



## ***LEARNER GUIDE***

# **GAP TRAINING**

***SIS30315 Certificate III in Fitness to  
SIS30321 Certificate III in Fitness***

## ***CLUSTER 1***

Student Name:



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# Unit Introduction

## **SISFFIT032 Complete pre-exercise screening and service orientation**

This unit describes the performance outcomes, skills and knowledge required to screen clients for participation in exercise programs and to provide general advice about programs and services suitable to clients.

It requires the ability to utilise industry standard pre-exercise screening systems, questionnaires and guidelines to collect and evaluate health information, and to determine suitable levels of exercise intensity for clients. This includes determining risk factors and providing referrals to medical or allied health professionals for guidance.

Screening may occur prior to clients beginning an exercise program, before changes to programs and when their health status changes. Outcomes are used by fitness instructors to plan client programs. Skills for planning are covered in complementary units.

This unit applies to group fitness instructors, gym instructors and personal trainers. It can also apply to other fitness facility staff members who screen clients and provide service information prior to clients participating in exercise activities. They practise in settings such as fitness facilities, gyms, leisure and community centres, client workplaces and homes, and outdoor locations, depending on their job role.

The skills in this unit must be applied in accordance with Commonwealth and State or Territory legislation, Australian standards and industry codes of practice.

No occupational licensing, certification or specific legislative requirements apply to this unit at the time of publication.

## **SISFFIT033 Complete client fitness assessments**

This unit describes the performance outcomes, skills and knowledge required to assess current fitness capabilities of clients using information from industry standard pre-exercise screening as the starting point. It requires the ability to complete assessments using a range of activities and measurements and to document outcomes.

Assessment may occur prior to clients beginning an exercise program, before changes to programs and when their health status changes. Outcomes are used by fitness instructors to plan client programs. Skills for planning are covered in complementary units.

This unit applies to gym instructors and personal trainers, who work unsupervised when interacting with clients using discretion and judgement to provide individually tailored client assessments. They practise in settings such as fitness facilities, gyms, leisure and community centres, client workplaces and homes and outdoor locations, depending on their job role.

The skills in this unit must be applied in accordance with Commonwealth and State or Territory legislation, Australian standards and industry codes of practice.

No occupational licensing, certification or specific legislative requirements apply to this unit at the time of publication.

## **SISFFIT040 Develop and instruct gym-based exercise programs for individual clients**

This unit describes the performance outcomes, skills and knowledge required to develop tailored gym-based exercise programs for individuals where the level of personalised instruction, ongoing client monitoring and program evaluation is limited. Clients are provided with initial instruction and then largely self-manage their own exercise sessions at the gym, according to the program, without ongoing one-to-one instruction.

It requires the ability to integrate information from pre-exercise screenings, fitness assessments, and any medical guidance that may have been received for particular clients, to design suitable programs.

This unit applies to gym instructors and gym-based personal trainers who work unsupervised when interacting with clients using discretion and judgement and are guided by policies and procedures. They practise in settings such as fitness facilities, gyms, and leisure and community centres.

The skills in this unit must be applied in accordance with Commonwealth and State or Territory legislation, Australian standards and industry codes of practice.

No occupational licensing, certification or specific legislative requirements apply to this unit at the time of publication.

## **SISFFIT047 Use anatomy and physiology knowledge to support safe and effective exercise**

This unit describes the performance outcomes, skills and knowledge required to identify the role of anatomy and physiology knowledge in fitness instruction, and to use that knowledge to develop and instruct safe and effective exercise activities.

Knowledge of anatomy and physiology underpins effective performance in a range of work functions for fitness instruction. This unit has direct links to, and supports, a range of units for planning and instructing group and personalised exercise programs.

This unit applies to group fitness instructors, gym instructors and personal trainers. They practise in settings such as fitness facilities, gyms, leisure and community centres, client workplaces and homes and outdoor locations, depending on their role.

The skills in this unit must be applied in accordance with Commonwealth and State or Territory legislation, Australian standards and industry codes of practice.

No occupational licensing, certification or specific legislative requirements apply to this unit at the time of publication.

## **SISFFIT052 Provide healthy eating information.**

This unit describes the performance outcomes, skills and knowledge required to provide general, and not individualised, information about healthy eating to fitness clients. Information is based on the main recommendations of the current Australian national dietary guidelines which aim to promote optimal health and wellbeing for generally healthy people.

The unit requires the ability to recognise situations that are beyond the scope of practice for fitness instructors, and to provide information about the types of medical and allied health professionals with expertise to advise on nutritional needs.

This unit applies to group fitness and gym instructors who practise in settings such as fitness facilities, gyms, and leisure and community centres.

The skills in this unit must be applied in accordance with Commonwealth and State or Territory legislation, Australian standards and industry codes of practice.

No occupational licensing, certification or specific legislative requirements apply to this unit at the time of publication.

## Pre-requisites

There are no pre-requisites for this unit.

## About this resource

This resource brings together information to develop your knowledge about these units. The information is designed to reflect the requirements of the units and uses headings to make it easier to follow.

Read this resource to develop your knowledge in preparation for your assessment. You will be required to complete the assessment tools that are included in your program. At the back of the resource are a list of references you may find useful to review also.

As a student it is important to extend your learning and to search out credible textbooks, internet sites, articles and journals which can provide additional learning material on the topic. External websites may be referenced through this learner guide. They are confirmed as credible sources of information and can be used to complete your assessment responses.

External resources used in your assessments should be referenced so that we can confirm these sources and validate their accuracy and credibility.

## Unit Elements and Performance Criteria

### SISFFIT032 Complete pre-exercise screening and service orientation

#### 1. Screen clients for participation in exercise programs

- 1.1 Consult with client to identify reasons for exercise participation and identify client needs and preferences.
- 1.2 Question client to identify current and past participation in physical activities.
- 1.3 Explain to client purpose of pre-exercise screening processes in identifying risks for participating in exercise programs.
- 1.4 Assist client to complete industry standard pre-exercise screening questionnaire.
- 1.5 Collect and record accurate client data and basic body measurements, with informed client consent.

#### 2. Evaluate outcomes of screening

- 2.1 Identify and evaluate client health risk factors using screening system guidelines and within boundaries of fitness industry scope of practice.
- 2.2 Use screening system risk assessment guidelines to identify risks for client participation in exercise programs.
- 2.3 Discuss outcomes of screening with client and provide information about suitable levels of exercise intensity.
- 2.4 Determine need for guidance from medical and allied health professionals and discuss appropriate action with client.

#### 3. Provide client referrals

- 3.1 Explain referral process and confidentiality procedures to client and obtain informed client consent to share health information.
- 3.2 Compile relevant, accurate and concise information for inclusion in referral.
- 3.3 Document and provide referral information to relevant medical and allied health professionals according to client needs.

#### **4. Provide exercise service information**

- 4.1 Describe available programs, services and facilities relevant to client needs and preferences.
- 4.2 Actively engage with client to explain the features, general benefits and health benefits of different services.
- 4.3 Provide advice on suitability of exercise programs for client, according to outcomes of screening.
- 4.4 Remind clients identified as requiring medical or allied health professional guidance of the requirement to obtain that guidance prior to participation.
- 4.5 Document accurate details of screening outcomes, referral details and advice provided.

### **SISFFIT033 Complete client fitness assessments**

#### **1. Prepare for fitness assessments**

- 1.1 Review client pre-exercise screening and medical guidance documentation to identify relevant information for fitness assessment.
- 1.2 Communicate purpose, benefits and scope of fitness assessment to client, and obtain client consent.
- 1.3 Consult with client to identify their goals and preferences to inform fitness assessment.
- 1.4 Build trust and rapport with client by using client-centred communication showing sensitivity and empathy during interactions.

#### **2. Assess current fitness capabilities**

- 2.1 Select assessment activities and exercise equipment suited to individual client profile.
- 2.2 Demonstrate and explain correct techniques appropriate for the exercise activity.
- 2.3 Use monitors and measuring equipment to take and record accurate client data.
- 2.4 Use communication techniques that encourage and support the client during completion of activities.
- 2.5 Monitor client during activities and immediately discontinue if signs and symptoms of exercise intolerance appear.
- 2.6 Evaluate results to determine client's current fitness capabilities.
- 2.7 Review client goals against assessment results and determine suggested changes.
- 2.8 Accurately record assessment outcomes in client records.

#### **3. Communicate assessment outcomes**

- 3.1 Explain assessment results to client and the implications for client goals and exercise programs.
- 3.2 Discuss and confirm adjustments to client goals and suggest options for exercise activities based on assessment outcomes and availability of fitness services.
- 3.3 Identify and communicate, to client, need for guidance from medical and allied health professionals prior to client participation in exercise programs.
- 3.4 Document and provide referral information to relevant medical and allied health professionals according to client needs and confidentiality procedures.
- 3.5 Encourage and respond to client feedback and questions.
- 3.6 Document assessment information in appropriate format to facilitate individual exercise program planning.

## **SISFFIT040 Develop and instruct gym-based exercise programs for individual clients**

### **1. Identify client needs**

- 1.1 Review outcomes of client pre-exercise screening and fitness assessment and identify relevant information for program design.
- 1.2 Identify implications of medical guidance for exercise programming and duty of care to follow.
- 1.3 Discuss exercise preferences and consult with client to identify their short- and long-term fitness goals to inform program design.
- 1.4 Build client trust and rapport using client-centred communication showing sensitivity and empathy during interactions.
- 1.5 Develop and document client profile to assist with programming.

### **2. Develop program and session structure**

- 2.1 Review client's exercise preferences, goals, current abilities and medical advice to determine types of exercises and equipment for program.
- 2.2 Determine type and frequency of exercise sessions required for client to achieve goals.
- 2.3 Select exercises, training techniques and exercise equipment that target client's fitness goals.
- 2.4 Plan sessions that incorporate volume and intensity and load of exercises appropriate to client's age, sex and existing fitness capabilities.
- 2.5 Plan for exercise phases and volume within client's preferred session duration.
- 2.6 Document program and session plans for use by client according to organisational format.

### **3. Provide initial instruction and advice**

- 3.1 Provide clear and accurate exercise technique instruction and demonstration to client.
- 3.2 Demonstrate safe use of equipment included in program.
- 3.3 Observe client exercise technique for safety and effectiveness and provide corrective instruction based on observations.
- 3.4 Provide advice to client about how to adapt and progress exercise volume and intensity over time to achieve fitness goals.
- 3.5 Seek feedback from client about proposed program and record agreed modifications before finalising program.
- 3.6 Provide information about ongoing program monitoring and evaluation options and agree to approach based on client preferences.

### **4. Provide ongoing service to client**

- 4.1 Identify and use opportunities to interact with and support client during their gym sessions and seek feedback on their experience with program.
- 4.2 Complete formal program evaluation based on client requests and organisational requirements for periodic evaluation.
- 4.3 Modify and update program according to feedback and evaluation.
- 4.4 Update client records with details of evaluation and modifications.

## **SISFFIT047 Use anatomy and physiology knowledge to support safe and effective exercise**

### **1. Identify role of anatomy and physiology in fitness instruction**

- 1.1 Identify credible sources of information about anatomy and physiology that are relevant to fitness instruction.
- 1.2 Review information and identify how it relates to safe and effective fitness training for clients.

### **2. Select effective exercise activities for participants**

- 2.1 Identify aspects of anatomy and physiology that impact selection of suitable exercises for participants.
- 2.2 Select exercises that account for variations associated with participant sex and age.

### **3. Support participants to exercise safely and effectively**

- 3.1 Provide succinct explanations about the relationship between exercises and their beneficial impacts on the body and health.
- 3.2 Explain injury risk factors and demonstrate and explain safe and effective exercise technique to participants.

## **SISFFIT052 Provide healthy eating information**

### **1. Identify authoritative and evidence-based information**

- 1.1 Source information about healthy eating from the national dietary guidelines that apply to healthy people.
- 1.2 Interpret key national dietary guideline recommendations and healthy eating messages to inform healthy eating advice.

