' (LDL) cholesterol, but they also decrease our levels of 'good' (HDL) cholesterol. Trans fats can be found in cookies, crackers, cakes, potato chips and margarine.

Watch your sugar intake

Excess energy intake in any form, including excess sugar, can result in weight gain or obesity, especially when combined with low levels of physical activity.

Sugars in food can improve the way a food tastes, so are often added to various foods. However, foods with high levels of refined sugars are very energy dense and often have lower levels of other nutrients. Eating a lot of food that is high in sugar can 'displace' more nutritious foods from your diet. The NHMRC guidelines suggest that you be watchful of the amount of sugars and sugary foods that you eat, aiming to have no more than a moderate level in your diet.

Include calcium for your bones

Milk and foods produced from milk — cheese, yoghurt, ice-cream and some custards — are the richest source of calcium in the Australian diet.

Calcium is a mineral that is important for healthy bones throughout life. Adequate calcium in the diet is also important for helping to avoid excessive thinning of bone in later life.

The *Nutrient Reference Values for Australia and New Zealand Including Recommended Dietary Intakes*, 2006 have increased the amount of calcium recommended for most people. These recommendations are given below.

| Recommended dietary intake of calcium | |
|--|---|
| Adults | Recommended Dietary Intake (RDI) for calcium |
| Women: 19–50 years | 1000 mg/day |
| Women: 51 years and over | 1300 mg/day |
| Men: 19–70 years | 1000 mg/day |

| | |
|---|-------------|
| Men: Over 70 years | 1300 mg/day |
| Source: Australian Government Department of Health and Ageing and NHMRC. <i>Nutrient Reference Values for Australia and New Zealand, including Recommended Dietary Intakes</i> , 2006. Endorsed 9 September 2005. | |

Examples of portions of these foods which would provide roughly 300 mg of calcium include one cup (250 mL) of milk, 200 g of yoghurt, and 40 g of hard cheese. Whenever possible, select reduced-fat varieties of these foods.

Alternative, non-dairy sources of calcium that provide 300 mg of calcium include 150 g of almonds, 150 g of pink salmon with bones or 1 cup (250 mL) of calcium-fortified soy drink.

Don't overlook iron

The NHMRC *Dietary Guidelines for Adult Australians* describe a low intake of iron as common in Australia. This is particularly an issue in some groups of the population such as girls, women and vegetarians. Iron deficiency can cause fatigue and listlessness, and can sometimes lead to anaemia.

Australians are advised by the NHMRC to consume lean red meat — the best source of dietary iron — 3-4 times every week.

Prevent weight gain: get active!

A key message of the NHMRC dietary guidelines is to prevent weight gain by eating according to your energy needs. General health benefits for adults can be gained from a daily total of 30 minutes of moderate physical activity on most, or preferably all, days of the week.

The NHMRC advises that you can achieve this by taking simple steps to incorporate more activity into your daily routine, for example, by reducing the amount of time you spend being physically *inactive* — watching TV, working on a computer, driving a car — and replace this with any form of physical activity that suits your lifestyle, even active household chores can contribute. You don't need to go to the gym or play an organised sport to increase your level of physical activity.

It's all about combining a healthy diet with an active lifestyle. Working in a sedentary (non-physically active) job means balancing your day by being physically active in your non-work time, and always aiming to moderate your food energy intake to meet your energy needs.

myDr, 2001

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