### **2. Communicate general healthy eating information to clients**

- 2.1 Advise clients about own role and limitations in providing healthy eating advice.
- 2.2 Provide information consistent with national dietary guidelines to help clients make informed healthy eating choices.
- 2.3 Advise on recommended daily serves of the five food groups outlined in national dietary guidelines.
- 2.4 Provide clear information about discretionary foods and inform clients about limiting daily intake.
- 2.5 Explain the benefits of healthy food and beverage choices, and impact of poor choices on health and wellbeing.
- 2.6 Show sensitivity to cultural and social differences that may influence food choices.
- 2.7 Provide accurate information about the role of healthy eating as part of a fitness program.

### **3. Identify clients who require nutrition advice outside of own scope**

- 3.1 Identify characteristics of clients who require nutrition advice beyond scope of practice and recognise risks of providing information to those clients.
- 3.2 Provide information about types of health professionals with required expertise to clients who require nutritional advice outside scope of practice.

# Performance Evidence

This describes the essential skills and their level required for each unit.

## **SISFFIT032 Complete pre-exercise screening and service orientation**

Evidence of the ability to complete tasks outlined in elements and performance criteria of this unit in the context of the job role and:

- complete a pre-exercise screening and service orientation for three different clients including:
  - a female adult
  - a male adult
  - a client aged 55 years or over
- for each of the above three clients:
  - identify exercise needs and preferences
  - determine health risk factors for exercise participation using industry standard screening questionnaire and guidelines
  - measure and record resting blood pressure
- take and record accurate basic body measurements:
  - weight in kilograms
  - height in metres
  - waist circumference in centimetres
  - body mass index
- explain features and benefits of available programs, services and facilities that meet the client's needs and preferences
- provide advice on suitability of exercise intensity and types of programs, according to the outcomes of their screening
- accurately document details of client contact including screening outcomes and advice provided
- according to actual client interactions or case studies:
  - identify two clients with risk factors that require referral to medical or allied health professionals
  - document informed consent to share health information for each of the two clients
  - prepare accurate referral documentation for each of the two clients to obtain guidance from medical or allied health professionals for exercise participation and prescription.

## **SISFFIT033 Complete client fitness assessments**

Evidence of the ability to complete tasks outlined in elements and performance criteria of this unit in the context of the job role, and:

- complete a fitness assessment of three different clients including:
  - a female adult
  - a male adult
  - a client aged 55 years or over
- for each of the above three clients:
  - measure heart rate at rest, during exercise and post exercise using a heart rate monitor
- select and use client-appropriate activities to assess:
  - cardiovascular endurance
  - muscle strength
  - muscle endurance
  - flexibility
- accurately record results in client records and prepare information to facilitate exercise program development

- suggest two options for suitable exercise activities according to fitness assessment outcomes and client goals
- according to actual client interactions or case studies:
  - identify two clients with risk factors that require referral to medical or allied health professionals
  - prepare accurate referral documentation for each of the two clients to obtain guidance from medical or allied health professionals for exercise participation and prescription.

#### **SISFFIT040 Develop and instruct gym-based exercise programs for individual clients**

Evidence of the ability to complete tasks outlined in elements and performance criteria of this unit in the context of the job role.

- develop and document one individually tailored gym-based exercise program for three clients, to collectively include:
  - a female adult client
  - a male adult client
  - a client aged 55 years or over
  - a client for whom medical guidance has been received
- for each of the above three clients:
  - develop and document two session plans, each with a minimum duration of 30 minutes
  - instruct two sessions according to the above session plans, each with a minimum duration of 30 minutes
  - consistently use client-centred communication and instructional techniques
- across the above six session plans collectively, incorporate the following:
  - cardiovascular exercises
  - resistance exercises
  - flexibility exercises
  - exercises with and without equipment
- according to actual client interactions or case studies, evaluate the effectiveness of two client programs, modify program and session content and document details of the evaluation and changes made.

#### **SISFFIT047 Use anatomy and physiology knowledge to support safe and effective exercise**

Evidence of the ability to complete tasks outlined in elements and performance criteria of this unit in the context of the job role, and:

- source and review information about anatomy and physiology relevant to fitness instruction from three credible sources, and select specific information for use in different areas of fitness instruction work
- choose two exercises that are suitable for each of the following client types (ten exercises in total):
  - female adults
  - male adults
  - clients aged 55 years or over
  - sedentary clients
  - active clients
- for each of the ten exercises:
  - demonstrate safe and effective exercise technique to clients during either individual or group exercise sessions
- during session instruction, provide a plain language explanation to the individual client or group about:
  - the relationship between the exercise and its beneficial impacts on the body and health, and muscular function
  - associated injury risk factors and safe exercise technique.



## SISFFIT052 Provide healthy eating information

Evidence of the ability to complete tasks outlined in elements and performance criteria of this unit in the context of the job role, and:

- provide healthy eating information from the Australian national dietary guidelines to three clients and include information about:
  - the five food groups and their recommended proportional daily intakes
  - discretionary foods that should be eaten only sometimes and in small amounts
- according to actual client interactions or case studies:
  - identify three situations outside scope of own practice for providing nutrition advice
- for each above situation:
  - advise client why their nutrition needs are outside scope of own role
  - provide information about the type of medical or allied health professional with relevant expertise.

## Knowledge Evidence

This describes the essential knowledge and level required for each unit.

### SISFFIT032 Complete pre-exercise screening and service orientation

Demonstrated knowledge required to complete the tasks outlined in elements and performance criteria of this unit:

- key legal obligations and procedures for maintaining confidentiality of client information including requirements for the collection, use, maintenance and secure storage of private information, particularly sensitive health information
- boundaries and responsibilities of fitness instructors in completing pre-exercise screenings, determining health risks and providing exercise prescription
- how pre-exercise screening and referral of at-risk clients relate to duty of care
- aims of pre-exercise screening processes and importance of implementing at different times:
  - prior to clients beginning an exercise program from sedentary and low exercise levels
  - prior to significant exercise program changes
  - when client's personal health status changes significantly
  - when assuming exercise programming responsibility for a client previously screened by others
- industry standard pre-exercise screening questionnaires and guidelines:
  - format and inclusions
  - purpose of different stages of screening questionnaires
  - how to use to identify and evaluate client health risk factors
  - circumstances indicating need for referral to medical and allied health professionals
- health risk factors to be considered in screening clients for participation in exercise programs, why these factors are important, and how single and multiple factors contribute to assessment outcomes:
  - chronic disease in client and family history of disease:
- cardiovascular disease including coronary heart disease and stroke
- chronic obstructive pulmonary disease (COPD)
- asthma
- metabolic disease including diabetes mellitus
- musculoskeletal disorders
  - adverse responses to physical activity including chest pain and dizziness
  - hypertension and hypotension
  - high cholesterol
  - high blood sugar

- muscle, bone, tendon, ligament and joint injuries, pain and problems, including diagnosed and of significant concern
- use of and reasons for prescribed medications
- reasons for hospital admissions during previous year
- body composition including underweight, overweight and obesity
- antenatal and post-natal general issues and conditions
- smoking
- role of medical and allied health professionals and their area of expertise in providing guidance for client exercise participation and prescription:
  - general practitioners (GPs)
  - rehabilitation physicians
  - sports physicians
  - physiotherapists
  - accredited exercise physiologists
  - accredited practising dietitians
- essential information included in referrals:
  - fitness instructor and facility details
  - client details
  - client consent for release of health information
  - reasons for referral
  - guidance being sought
  - copy of completed pre-exercise screening tool
- how to locate, use and adapt template referral letters
- legal and ethical obligations of obtaining and documenting informed consent from clients to:
  - share screening information with medical and allied health professions
  - authorise medical and allied health professionals to release health information to fitness instructors
- how to tailor consent documentation according to a client's instructions when they choose to limit information to be released to and from medical and allied health professionals
- how to take basic body measurement techniques recorded for screening and how to calculate body mass index (BMI):
  - weight in kilograms
  - height in metres
  - waist circumference in centimetres
- blood pressure and how to operate a blood pressure monitor
- features and benefits of different types of services offered by fitness facilities:
  - group classes
  - programs, advice and support provided by gym instructors
  - personalised exercise programming and instruction by personal trainers
  - supplementary services offered to promote health and wellbeing
- overview of the health benefits of exercise activities, and examples of exercise classes that feature:
  - cardiovascular exercises
  - resistance exercises
  - flexibility exercises
  - high impact exercise
  - low impact exercise.

### **SISFFIT033 Complete client fitness assessments**

Demonstrated knowledge required to complete the tasks outlined in elements and performance criteria of this unit:

- key legal obligations to maintain confidentiality of client information including requirements for the collection, use, maintenance and secure storage of private information, particularly sensitive health information
- boundaries and responsibilities of fitness instructors in completing fitness assessments and providing exercise prescription
- how fitness assessments and referral of at-risk clients relate to duty of care
- type of information provided by industry standard pre-exercise screening processes and implications for fitness assessments:
  - client needs and exercise preferences
  - client body measurements
  - contraindications and precautions for exercise including those provided by medical and allied health professionals
  - indicative recommended level of exercise intensity
- purpose of fitness assessments and benefits for clients and instructors
- key aspects of health-related components of fitness, methods used to assess these and how to interpret results:
  - cardiovascular endurance
  - muscle strength
  - muscle endurance
  - flexibility
- methods for measuring exercise intensity:
  - heart rate response
  - talk test
  - rated perceived exertion (RPE) scale
  - power output
- types of exercise equipment used for fitness assessments and how to complete assessments without using exercise equipment
- functions of heart rate monitors used for fitness assessments and how to operate
- meaning of exercise intolerance and common signs and symptoms
- fitness assessment situations and outcomes indicating the need for referral to medical and allied health professionals
- essential information included in referrals
- formats of client fitness assessment records and the types of information they include
- services available in the fitness industry that match different fitness levels and types of client goals.

### **SISFFIT040 Develop and instruct gym-based exercise programs for individual clients**

Demonstrated knowledge required to complete the tasks outlined in elements and performance criteria of this unit:

- role and scope of established gym procedures that impact fitness instruction
- boundaries and responsibilities of fitness instructors in providing tailored gym-based programs for clients and relationship to duty of care
- differences between gym-based programs where clients largely self-manage their exercise activities, and fully personalised programs involving ongoing one-to-one instruction

- type of client information provided by pre-exercise screening and fitness assessment processes, and implications for exercise programming:
  - client needs and exercise preferences
  - client body measurements
  - client fitness data and indication of suitable exercise intensity
- types of client guidance that may be provided by medical and allied health professionals and implications for exercise programming:
  - injury management protocols
  - contraindications and precautions for types of exercise for those with medical conditions and health risk factors
  - exercise recommendations for client health improvement and collaborative rehabilitation
- factors that affect the design of client-tailored gym-based exercise programs:
  - physical differences that need to be considered for:
    - adults of different sexes
    - older people
    - antenatal, postnatal, menopausal and post-menopausal women
  - exercise history and current abilities
  - desired frequency of gym attendance and other personal exercise activities
  - client goals
- the meaning of the following components of fitness, and how exercises can target client goals and improvements for each:
  - health related components:
    - cardiovascular endurance
    - muscle strength
    - muscle endurance
    - flexibility
    - body composition
  - skill related components:
    - power
    - speed
    - agility
    - coordination
    - balance
    - reaction time
    - proprioception
- different types of exercises, equipment that can be used and safe techniques for their completion:
  - cardiovascular exercises:
    - continuous
    - interval
  - resistance exercises using:
    - free weights
    - gym equipment including weight machines
    - body weight
  - flexibility exercises:
    - dynamic
    - static
- benefits and impacts on the body of different types of exercises and specific injury prevention strategies
- how different types of exercises can be combined and sequenced for safety and optimum effectiveness

- overview of the following exercise science principles and how they are used to design gym-based exercise programs and sessions for individuals:
  - adaptation
  - overload
  - specificity
  - individualisation
  - progression and regression
  - reversibility
- how the FITT (frequency, intensity, time and type) principle is used to structure exercise programs and sessions
- established phases of exercise sessions, their underpinning rationale and timing for each within designated time of session:
  - warm up
  - main workout
  - cool down and stretches
- components of exercise sessions, and how they can be used effectively to target client goals:
  - exercise order
  - volume and intensity and load of exercises
  - repetitions and sets
  - repetition tempo
  - rest intervals
- training techniques that can be used by clients in self-directed gym sessions, how they can be used, and considerations for their use:
  - supersets
  - drop sets
  - pre-fatigue techniques
  - plyometric training
  - interval training including high intensity interval training (HIIT)
  - circuit training
- instructional techniques used with individual clients and how they impact effectiveness of instruction and client execution of exercises:
  - providing clear information about exercises and instructions about technique
  - combining explanation and demonstration of correct exercise technique
  - cueing and how to adapt instruction to suit different learning styles:
    - verbal
    - visual
    - tactile
    - kinaesthetic
- communication techniques used for the following and how these may vary depending on individual client characteristics:
  - establishing and maintaining individual rapport
  - motivating individuals for optimum performance
  - providing constructive feedback and positive reinforcement
- ways of supporting clients managing their own exercise sessions in a gym environment:
  - recognising when clients could progress volume, intensity and loads and making suggestions
  - correcting technique
  - offering opportunities for formal program evaluation and modification

- methods used to evaluate gym-based exercise programs:
  - periodic informal discussions with client and targeted questions to elicit opinion about achievement of goals, fitness improvement, changes to health, general wellbeing and skills
  - periodic observation and measurement of client performance, and health and skill improvements
- format and inclusions of documented:
  - client based exercise programs
  - client based exercise session plans
  - client profile and client evaluation records.

## **SISFIT047 Use anatomy and physiology knowledge to support safe and effective exercise**

Demonstrated knowledge required to complete the tasks outlined in elements and performance criteria of this unit:

- types of activities where fitness instructors use knowledge of anatomy and physiology:
  - interpreting client health information and related terminology
  - developing exercise programs and sessions appropriate for participant characteristics and goals
  - providing instruction about exercise technique
  - explaining purpose of exercises and answering client questions
- credible sources of information about human anatomy and physiology that draw links with fitness instruction activities
- overview of the six levels of structural organisation of the human body:
  - chemical
  - cellular
  - tissue
  - organ
  - system
  - organism
- basic aspects of the following and any variances for different sexes:
  - cardiovascular system:
    - structure and overall function
    - role of blood and circulation pathways
    - relationships between exercise intensity and circulatory and ventilator responses
    - short- and long-term effects of different types of exercise on blood pressure and cardiorespiratory fitness
  - respiratory system:
    - structure and overall function
    - mechanics of breathing
    - respiratory system demands of exercise activities
  - muscular system:
    - structure and overall function
    - types of muscle tissue and classifications
    - major muscle groups
    - function of muscle proprioceptors
    - functions and actions of major muscles during movement and exercise, and resulting joint actions
    - short- and long-term effects of different types of exercise on muscle
    - changes to the muscular skeletal system over the lifespan

- skeletal system:
  - structure and overall function
  - major bones, major joints and joint structures
  - bony landmarks
  - short- and long-term effects of different types of exercise on bones and joints
- nervous system:
  - structure and overall function
  - the specific role of the central and peripheral nervous systems in controlling skeletal muscle
  - nerves and nerve impulses
  - short- and long-term effects of different types of exercise on neuromuscular system
- overview of these aspects of human biomechanics:
  - forces which act on the body during exercise
  - lever systems in the body
- anatomical planes and axes of movement, and relationships to joints and range of movement:
  - sagittal
  - frontal
  - transverse
- meaning of the following anatomical terms of location:
  - medial and lateral
  - anterior and posterior
  - superior and inferior
  - proximal and distal
  - superficial and deep
- meaning of the following anatomical terms relating to movement:
  - flexion
  - extension
  - abduction
  - adduction
  - pronation
  - supination
  - dorsiflexion
  - plantarflexion
  - circumduction
  - inversion
  - eversion
- basics of thermoregulation and its application to exercise activities:
  - processes of heat gain and heat loss
  - effects of environmental conditions
  - effects of dehydration on body temperature
- basic definitions of these types of injuries, and common exercise related causes:
  - primary and secondary
  - direct and indirect
  - acute and overuse
- how exercise activities can be adjusted to safely accommodate common and low risk injuries
- client-focussed plain language explanations of anatomical and physiological information
- types of visual aids that can assist with providing anatomical and physiological information to clients.

## SISFFIT052 Provide healthy eating information

Demonstrated knowledge required to complete the tasks outlined in elements and performance criteria of this unit:

- roles of medical and allied health professionals in providing nutritional advice and their expertise in addressing different needs:
  - accredited practising dietitians (APD)
  - accredited sports dietitians (AccSD)
  - general practitioners
- differences and similarities between the roles and skills of dietitians and nutritionists
- common consumer expectations of fitness instructors to provide nutrition and weight management advice, and:
  - purpose and content of established industry guidelines for scope of practice for fitness instructors in providing nutrition advice
  - own role and limitations in providing nutritional advice to clients
  - techniques used to positively communicate with clients about scope of own role and knowledge
  - how industry guidelines assist fitness instructors to appropriately respond to client enquiries outside their scope of practice
- opportunities for fitness instructors to promote and support healthy eating with clients
- how nutritional needs differ for special population clients, and characteristics of clients who require nutrition advice beyond fitness instructor scope of practice:
  - those with chronic conditions
  - the frail elderly
  - pregnant and breastfeeding women
  - clients who show signs of having an eating disorder as identified in established industry guidelines
  - any client seeking individualised information outside the scope of the population level recommendations in national dietary guidelines
- risks to clients of fitness instructors providing nutrition-related advice outside scope of practice:
  - nutrient deficiencies and imbalances
  - exposure to low energy availability (LEA) and overview of LEA impacts
  - negative impact on existing health conditions
  - food intolerance and allergy adverse reactions
  - negative food-drug interactions
  - nutrition confusion
  - financial burden of product recommendations
- risks to fitness instructors of providing nutrition-related advice outside scope of practice, specifically the potential professional, legal and financial consequences
- key contents of current Australian national dietary guidelines and associated resources:
  - the principal recommendations and guidelines
  - characteristics and examples of types of foods in the five food groups
  - proportions of the five food groups recommended for consumption each day
  - characteristics and examples of discretionary foods to be avoided
- healthy eating:
  - benefits of healthy eating
  - relationship to physical wellbeing
  - how healthy eating can impact on client health and fitness goals and outcomes
  - the role of healthy eating in a fitness program and basic aspects of how nutrition and exercise interrelate
- potential impacts of unhealthy food choices and eating patterns on general health and wellbeing and:
  - diet-related risk factors for chronic disease, including high cholesterol, high blood pressure and obesity
  - risk of chronic diseases including type 2 diabetes, cardiovascular disease and some types of cancers
- effects of cultural and social influences on food choices.



## Assessment Conditions

Instructional activities for these units can be demonstrated in:

- The workplace, or
- A stimulated workplace set up for the purpose of skills assessment

The following resources must be available to replicate industry conditions of operation during practical tasks:

### **SISFFIT032 Complete pre-exercise screening and service orientation**

Skills can be demonstrated in:

- the workplace, or
- a simulated workplace set up for the purpose of skills assessment.

Assessment must ensure the use of:

- interaction with clients; these can be:
  - clients in an industry workplace, or
  - individuals who participate in simulated activities used for the purpose of skills assessment
- blood pressure monitor
- weight scales
- tape measures which can include stadiometers for measuring height
- industry standard pre-exercise screening questionnaire and guidelines
- informed consent forms
- client record keeping forms
- template referral letters.

### **SISFFIT033 Complete client fitness assessments**

Skills can be demonstrated in:

- the workplace, or
- a simulated workplace set up for the purpose of skills assessment.

Assessment must ensure the use of:

- interaction with clients; these can be:
  - clients in an industry workplace, or
  - individuals who participate in simulated activities used for the purpose of skills assessment
- heart rate monitor
- template referral letters
- client records which include completed industry standard pre-exercise screening documentation.

### **SISFFIT040 Develop and instruct gym-based exercise programs for individual clients**

Skills can be demonstrated in:

- the workplace, or
- a simulated workplace set up for the purpose of skills assessment.

Assessment must ensure the use of:

- interaction with clients; these can be:
  - clients in an industry workplace, or
  - individuals who participate in simulated activities used for the purpose of skills assessment
- equipment required for selected exercises

- client records which include documentation of:
  - completed industry standard pre-exercise screenings
  - completed fitness assessments
- samples of guidance information provided by medical or allied health professionals
- template client-based exercise program and session plans

#### **SISFFIT047 Use anatomy and physiology knowledge to support safe and effective exercise**

Instructional activities for this unit can be demonstrated in:

- the workplace, or
- a simulated workplace set up for the purpose of skills assessment.

The following resources must be available to replicate industry conditions of operation:

- first aid equipment
- communication equipment for emergency response.

Assessment must ensure the use of:

- interaction with individual clients or group exercise participants; these can be:
  - clients or participants in an industry workplace, or
  - people who participate in simulated activities used for the purpose of skills assessment
- equipment required for selected exercise types.

#### **SISFFIT052 Provide healthy eating information**

Skills can be demonstrated in:

- the workplace, or
- a simulated workplace set up for the purpose of skills assessment.

Assessment must ensure use of:

- interaction with clients; these can be:
  - clients in an industry workplace, or
  - individuals who participate in simulated activities used for the purpose of skills assessment
- established fitness industry guidelines for providing nutrition advice within scope of practice for fitness instructors
- current Australian national dietary guidelines and associated resources:
  - the principal recommendations and guidelines
  - guides to healthy eating
  - consumer brochures.

# PREPARE FOR A PRE-SCREENING SESSION

Whether you are planning to work as a Gym Instructor or to become a full qualified Personal Trainer, writing programs for various client types will be an integral part of your career.

We have already established that a strong foundation of knowledge about human anatomy and physiology will help you understand how exercise impacts clients individually. This will allow you to select the most appropriate types of exercises to avoid injuries and help clients reach their goals.

During this study block you will need to refer back to the knowledge gained in Study Block 2 as you continue to apply anatomy and physiology principles to program writing and exercise instruction for various client needs.

## Legislation and duty of care

Gym instructors and personal trainers have an industry code of conduct to adhere to that outlines best practices to be followed to ensure a duty of care to the client is observed and to reduce the risk of litigation being brought against them.

AUSActive (previously Fitness Australia) has published this list of professional expectations to promote good and professional practice among Australian Fitness Representatives.

It is important that you familiarise yourself with the code of conduct and conduct yourself in alignment with the recommendations when practicing as a fitness representative.

Failure to comply may result in litigation being brought against you and/or the business you work for, loss of privilege to register with AUSActive, loss of reputation and the safety of your clients or colleagues jeopardised.

The code is complimentary to legislative acts that a fitness representative must also be familiar with including:

- Anti-discrimination law
- Child safety protection laws
- Consumer law
- Privacy law
- Workplace health and safety law

Please familiarise yourself with this code of conduct as you will need to use it for parts of your assessments:

[https://fdlc.com.au/sites/default/files/imce/Code\\_of\\_Ethical\\_Conduct\\_v2.pdf](https://fdlc.com.au/sites/default/files/imce/Code_of_Ethical_Conduct_v2.pdf)



# **Key legal obligations when working in the fitness industry**

## **Anti-discrimination Law**

Relationships with clients and colleagues must be based on respect, openness, trust and good communication.

Anti-discrimination laws are in place to protect people from unfair treatment, sexual harassment and questionable conduct which can offend or victimise others.

It is essential that when we are interacting with all people that our conduct is without discrimination on the basis of the following attributes:

- Sex
- Relationship status
- Pregnancy
- Parental Status
- Breastfeeding
- Age
- Race
- Impairment or disability
- Religious belief or activity
- Political belief or activity
- Trade union activity
- Gender Identity
- Sexuality
- Family responsibilities
- Association with or relation to a person identified on the basis of any of the above attributes

For more detail on the QLD Anti-discrimination Act 1991:

<https://www.legislation.qld.gov.au/view/pdf/2017-06-05/act-1991-085>

## **Child Safety Protection Law**

Child safety protection law has the purpose of protecting children. It aims to ensure that the safety, wellbeing and best interests of a child are cared for and that they are protected from risk or harm.

Most states in Australia will require that you are screened before being allowed to work with children. A fitness representative should obtain the appropriate registration or license to work with children in their state before offering a service to minors.

For more detail on the Child Protection Act 1999:

<https://www.legislation.qld.gov.au/view/pdf/inforce/current/act-1999-010>

## **Consumer Law**

The Australian Consumer Law applies nationally and has the purpose of protecting consumer rights. Including the following:

- a national unfair contract terms law covering standard for consumer and small business contracts
- a national law guaranteeing consumer rights when buying goods and services
- a national product safety law and enforcement system
- a national law for unsolicited consumer agreements covering door-to-door sales and telephone sales
- simple national rules for lay-by agreements; and
- penalties, enforcement powers and consumer redress options.

Fitness professionals that manage a business should familiarise themselves with consumer law legislation. For more detail on Australian Consumer Law:

<https://consumer.gov.au/australian-consumer-law>

## Privacy Law

The Information Privacy Act 2009 (Qld) (IP Act) recognises the importance of protecting the personal information of individuals. It contains a set of rules or 'privacy principles' that govern how Queensland Government agencies collect, store, use and disclose personal information.

Each state has its own Privacy Act that should be consulted based on which state your business is located in.

Familiarisation of privacy laws is essential for fitness professionals as they are gathering personal and sensitive information about a client's health which must be stored privately and securely.

The following are essential inclusions that must be observed when dealing with clients:

- Do not gather personal information from a client that is not necessary to determine a safe approach to their fitness and health plan.
- Store client personal details in a secured and locked or adequately protected online location.
- Clients should be allowed access to their personal details at all times.
- Do not share a client's personal information with anyone without their permission or consent.
- Gain clear guidance from the client on which parts of their personal information can be shared and with whom.
- Have professional reasons to request consent to share personal information.
- Explain why the information needs to be shared and with whom before gaining consent.
- In the case of a minor or person unable to give consent personally, consent must be gained from a carer, parent or guardian.

For more detail on the QLD Information Privacy Act 2009 (as an example):

<https://www.legislation.qld.gov.au/view/pdf/inforce/current/act-2009-014>

## Workplace Health and Safety Law

This law applies to many areas of the fitness industry and is covered more extensively in Study Block 4.

In relation to providing health pre-screening sessions, a client duty of care would make it essential to conduct such a screening on all clients that want to start an activity or exercise program.

Duty of care refers to your obligation to provide a safe work environment for the consumer and workers. All work activities must be conducted with reasonable care to reduce risks to safety everywhere possible.

Therefore, not conducting a thorough pre-screening session would be putting the client at risk as you would not have the required health information you need to make educated recommendations for physical activity for them. This can put your business, reputation, insurance obligations and national registration at risk and is unacceptable.

Under a duty of care as a fitness representative it is also essential that you identify when a client's needs are outside of your scope of practice and require a referral and/or clearance from a medical practitioner or allied health professional before commencing an exercise program.

For more detail on WHS duty of care:

<https://www.safeworkaustralia.gov.au/doc/model-work-health-and-safety-act>

## **Aims of pre-exercise screening**

Clients may need to have a pre-exercise screen at various times during their fitness journey. It is important to be aware of the different times that conducting, or an update of a pre-screening document would be appropriate.

### **➔ Prior to a client beginning an exercise program if they have been sedentary or have a low fitness level.**

These clients will likely have just joined the fitness centre or may have been exercising over a year ago but have not been doing any exercise recently leading to low fitness levels or current sedentary lifestyle.

They may be a little nervous to start or get back into exercise due to their low fitness and motivation levels. They may also be coming back to fitness after a serious health issue or birthing a child. Clearance is usually necessary from their medical practitioner to ensure their health is at a level that can sustain physical activity. These clients will need to start at a low level of intensity.

### **➔ Prior to significant exercise program changes**

A client may want advice on an exercise program change, in which case the pre-screening tool should be updated, preferable a new one completed and added to their file with their previous screening

documentation. Clients may have also had a health concern and need a change in their program to suit new health circumstances or may be wanting to achieve new goals and need to train at a higher level of intensity to achieve the new goal. All very valid reasons to update their pre-screening records.

### **➔ When a client's health status changes significantly**

A client may be diagnosed with a significant health issue that requires a change in their exercise program and session plans. It may be important to gain clearance or guidance on how to proceed with the persons new health status in mind and updating their pre-screen records is essential to ensure you have a clear picture of the persons current situation to program a safe and effective exercise plan for them.

### **➔ When assuming exercise programming responsibility for a client previously screened by others**

The question is, how can you be sure that the previous fitness representative did a pre-screen with the client or if they did it thoroughly? Also, when was it last completed and how long has it been since the client exercised regularly? The safest option is to complete a new pre-screening record with the client so that you are confident that you have gained all the necessary details to complete their exercise program and session plan safely and effectively.

### **➔ To identify if a client needs to be referred to an allied health practitioner**

After the health screen has been completed you will be able to identify the client's health risk level and decide if they require a referral or clearance from an allied health professional. Allied health professional (AHP's) are trained professionals who are not doctors or dentists. They can be used to help manage physical or mental conditions by providing services that diagnose, treat or rehabilitate. Clients may need to be referred to their General Practitioner (GP) or an allied health professional before they start an exercise program or if they have an adverse reaction to exercise once they commence a physical activity program.

## Client centered communication

Good communication skills are essential when working in the fitness and health industry. Every interaction that we have with a client is an opportunity to develop rapport with them and show that we genuinely care about them, their health, fitness and their results.

This is often called patient or client centred care and means that we are focused on finding out what really matters to the client and how we can help them incorporate fitness and healthy lifestyle changes into their lives permanently.

This needs to be an individual process and genuine concern and interest should be taken in the client personally so the rapport that is built helps them believe their needs will be respected.



Some of the qualities and skills fitness representatives need to become proficient in are:

### ➡ **Listening**

Listening carefully to a client's answers will show them that you genuinely care about them and may prompt you to ask for more information on a certain topic if you believe it will affect their fitness programming. For example: When a client indicates that they are taking prescribed medications you may enquire a little further and ask what the medication is for (if they don't mind sharing this information) so that you can gain a better understanding of the conditions they have and how they are being managed.

### ➡ **Clarifying**

When a client communicates something important to you, paraphrase it back to them to make sure you have the correct understanding of what they are communicating to you.

For example: A client may explain they want to tone up around their hips and thighs – and you may paraphrase that back by saying "Let me be clear, I am hearing that you want your hips and lower body to have more shape and definition, is that right?" Then allow them to answer yes or no and this may lead to them giving you even more information about their needs and goals.

### ➡ **Sensitivity and empathy**

Clients may feel nervous, shy or even intimidated when communicating sensitive information about their health, body image or goals and it is essential for rapport building that a fitness representative can show that they care about these feelings. Use sensitive body language and

allow them to explain how they feel so that you can then relate their goals back to moving away from their negative feelings and replacing them with results and positive feelings.

### ➡ **Enthusiasm**

Your enthusiasm and positivity will be contagious for most clients, and they will feel drawn to your energy and vibe. Be encouraging and passionate about the benefits of fitness and health and excited for the client to experience these benefits by following the exercise program you produce for them.



## Professional

Always present yourself professionally in uniform or in modest workout clothes. Be clean and neat in your personal appearance. When speaking with clients display confidence in your skills, knowledge and ability to help the client achieve their goals. When the client feels like you know what you are talking about and are confident in your own skills, this will usually transfer to them developing confidence in you quickly.

When you are a new trainer, you may lack the confidence that experience will naturally give you. When starting out and during your course, keep the interviews or programs simple and practice with friends and family until you feel confident in your knowledge and skills.

Clients need to remain informed about the processes you are taking them through and be involved in decision making about their health and fitness program. It's essential to ask them about their needs and preferences so that the exercise programs that you write are tailored to achieve the results they want and in alignment with their likes and dislikes. They will find programs easier to adhere to if they are enjoying the sessions and understand the benefits of the activities they are participating in to improve their health and wellness.

For more information about effective communication in healthcare:

<https://www.health.vic.gov.au/patient-care/communication>.

## Prepare for the session

When you prepare well for a pre-screening session you will feel more confident and present in a professional way to the client:

### Check the following in preparation for your session:

- ☒ Has the client booked an appointment time for the session?
- ☒ Have you confirmed the session time with the client 24-48 hours prior?
- ☒ Do you have the pre-screen tool ready to complete? This can be done on an electronic device or completed as a printed hard copy based on your organisations policies and procedures. Check that the device is charged and/or your pen works!
- ☒ Will the client fill out the form on their own or will you complete the form in an interview style. This may be decided based on the organisations policies and procedures or based on how much time is available for the interview.
- ☒ Do you need anything else for the interview? Some things that may be considered are a price presentation if they decide they want personal training or class timetable if they would benefit from attending classes. Perhaps a brochure for other services that may interest them like an 8-week challenge or dietitian service offered by the fitness facility.
- ☒ Will you need equipment or calculating tools such as blood pressure readings, girth and body weight and height measurements? Are these available, easily accessible and in working order?
- ☒ Do you have referral documentation and consent forms ready in case the client needs a referral to start exercising?
- ☒ Is your personal presentation ideal including neat hair, clean clothes/uniform, minimal jewellery and pleasing body odours?

Always prepare well for every appointment as this will show a professional attitude and help the client feel confident in your abilities and recommendations.



### Key information being gathered in a pre-screening session:

- Client's personal details
- Clients' health concerns
- Client's health risk factors
- Clients' past and present participation in physical activities
- Clients' goals/reasons for exercise participation
- Clients body measurements (if appropriate)
- Resources available to achieve clients' goals (time, facilities, support etc)
- Personal barriers to achieving the clients' goals
- Client's general needs and preferences

Once this key information is gathered the outcome will be that you can decide on and describe the following to the client:

- What the client's level of risk of an adverse event happening is when participating in exercise activities
- Suitable level of exercise intensity the client can participate in safely
- Whether the client needs a referral to a medical or allied health professional
- Which programs, services and facilities are relevant to the client's needs and preferences
- The features and health benefits of various services available to the client
- What should be included in a client's program plan and sample session plan

## Pre-Screening Forms and Equipment

During the assessment for this study block you will need the following tools to conduct the full pre-screen session with each client:

1. Industry standard pre-screening questionnaire
2. Goal setting and recommendations form
3. Fitness facility services information
4. Blood pressure monitor
5. Body weighing scales
6. Body height measurement tool (stadiometer or tape measure)
7. Tape measure
8. Calculating device

### Industry standard pre-screening questionnaire

The pre-screening health form we recommend is the industry endorsed ESSA Adult Pre-Exercise Screening System. (APSS)

You can find this tool, including various versions for different client types and a user guide here:

[https://www.essa.org.au/Public/ABOUT\\_ESSA/Pre-Exercise\\_Screening\\_Systems.aspx](https://www.essa.org.au/Public/ABOUT_ESSA/Pre-Exercise_Screening_Systems.aspx)

#### There are three different types:

1. Adults Pre-Exercise Screen
2. Pre-Exercise Screen for young people (PSS-YP) (various age categories)
3. Pre-Exercise Screen during pregnancy

"Any health professional is free to download, access and utilise any of the above Pre-Exercise Screening Systems, ensuring appropriate reference is made to Exercise & Sports Science Australia (ESSA), Sports Medicine Australia (SMA) and Fitness Australia." (Exercise and Sports Science Australia 2021)

Choose the screening system that suits your client type and familiarise yourself with the user guide attached. The user guide will explain each stage in detail, the types of information you need to know and how to interpret the answers the client provides you for each question.

There are two stages to the Adult Pre-Exercise Screening tool:

## Stage 1 (Compulsory)

**Aim** - To identify those individuals with a known disease, and/or signs or symptoms of disease, who may be at a higher risk of an adverse event due to physical activity/exercise.

An adverse event refers to an unexpected event that occurs as a consequence of a physical activity/exercise session, resulting in ill health, physical harm or death to an individual.

Stage 1 may be self-administered and evaluated by the client. The screening tool can be administered to both regular and casual users of exercise services including group fitness participants.

- If the individual answers YES to any of the first 6 questions, they are advised to seek guidance from an appropriate allied health professional or their medical practitioner prior to undertaking physical activity/ exercise (see Figure 1 in the user guide).
- If the individual answered NO, they may proceed to question 7, and if they have no other concerns about their health, they are advised that they may commence activity at a light-moderate intensity or continue with current intensity levels.

Individuals who participate in less than 150 minutes of weighted physical activity a week may participate in physical activity/exercise at a light or moderate intensity.

Individuals who participate in 150 minutes or more of weighted physical activity may continue with light, moderate or vigorous to maximal intensity exercise (based on their current physical activity patterns). Refer to Figure 2: Exercise Intensity Guidelines in the screening tool.

**Aim of this stage:**

The main reason this section is compulsory is that if a client answers “Yes” to **ANY** of the questions in stage one – they need to be referred to a medical practitioner for clearance **before they commence physical activity of any level**.

## Stage 2 (Recommended)

This stage is to be completed to determine an appropriate exercise prescription based on established risk factors. This section should be completed with the fitness representative – not self-administered.

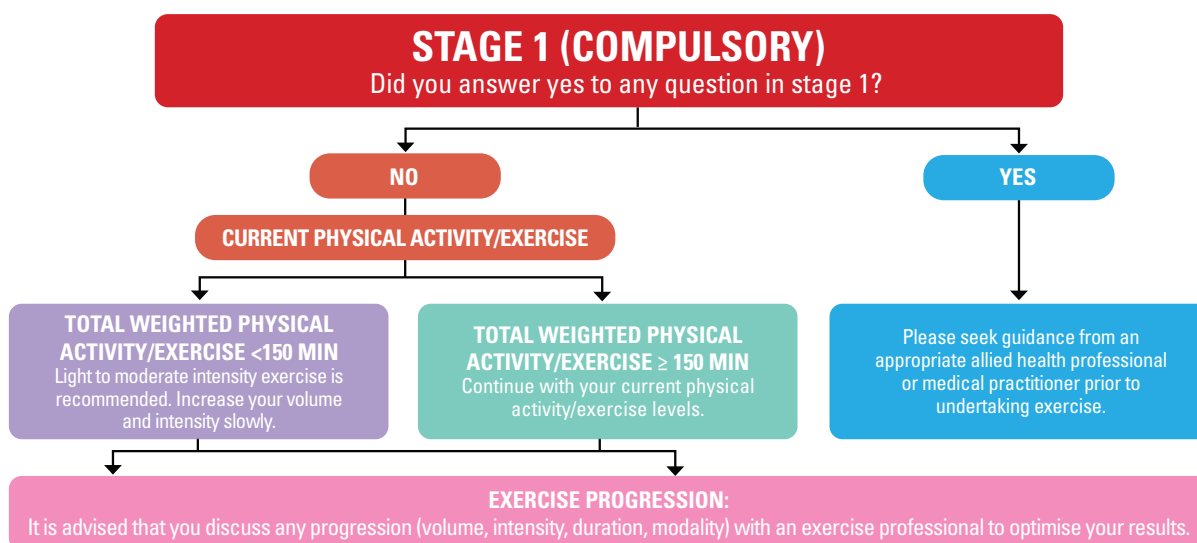
The information obtained through Stage 2 will identify individuals with risk factors or other conditions. This will assist with appropriate exercise prescription. If there are significant or multiple risk factors, the exercise professional should use professional judgement to decide whether further medical advice is required.

For more details regarding identified risk factors:

[www.exercisesciencetoolkit.com](http://www.exercisesciencetoolkit.com) (pre-exercise screening and blood biomarker modules).

Once completed, the form should be filed appropriately (privately and securely) with the client’s records for future reference. The information provided should not be shared with anyone without the client’s consent.

**FIGURE 1: Stage 1 Screening Steps**



**FIGURE 2: Exercise Intensity Guidelines**

INTENSITY CATEGORY	HEART RATE MEASURES	PERCEIVED EXERTION MEASURES	DESCRIPTIVE MEASURES
<b>LIGHT</b>	40 to <55% HRmax*	<b>VERY LIGHT TO LIGHT RPE# 1-2</b>	<ul style="list-style-type: none"> <li>An aerobic activity that does not cause a noticeable change in breathing rate</li> <li>An intensity that can be sustained for at least 60 minutes</li> </ul>
<b>MODERATE</b>	55 to <70% HRmax*	<b>MODERATE TO SOMEWHAT HARD RPE# 3-4</b>	<ul style="list-style-type: none"> <li>An aerobic activity that is able to be conducted whilst maintaining a conversation uninterrupted</li> <li>An intensity that may last between 30 and 60 minutes</li> </ul>
<b>VIGOROUS</b>	70 to <90% HRmax*	<b>HARD RPE# 5-6</b>	<ul style="list-style-type: none"> <li>An aerobic activity in which a conversation generally cannot be maintained uninterrupted</li> <li>An intensity that may last up to 30 minutes</li> </ul>
<b>HIGH</b>	≥ 90% HRmax*	<b>VERY HARD RPE# 7</b>	<ul style="list-style-type: none"> <li>An aerobic activity in which it is difficult to talk at all</li> <li>An intensity that generally cannot be sustained for longer than about 10 minutes</li> </ul>

\* HRmax = estimated heart rate maximum. Calculated by subtracting age in years from 220 (e.g. for a 50 year old person = 220 - 50 = 170 beats per minute).

# = Borg's Rating of Perceived Exertion (RPE) scale, category scale 0-10.

Modified from Norton K, L. Norton & D. Sadgrove. (2010). Position statement on physical activity and exercise intensity terminology. J Sci Med Sport 13, 496-502.

## Client risk levels

Clients can generally be categorised into three categories of risk once the APSS has been completed.

Risk Category	Indications on APSS	Precautions	Exercise intensity recommended
High Risk	Answers yes to one or more questions in Stage 1 Answers yes to 4 or more questions in Stage 2	Must seek medical advice and clearance before commencing exercise	Exercise program should not be commenced before medical clearance is received
Moderate Risk	Answers yes to less than 4 but more than 2 in Stage 2	Use professional discernment to decide whether a referral is required – start at light intensity and progress in alignment with fitness test results	Light to moderate (2-4 RPE) depending on previous and current exercise habits
Low Risk	Answers yes to less than 2 questions in Stage 2	Referral usually not required – start at a low to moderate level and progress in alignment with fitness test results	Moderate to vigorous (RPE 3-5) – depending on previous and current exercise habits

## Health Risk Factors to Consider

Clients may present with a number of common health risk factors, and it is important to understand the implications of these when giving physical activity advice so that a client with such conditions can safely improve their health and fitness.

Often a client will need to be referred to an allied health professional, especially if they have a number of health concerns contributing to their risk level.

Clients may also experience adverse responses to physical activity, especially if they are new to exercise or have been sedentary for over 12 months. When these become obvious, they may result in the need for a referral to an AHP or GP to investigate the cause of the reaction.

Adverse reactions to exercise can be caused by health issues, lack of fitness or progressing too fast in an exercise program.

### Chronic disease diagnosed or in family history

The risk of some chronic diseases increases when there is a family history of the disease. Extra precautions should be adopted to help someone that is at a higher risk of developing such a disease so that it can be delayed or prevented.

Lifestyle choices can have a large impact on the risk of developing such diseases, even if there is a family history. There are often many healthy choices that can be made to reduce a client's risk of developing the disease.

## Cardiovascular/heart disease and stroke

Heart disease and stroke are responsible for 16% of the world's total deaths. Since 2000, the largest increase in deaths has been from this disease, rising by more than 2 million to 8.9 million deaths in 2019.

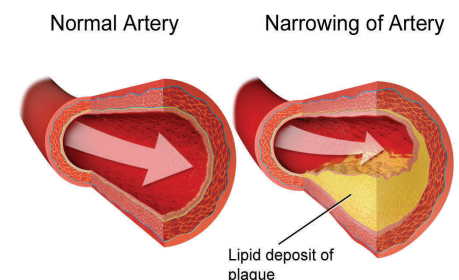
Ischemic heart disease is caused by a decrease in blood flow through one or more of the blood vessels that carry oxygen to the heart (coronary arteries). When blood flow is reduced, the heart muscle does not receive the amount of oxygen it needs to function properly and can go into arrest.

Atherosclerosis is the thickening and stiffening of the arteries often caused by a buildup of plaque inside the walls.

Plaque in the arteries largely consists of calcium, cholesterol and fat.

- Atherosclerosis happens when the endothelium becomes damaged, due to factors such as smoking, high blood pressure, or elevated levels of glucose, fat, and cholesterol in the blood.
- This damage allows a collection of substances, known as plaque, to build up in the artery wall.
- The symptoms of atherosclerosis depend on which arteries are affected.

1. Carotid arteries provide blood to the brain.  
Restricted blood supply can lead to a stroke.
2. Coronary arteries provide blood to the heart.  
When the blood supply to the heart falls, it can cause angina or heart attack.
3. Renal arteries supply blood to the kidneys.  
If the blood supply becomes limited, kidney disease may develop.



Coronary Artery Disease

### To prevent or manage cardiovascular disease exercise may:

- Maintain a healthy weight
- Lower blood pressure
- Reduce stress.

### Risk factors for developing cardiovascular disease:

- Being overweight or obese – especially with abdominal fat
- Not getting enough physical activity daily
- High cholesterol levels
- High blood pressure
- Family history, sex and ethnicity
- Risk increase after the age of 60 years
- Untreated pre-diabetes or high blood sugar levels

### Key related lifestyle actions to reduce the risk of the early onset of heart disease:

- Exercise regularly
- Maintain a healthy body weight
- Keep cholesterol and blood pressure levels controlled
- Reduce saturated fat, foods high in sodium and added sugars
- Consume plenty of whole, plant-based foods
- Consume alcohol moderately
- Stop smoking

### For more information on heart disease:

<https://www.heartfoundation.org.au/>  
<https://www.healthline.com/health/heart-disease>

## Diabetes

Approx. 1 in 20 people in Australia have diabetes type 1 or 2 and about 500 000 have undiagnosed type 2 diabetes.

- Type 1 Diabetes is an autoimmune disease that usually occurs in childhood or early adulthood.
- Type 2 Diabetes occurs in adulthood and is largely preventable.

### How does Diabetes happen?

Our cells absorb the glucose from the blood stream with the help of a hormone called insulin, which is made by the pancreas.

Beta cells in the pancreas make insulin and release it into the blood stream.

If these beta cells do not produce enough insulin, glucose will build up in the bloodstream leading to diabetes.

### Fitness considerations for people at risk of or with diabetes

Regular exercise is an important part of diabetes management. It will help insulin to work more efficiently and assist with blood glucose control.

However, if the client has fluctuating or high blood glucose levels (i.e. fasting blood glucose levels greater than 14 mmol/L and urinary ketones), it is best to avoid exercise until their blood glucose has settled. Exercise in these circumstances can actually elevate blood glucose and increase ketone production which is not good.

#### For a person with diabetes exercise helps:

- Insulin to work better, which will improve your diabetes management
- Maintain a healthy weight
- Lower your blood pressure
- Reduce your risk of heart disease

#### Risk factors for developing diabetes:

- Being overweight or obese – especially with abdominal fat
- Not getting enough physical activity daily
- Family history and ethnicity (Asian and Pacific Islanders are more prone)
- Risk increases after the age of 45 years
- Untreated pre-diabetes or high blood sugar levels
- Overeating carbohydrates at each meal
- Consuming foods and drinks with high sugar content

#### Key related lifestyle actions to reduce the risk of the early onset of diabetes:

- Be physically active daily to the recommended levels
- Maintain a healthy body weight and moderate body fat percentage
- Eat plenty of fruits, vegetables and grains
- Control carbohydrate intake to avoid overloading the beta cells at any one meal (this often involves avoiding added sugar as this is extremely high in high GI carbohydrate)
- Drink plenty of water daily

For more information about diabetes: <https://www.diabetesaustralia.com.au/>

## Chronic Obstructive Pulmonary Disease (COPD)

Chronic Obstructive Pulmonary Disease (COPD) is an umbrella term for a group of progressive lung conditions including:

- Emphysema
- Chronic bronchitis
- Chronic asthma.

COPD is a common lung condition affecting both men and women. Around 1 in 7 Australians aged 40 years and over have some form of COPD however around half of these people living with COPD symptoms do not know they have the condition. Indigenous Australians are 2.5 times more likely to have COPD than non-Indigenous Australians. COPD is not a contagious disease.

This condition causes narrowing of the bronchial tubes in the lungs (sometimes called bronchi or airways) and this makes it difficult to breathe. While COPD is a progressive and (currently) incurable disease. With the right diagnosis and treatment there are many things that can be done to manage the condition. People with chronic lung conditions use 25-50% more energy than healthy people due to increased work required to breath and fighting off chest infections and flare ups.

People can live for many years with COPD and still enjoy a good quality of life, especially if they look after their health and adopt healthy lifestyle habits.

### To prevent or manage COPD exercise may:

- Improve circulation and help the body better use oxygen
- Improve symptoms
- Build energy levels so they can do more activities without becoming tired or short of breath
- Strengthen the heart and cardiovascular system
- Increase endurance
- Help reduce body fat and maintain a healthy weight
- Help reduce stress, tension, anxiety, and depression

### Risk factors for developing COPD:

- Smoking – this includes smoking in the past and passive smoking
- Environmental factors – working or living in areas where there is dust, gas, chemical fumes, smoke or air pollution
- Genetic – a small number of people have a form of emphysema that is caused by the body not producing a protein that protects the lungs

### Key related lifestyle actions to reduce the risk of the early onset of COPD:

- Quit smoking
- Maintain a healthy body weight
- Eat a healthy and balanced diet
- Be physically active
- Reduce stress
- Get good quality rest and sleep

For more information on Chronic Obstructive Pulmonary Diseases:

<https://lungfoundation.com.au/resources/copd-fact-sheet/> <https://my.clevelandclinic.org/health/articles/9450-copd-exercise--activity-guidelines>



## Asthma

Asthma can be related to COPD and many people who have COPD also have asthma. Not all people with asthma have COPD though, some people just have asthma, especially younger populations.

Asthma can be caused by numerous factors such as allergies to mould, pollens and pet dander. Exercise, stress, illness and weather conditions can also trigger asthma.

### What is an asthma attack?

When we breathe normally, muscles around the airways are relaxed, letting air move easily and quietly. During an asthma attack, three things can happen:

- **Bronchospasm:** The muscles around the airways constrict (tighten). When they tighten, it makes the airways narrow. Air cannot flow freely through constricted airways.
- **Inflammation:** The lining of the airways becomes swollen. Swollen airways don't let as much air in or out of the lungs.
- **Mucus production:** During an attack the body creates more mucus. This thick mucus clogs airways. When airways become tighter, they make a wheezing sound when breathing.

Asthma attacks are life threatening when the airways become totally blocked, quickly, and if there is no oxygen getting to the blood, the organs will become starved of oxygen and start to shut down within minutes.

If a client starts to have an asthma attack, they must be monitored closely and asked if they have any relieving medication to help keep their airways clear. If the asthma attack becomes severe it must be treated as an emergency situation.

Asthma can't really be prevented, but people with allergies or that are exposed to tobacco smoke are more likely to develop asthma.

### To manage asthma:

- Monitor asthma symptoms to identify common triggers
- Avoid known triggers
- Control the symptoms with an asthma treatment plan from a medical professional
- Always carry reliever medication in case of a sudden attack
- Warm up and cool down effectively when exercising
- Avoid cold and dry air, when possible, especially when exercising

For more information on Asthma:

<https://my.clevelandclinic.org/health/diseases/6424-asthma>

<https://www.mayoclinic.org/diseases-conditions/exercise-induced-asthma/symptoms-causes/syc-20372300>



## Musculoskeletal disorders and injuries

Clients may have different types of issues with their muscles, bones, tendons, ligaments, and joint injuries that need considering when recommending physical activity for them.

If a client has a significant issue that gives them pain or discomfort, that has not been diagnosed, they need to be referred to a General Practitioner or a Physiotherapist to gain a diagnosis.

The allied health professional will likely run a series of scans or tests to identify what the issue is and can provide you with advice on how to proceed with an exercise program.

They will be able to give suggestions on types of exercises that may improve the condition and types that may be contraindicated or could worsen the issue.

Musculoskeletal disorders (MSDs) are conditions that can affect muscles, bones, and joints.

### MSDs include:

- Tendinitis
- Carpal tunnel syndrome
- Osteoarthritis
- Rheumatoid arthritis (RA)
- Fibromyalgia
- Bone fractures

The risk of developing MSDs increases with age. Muscles, bones and joints naturally deteriorate as we get older. The risk of developing these disorders can be reduced.

### Common causes of MSD's include:

- Age
- Occupational injuries
- Activity levels
- Poor posture or functional movement patterns
- Lifting loads inappropriately
- Family history of certain types of MSD's

Medical practitioners will generally recommend a treatment plan based on the diagnosis and severity of symptoms.

### To prevent or manage MSDs with exercise:

- Regular strength exercises
- Stretching to keep joints flexible
- Maintain good posture
- Perform activities with correct movements patterns
- Warm up and cool down adequately
- Seek a treatment plan from a medical professional if required.

For more information on MSD's: <https://www.healthline.com/health/musculoskeletal-disorders>

## Dizziness

Dizziness during a training session or previously experienced can be an indication of a serious health issue and must be referred to a medical practitioner for investigation or clearance for various types of exercise.

Dizziness may occur due to hypotension, which is when a client's blood pressure is very low. This would normally occur when moving from a horizontal or low position to a standing position. Low blood pressure in itself is not dangerous but may be a symptom of an underlying health issue and should be investigated if the client is experiencing dizziness during training sessions.

For more information on hypotension symptoms:

<https://www.healthdirect.gov.au/low-blood-pressure-hypotension>

Other causes of dizziness include stress, dehydration, ageing process, low blood sugar, vertigo, blood flow issues, conditions that affect the ears and brain or nerve related disorders.

As there are so many different causes, if dizziness has been experienced or is observed during a client's training session, they should be referred to their General Practitioner (GP)

For more information on dizziness: <https://www.healthdirect.gov.au/dizziness>

## Chest pains

Chest pain is any sort of pain that is felt in the upper body around the chest area and possibly radiating into the arms.

Chest pains should always be taken seriously, especially when felt during physical activity and referred to a GP.

If a client has symptoms of chest pain that is severe and becoming worse, feels heavy or crushing on the chest area or is combined with breathlessness, nausea, dizziness, clamminess or sweating an ambulance should be called immediately.

All symptoms of chest pain require the client to be referred to their GP without hesitation.

For more information on chest pains: <https://www.healthdirect.gov.au/chest-pain>

## Hypertension (high blood pressure)

High blood pressure readings are when the reading is higher than 140/90 mmHg, which is considered to put the person at higher risk of having a heart attack or stroke (cardiovascular disease).

If a client has high blood pressure when you test them, this means that it may not be controlled, and they need to be referred to their GP. The GP might recommend medication to stabilise the blood pressure and high blood pressure is also indicative of other health issues that may need to be treated.

Do not train a client that has high blood pressure at the start of their session, as exercise increases the blood pressure even further which may be dangerous for them.

Gain clearance from the clients GP before allowing them to perform physical activity and ensure they understand how to exercise at the intensity recommended by the GP with their health concerns considered.

For more information on hypertension: <https://www.healthdirect.gov.au/high-blood-pressure-hypertension>

## High cholesterol and high blood sugar

During a health screen clients may explain that they are aware of having high cholesterol or blood sugar levels after a formal diagnosis.

This puts them at a high risk of an adverse reaction to exercise and a referral and clearance should be requested to confirm the extent of their condition and if it is being treated.

The GP can also provide a recommendation for exercise intensity that is safe and may help the client improve their symptoms or condition.

High blood sugar may be a sign the client has pre- or diagnosed diabetes and must be treated to ensure the client does not have low or high blood sugar during training sessions. Clients will need to know how to control their sugar levels and the right foods to eat before and after training sessions.

If a client has one or both of these issues they should be referred to their GP to confirm they know how to manage their condition and that you have clearance to train them at a certain intensity level.

For more information on high cholesterol and high blood sugar:

<https://www.healthline.com/health/high-cholesterol> <https://www.healthline.com/health/type-2-diabetes/hyperglycemia>

## Prescribed medications

If a client takes medications, it may be obvious what they are taking them for, or it may not be. You may notice that a client has described a certain health concern that they are taking medication for, and they may explain that the medication is related to that condition.

Sometimes a client will take medication that they don't want to share the reason for.

Keep in mind that the Privacy Act recommends that we only take information about a person's health that is necessary to achieve their fitness goals. If a client doesn't think that the medication being taken will affect their fitness goals, then they don't need to tell you why they are taking it.

You can also look up medications online but only do this with the goal of finding out how it may affect the client during a training session.

If you are concerned that a medication the client is taking will affect their training sessions, then request a referral and allow the GP to explain the side effects of the medication and how it may alter the clients' progress and/or performance during training sessions.

## Hospital admissions

A client may indicate that they have had a hospital admission during the previous year which indicates a serious health issue at some point.

Some reasons for hospital admissions could include operations for various reasons like childbirth, removal of cancerous or other tissue, asthma attack, heart related complications or respiratory issues.

There are many reasons for a hospital admission and if the client believes that the reason will affect their fitness and health goals, they should explain what the admission was for.

If they don't wish to communicate the reason for the hospital admission you will need to respect their privacy and trust that the information is not necessary. But keep in mind that they have had a health issue that was serious in the past year and be moderate in progressing their fitness and health goals slowly.

You may also request a GP referral for information on the hospital admission in case their GP has further information about how the hospital admission could impact their future fitness and health progress.

## Antenatal clients (pregnant)

Antenatal clients will be pregnant with a child.

They will likely be seeing a GP regularly or an obstetrician. An obstetrician is a medical practitioner that specialises in providing care to pregnant women, delivering babies and post-natal care.

Pregnant women go through three trimesters of pregnancy, each approximately 3-months long, to create a 9-month gestation period. Each trimester brings new challenges and adjusted requirements to their physical activity programs.

Be sure to maintain close contact with the client and the client's medical professional in case the client's health is affected during the pregnancy.



### Trimester one: 0–13 weeks

Client is in the early stages of pregnancy – they may not know they are pregnant until about 4-6 weeks. Symptoms may include the onset of nausea, tiredness, stomach cramps, urinating more often and more.

It is important for the client to avoid training at a high intensity while their body gets ready to grow and carry a child. Exercise should be to maintain current activity levels only and impact should be low.

### Trimester two: 14–25 weeks

Client is in the middle term of pregnancy – the pregnancy is more secure now and morning sickness may be subsiding. The client may feel like training at a moderate intensity depending on how large the baby is at various stages.

#### Exercises to avoid:

- High impact
- Heart rate increase above 140 BPM and overheating
- Abdominal crunches or sit ups
- Lying on her stomach
- Lying on her back for extended periods of time after about 20 weeks
- The client's centre of gravity will be changing so take care when challenging balance

Listen to how the client feels and help them listen and take notice of how their body is feeling each week as it changes. If the client experience discomfort or pain during or after exercise they should stop and rest or seek medical advice.

### Trimester three: 26–38 weeks

Client is in the final trimester of the pregnancy and the baby is growing in size. The client may be feeling discomfort as their long abdominal ligaments stretch to accommodate the growth of the baby.

Lower body strength is important as they are carrying more weight around. As is lower back and core strength to help reduce the risk of lower back pain.

The client may feel more tired and need more rests during the session. The risk of gestational diabetes and high blood pressure increases.

Continue to observe the trimester two contraindicative exercises and add the following considerations:

- Train the core with low intensity planks and bird dogs to help the clients “brace the baby toward the spine”
- Train neutral spine maintenance
- Maintain strength exercise intensity – do not increase intensity or focus on progression
- Listen to the client and how they are feeling each session
- Maintain contact with the client’s medical practitioner in case their health status changes rapidly
- Help the client contract and relax the pelvic floor muscles to allow for the childbirth but maintain neuromuscular connection ready for post-natal recovery

At all times during a client’s pregnancy listen carefully to updates on their health status and how the pregnancy is progressing. Avoid any unsafe exercises, pregnancy is not the time to be increasing in strength and fitness. The client should aim to maintain a strong and healthy body while they are pregnant ready for childbirth and post-natal recovery.

Keeping weight gain in a healthy range is also an ideal goal so that the client doesn’t have excessive “baby fat” to lose after the birth.

An average of 10-15 extra kilos of body weight is normal during pregnancy depending on the persons starting weight.

### Post-natal clients (after pregnancy)

Post-natal clients have had their baby and are now in the recovery phase. They may be breast feeding and experiencing interrupted sleep.

It is essential to continue to maintain close contact with the client’s medical practitioner to ensure their body heals correctly and there are no post birth complications.

Most post-natal clients will refrain from structured physical activity for 6-8 weeks after the birth of their child as instructed by their health professional.

After that time clearance should be gained from their medical professional to resume a certain intensity of physical activity.

Generally, the first step will be to strengthen the core and pelvic floor muscles and include cardiovascular and light strength training to help the client with energy for the rigorous schedule of caring for a newborn and to help them slowly lose excess baby weight they may have gained.

It is important to note that breastfeeding parents should not be looking to diet to lose weight and should seek the advice of their GP or a dietitian, should they wish to lose weight while breastfeeding.

## Smoking

Clients that have been smoking have an increased risk of lifestyle diseases and are at a higher risk of experiencing an adverse reaction to exercise if they have been sedentary.

Smoking affects the efficiency of the lungs and causes the oxygen to be displaced leading to low blood oxygen levels and reduced performance during training sessions. This decrease in blood oxygenation will make everyday activities harder and resting heart rate higher.

If a client has been a regular smoker in the past 6 months, it is important to send a referral to their GP and gain clearance to train them at a moderate to high level. It is likely that they will need to progress their fitness goals slowly and it is important to rule out other health risks before they start training.

It is even more essential to have clearance for them to commence physical activity if they have other risk factors like high blood pressure or high cholesterol as the onset of heart disease is a strong possibility.

## Menopausal and post-menopausal women

Menopause is the time in a woman's life when she stops menstruating. When a woman is approaching menopause the production of female hormones such as oestrogen and progesterone starts to slow down and can fluctuate as the body changes.

Some common symptoms associated with the approach to menopause is the period cycles may become longer, shorter or irregular.

Period bleeding may become lighter or can be unpredictably heavy. Hot flushes, night sweats, aches and pains, crawling and itchy skin, headaches, forgetfulness, lack of self-esteem and sex drive, tiredness, difficulty sleeping, urinary frequency, vaginal dryness and more can all occur as hormone levels change.

At the time when a woman has had no period for 12 months she has officially gone through menopause and will be termed post-menopausal.

The decrease in female hormones has been linked to a higher risk of thinning bones and osteoporosis and heart attack, heart disease, high blood pressure and stroke.

The symptoms a woman may experience while going through menopause can often be reduced with lifestyles factors such as:

- Healthy diet – increase low fat calorie sources, drink plenty of water and limit alcohol intake.
- Regular exercise
- Looking after mental health
- Reducing stress levels
- Getting good quality sleep
- Avoid wearing restrictive clothing or things that can trigger hot flushes (like hot environments, spicy food or stressful situations)

## Exercise and menopause

The hormonal changes that occur during menopause often causes fat to store around the abdomen more easily, rather than on the hips, thighs and buttocks, which can increase health risks. Therefore, it is essential that post-menopausal women maintain a healthy body fat level.

Regular exercise of at least 30 to 45 minutes on most days of the week will help to:

- Maintain heart health and improve general health
- Keep bones healthy and prevent bone density loss through osteoporosis – particularly weight-bearing and strength-training activities
- Maintain healthy body weight
- Maintain good balance and reduce the risk of injury from falls
- Provide a feeling of relaxation and wellbeing
- Possibly improve hot flushes.

The types of exercise that are ideal for menopausal and post-menopausal women is regular activity that includes a variety of types that they enjoy.

Low impact cardio is ideal and strength training is recommended. Stretching is also important because maintaining flexibility requires more effort as the body ages.

## Ageing process

The ageing process affects the body in a variety of ways and these changes need to be considered when recommending physical activity to older populations.

Older populations are considered to be 55+ years. The following affects are often seen as we age but will not necessarily affect all people at the same age and may affect different people to greater or lesser degrees.

### Physically

- Progressive decline in muscle mass, strength and functionality
- Progressive decline in bone mass
- Hearing and vision loss
- Higher risk of disease
- Joint, muscle pain and arthritis risk increases
- Reduction in stability and balance

### Mentally

- Increased risk of depression and social isolation
- Increased risk of dementia
- Cognitive decline regarding memory and speed of processing data
- Decline of coordination and reaction time



### Senior client fitness needs:

- Maintain healthy BMI to reduce the risk of lifestyle disease
- Maintain healthy waist to hip ratio
- Increase muscle strength for ease of daily life and to reduce the rate of atrophy
- Maintain cardiovascular fitness with low impact exercise
- Improve posture and core muscle strength
- Improve balance and stability for falls prevention
- Low to moderate physical activity daily

The fitness level of a senior client will depend on how much physical activity they have performed during the early years of their life. If the senior client is just starting a fitness training program, then progress should be taken slow, and abilities confirmed before progression occurs. Regular low to moderate exercise is more beneficial than irregular high intensity exercise, as this may increase the risk of injury. The main focus in a fitness program for senior clients is to maintain cardiovascular health and increase full body muscle strength for ease of everyday activities. Another important consideration in senior clients is balance and stability development to reduce the risk of falls.



## Gender differences

There are physiological differences between male and females such as hormone types and levels, ability to grow muscle size, strength and natural base levels of muscle and strength. This does not mean that females need to train differently to men, the way their programs are structured should still be developed with their current strength and fitness levels, goals, needs and preferences as the focus.

As you will see below, many of the fitness needs that are related to health-related fitness are similar. The main difference is that men will generally be stronger than women and can grow muscle size and strength more rapidly due to a different hormone makeup. This may not be the case for all women or all men though, and each client needs to have their programs developed to cater for their individuality.

## Female adults

Female adults range from the ages of 18 - 55 years. Younger than 18, and they are classified as adolescents or children and older than 55, they are classified as senior populations.

### Female fitness needs:

- Maintain healthy BMI to reduce the risk of lifestyle disease
- Maintain healthy waist to hip ratio
- Increase muscle strength for ease of daily life
- Improve cardiovascular fitness for cardiovascular health
- Increase metabolic rate to reduce the risk of excessive fat gain
- Improve posture and core strength

Females are able to healthily carry more body fat than males due to their ability to grow a baby and the bodies fat storage needs for such a process. According to the American Journal of Clinical Nutrition, the normal body fat range for a female is 21% - 32%. Females also tend to carry body fat in areas such as the lower body and limbs, which is a healthier place to carry it than in the abdominal region.



## Male adults

### Male fitness needs:

- Maintain healthy BMI to reduce the risk of lifestyle disease
- Maintain healthy waist to hip ratio
- Increase muscle strength for ease of daily life
- Improve cardiovascular fitness for cardiovascular health
- Increase metabolic rate to reduce the risk of excessive fat gain
- Improve posture and core strength

Males are required to maintain a lower body fat range for health purposes. According to the American Journal of Clinical Nutrition, men should have 10% to 20% body fat to reduce the risk of lifestyle disease.

Men tend to carry body fat in the abdominal region more prevalently than women, due to hormonal variances, and therefore a focus on healthy waist to hip ratio is essential for male clients. Male clients will commonly be naturally stronger than female clients, due to the fact that men maintain muscle mass more easily than women and may be able to perform more advanced progressions of exercises in less training time.

For example: many females will need to start performing push ups on their knees and may take some time to progress to their toes, whereas quite a few male clients will be able to complete push ups on their toes even if they have not been strength training regularly.





## Clients with multiple health concerns

A client with multiple health concerns will move into a higher risk category.

For example: A client that has managed diabetes is not necessarily high or even moderate risk, but if they also have diagnosed heart disease and a musculoskeletal condition such as tendinitis or fibromyalgia, then they become moderate to high risk and more precautions need to be taken when recommending exercises to them.

When a client becomes high risk, a medical practitioner's clearance to exercise is necessary and they can advise you on how to proceed safely with an exercise program for the client, with all of their health issues considered.

Treat each health issue individually and ensure that you are including types of exercises in their program that will help lessen their symptoms or reduce the risk of them developing a disease that is in their family history.

Most forms of exercise will naturally reduce the risk of lifestyle diseases, as long as the cardiovascular system is challenged, the exercise sessions are of a safe level and attendance is consistent.

## Goal Setting

Now that the client's health risk level has been identified the next step is to help them set some goals to achieve for their health and fitness.

A goal setting form should be used that identifies what they would like to achieve, when they would like to achieve it and helps you discern if their goals are reasonable and appropriate for them.

Sometimes clients may not have specific goals and look to you for suggestions on what type of goal they should aim for.

When considering goals for clients always identify the level they are at right now in their fitness, health and motivation stages and help them take the next step or two.

If goals are set too high, clients can become discouraged that the outcome is too far away. Clients thrive on feeling successful often. Their goals should give them opportunity to celebrate small wins along the way to achieving overall or larger goals.

Therefore, goals can be broken into short-term and long-term goals.

Once a client's goals are identified, you can recommend services or products that will suit their needs in the fitness facility and write them an effective exercise program and session plans to get them there.

It is recommended to use the **SMART** acronym to set specific goals that are attainable.



## **S** = Specific

Goals should be specific – which areas of the body do they want to adapt? How much growth or body fat do they want to lose etc.

## **M** = Measurable

Work out some mutually agreeable ways to measure the clients progress so that you both know exactly what achieving the goal looks like for them. For example: I would like to lose 3% body fat, or I would like to gain 2 cm of muscle on my biceps. Or I would like to bench press 50% more weight, or I would like to bench press 100 kg.

## **A** = Achievable

Ensure the goals can be achieved safely with the resources the client has available. Progress is usually best achieved in 5-10% increments of overload to ensure that adaptation and recovery are balanced.

## **R** = Realistic

Are they realistic based on the time the client has to train, resources available and current level of fitness. Take into consideration how large their goal is and how long this would realistically take to achieve safely and permanently. Losing 10 kg in 4 weeks is not a realistic goal unless they are willing to exercise for hours a day and eat a very calorie-controlled diet. Even then, this may not be healthy or sustainable for the body, and an injury or overtraining could result.

## **T** = Time-based

When does the client want to achieve their goals? Setting a period to achieve goals within can motivate clients to be consistent with their program and allow them to feel successful as they achieve each goal within a certain time. You can also program accordingly so that the timeframes are met if they are consistent with their training plan. Time frames can be short term and long term – it is good to break larger goals into smaller milestones for motivation and achievability.

Here are some examples of SMART goals that are realistic and achievable within the timeframes:

1. Lose 3 kilos of body weight in 6-8 weeks.
2. Increase bench press personal best (PB) from 40 kg – 50 kg in 3 months.
3. Achieve x3 body weight pull ups in a row in 6 months (depending on body weight and current strength level.)
4. Hold a plank for 2 minutes within the next 3 months.
5. Improve sit-up test from level 2 to level 3 in 4 weeks.
6. Do the splits in 12 months (depending on current flexibility)
7. Hold a handstand position for 30 seconds within 6 months (depending on current body weight strength)

If the goal is about a 5 percent increase or decrease it is reasonable to assume it would take about 6 weeks to adapt. Sometimes this will happen faster and sometimes it may be slower.

Results can sometimes be achieved faster with more training, but not always as overtraining and risks of injury can affect results negatively.

If a large adaptation has already been achieved, results may come slower. Someone who is already healthy or has a low body weight may find it harder to lose body fat than someone who has a lot of stored body fat. A client who has already achieved a high level of strength may find it harder to increase in their strength by 5% than a beginner, for whom that would likely be quite easy.

Breaking larger goals into short term goals is necessary so that milestones can be achieved more often. This gives the client reasons to celebrate and reward themselves more often, motivation to hit the smaller goals with less effort and confirms they are strategically taking the right steps, over time, to achieve the larger goal.

## Example of a long-term goal broken into smaller goals:

<b>Long-term goal</b>	I would like to be able to touch my toes within 16 weeks (or approx. 4 months). (Starting test results: sit and reach -30 cm away from toes)
<b>Short term milestones</b>	<ul style="list-style-type: none"> <li>• 4 weeks – perform 10 mins stretching session 3 times per week, every week</li> <li>• 8 weeks – be able to achieve 15 cm away from toes</li> <li>• 12 weeks – be consistently stretching 15 mins every day and holding stretches for 1 min each</li> <li>• 16 weeks – be able to touch toes</li> </ul>

<b>Long-term goal</b>	Run the Bridge to City Fun Run (10 km) under 1 hour in 24 weeks (starting test result – 2.4km run/walked in 17.24 mins)
<b>Short term milestones</b>	<ul style="list-style-type: none"> <li>• 4 weeks – run/walk 3 km x3 times per week in under 22 minutes</li> <li>• 8 weeks – run 4 km without stopping in under 24 minutes</li> <li>• 12 weeks – run/walk 6 km in under 45 mins</li> <li>• 16 weeks – run 8 km without stopping in under 55 mins 20 weeks – run/walk 10 km in under 68 mins</li> <li>• 24 weeks – run 10 km without stopping in under 60 mins</li> </ul>

You can see the goals above were broken into smaller milestones to gradually achieve the overall goal within the timeframe.

Breaking goals up can help us to see how much work is involved in achieving a larger goal and if it is realistic and achievable within the period of time selected.

Ask yourself: do I really think that they can achieve the short-term milestones within the allocated timeframes with the amount of time and resources they have available?

If the answer is “no” ... or even “maybe not” - then it would be better to allow more time to achieve the goal.

## Record keeping

Most fitness facilities will have their own version of a goal setting form to complete with clients so that you can accurately develop an exercise plan that is tailor made for them and their needs. You can also recommend various programs that the facility offers to help the client achieve their goals once you know what they want to achieve, when and what their barriers are to getting there.

Please see an example of the goal setting form you will use in your assessments throughout this course.

CLIENT GOAL SETTING			
Client Name:	Mark Whittaker	Date of consultation:	
Age:	54	Email:	
Address:			
Phone:		Client risk level:	Moderate

Please indicate which of the following you would like to achieve:		
Lose Body fat	Increase definition	Increase muscle strength
Gain muscle size	Increase speed	Improve sports skills
Start exercising	Improve core strength/balance	Increase flexibility/mobility
Increase energy	Increase endurance strength	Improve nutrition
Improve posture	Increase metabolism	Improve lifting technique
Client Goals: (Make them S.M.A.R.T.)		
What would you like to achieve within 1-2 weeks?	Follow my exercise program – not miss any sessions	
What would you like to achieve within 3 months?	Lose 5 kg of body fat	
What would you like to achieve within 6 months?	Increase strength by 30% on all lifts, decrease back pain.	
How will you feel when you achieve these goals?	Happier, healthier, stronger and satisfied	
How important is achieving these goals to you right now?	Important 8/10	
<b>LOW</b> <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <b>HIGH</b>		
What are the barriers to you achieving these goals now and possibly have been in the past?	<i>(e.g., time, family commitments, holidays, lack of motivation, injury, medical conditions etc)</i> Working a lot, no motivation to go to the gym and train, not much gym experience	
Describe 3 ways we can overcome these barriers in the future:	1. Prioritise my health and fitness and book training sessions into my schedule. 2. Use my results/goal achievement as motivation to be consistent. 3. Rewards for my milestones – massage, new training shoes etc.	
Services recommended to assist with client goals:		
Yoga class	Resistance machines	Personal Trainer
Pilates class	Free weights	Sports specific trainer
Les Mills classes	8-week challenge	Physiotherapist
Spin class	Cardio machines	Dietician
I, Mark Whittaker hereby declare that I have provided true answers to all medical and summary questions and am committed to achieving my goals using the services and programs at Fantastic Fitness.		
Client Signature:	MWhittaker	Trainer Signature:

## **Services, programs and facilities**

Different fitness facilities will offer different services and products for clients to access. Not all facilities will have everything mentioned below, so be sure to familiarise yourself with the services that your facility offers specifically.

Recommending the services that will help your client achieve their goals is essential so that the business thrives, and the clients are aware of the options they have. This can be viewed as a sales process but based around simply letting the client know what they can take advantage of to get them to their goals and then it's up to them what they use and when. They may not know what is on offer if you don't recommend the right services and products to them, so it is valuable customer service to do this thoroughly.

### **Gym Instructors**

Gym instructors are often on the floor in clubs and are able to help members with basic programs and exercise technique. They can give advice on how to perform exercises and use equipment safely and correctly. They will often give gym orientations and develop basic gym programs for the members to come in and follow when they train themselves.

Some clubs may not have gym instructors on the floor and gym members need to know who they can ask if they have questions about their program or the facility. The reception staff or club manager will likely be the next best person for them to turn to for credible advice.

#### **Limitations:**

Gym instructors cannot write specific programs like a personal trainer can and will not be able to provide one on one personal training sessions. They should also be supervised if they only have a Certificate III in Fitness to ensure their programs are safe and effective for a member's risk and fitness level.

### **Personal training services**

Ideal for clients that need motivation and are at a low level of fitness or have specific goals they want to achieve. Personal trainers will coach the client through each exercise, can ensure correct technique is performed and improve client's posture and strength with specific programming. Client may also want to train with someone as it is less intimidating, and they can learn how to train correctly to avoid injuries.

#### **Limitations:**

Personal training services are a higher price than coming to the gym to train alone and some clients may not be able to afford this or don't perceive the value of having a trainer until they try it.

## Group fitness classes

Group fitness classes are a great way for beginners to get active and enjoy exercising. There is the social aspect of training in a group with other people that is a motivational factor and often group exercise classes are high energy and the music adds another element of enjoyment and motivation.

Try to recommend specific classes that would suit each client's needs as some classes may be more suitable or more advanced than others. For example: the client may require a flexibility or mobility-based session (like yoga or Pilates) rather than cardio or high impact types of classes.

### **Limitations:**

Classes may not be specific enough for a client's needs, and they still need to be self-motivated to turn up and work hard during the class. Technique correction relies on the instructor's ability to correct the whole groups technique and so the risk of injury could be higher than in one-on-one sessions.

## Club challenges (6, 8 or 12-week challenges)

Challenges can inspire clients to achieve their goals quickly or find new motivation to be consistent in their training. There is often a social and competitive element to challenges that is fun and engaging for clients to be a part of.

### **Limitations:**

May be expensive if they are required to have a trainer and could risk injury if they try to progress too quickly to win the challenge.

## Various training areas of the gym (cardio, functional, free weights etc)

Clients should be familiar with the different training areas in the gym and how they can use the equipment to their benefit. They should be shown how to use the equipment safely and effectively and have areas explained that may not be suitable for them at their current level of fitness. They should also be aware of etiquette that applies to different areas and club rules for safety and hygiene.

### **Limitations:**

Clients may not be ready for certain areas like the free weights area for example and it may be unsafe for them to train themselves in these areas until they develop some training experience and general strength. It is important that they do not feel excluded from any areas for reasons other than their own or other client's safety.

## Allied health professional (AHP) services

Some clubs may have allied health professionals on site at certain times for client appointments. Some common ones include physiotherapists, dietitians, exercise physiologists, weight loss consultants/programs, massage therapists, life coaches, counsellors. Clients should be made aware of the various services available and how to book a session should they want to use these professionals for various reasons.

There should also be an information brochure they can access online or as hard copies, explaining what the role of each AHP is and how they can benefit from their services.

### Limitations:

Clients should consult a medical practitioner for a referral to these AHP's should they require it as they may be able to gain a GP care plan to see the professional. These services will often be at an extra cost to the client/member.

## Creche or child-minding service

Many fitness centres will have a child-minding service so that parents can exercise while their young ones are in safe hands. This is often essential for parents that are full time carers and have few baby-sitter options to allow them to keep fit and healthy.

### Limitations:

This service may be an additional cost or have limitations on how many children can be booked at once. The program should be explained to clients so that they are aware of the hours of service and how to book their child in.

There are many services that could be available in different fitness facilities, especially programs for various types of clients and group fitness classes that are specific for different client needs.

When you are completing your assessments, think about the types of services and facilities each client would benefit from and explain these to them so that they have a clear understanding of the support available to them.





## Health benefits of various types of fitness

When performing a health screening and goal setting session with a client, explain the benefits of various types of exercise activities so that they are aware of the various fitness components and how to make progress in all areas so that their fitness and strength becomes balanced and well-rounded.

Engaging in various types of physical activity types will also be motivating to a client as they enjoy different challenges and include a variety of exercise types in their weekly programs.

When recommending types of exercise and services to clients always consider their health status and what would be the safest and most effective way for them to achieve their goals.

### Cardiovascular exercises

Cardiovascular exercise is beneficial for cardio-respiratory system health and bone and muscle strength. Cardio exercise is also great for burning excess body fat for weight loss, healthy body composition maintenance and improving stress management and mental health. It is important to help reduce the risk of lifestyle diseases.

Any exercise that elevates the heart rate can be considered as cardiovascular exercises – this would include cardiovascular machines in the gym such as rowers, treadmills, various types of cycling and steppers.

Cardio can also be achieved from endurance training and circuit sessions that are cardio based, brisk walking, hiking, running and swimming and playing sport.

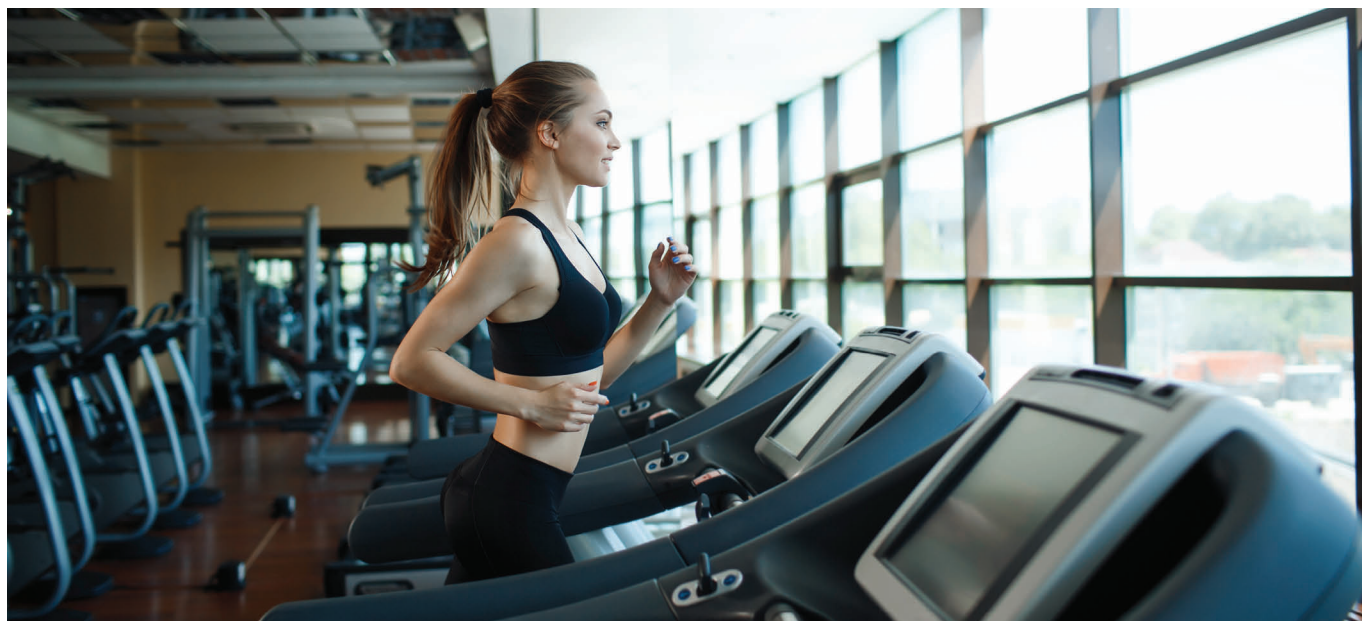
Classes that focus on cardiovascular exercise are aerobics, spin/cycling classes, aqua aerobics, dance classes, boot camps, swim or run clubs etc.

Australian physical activity guidelines recommend that adults aged 18-64 should be active most days, preferably every day of the week. Including the following weekly:

- 2.5 to 5 hours (150–300 minutes) of moderate intensity physical activity – such as a brisk walk, golf, mowing the lawn or swimming OR
- 1.25 to 2.5 hours (75–150 minutes) of vigorous intensity physical activity – such as jogging, aerobics, fast cycling, soccer or netball OR
- an equivalent combination of moderate and vigorous activities.

For more information on the benefits of cardiovascular exercise:

<https://www.healthline.com/health/fitness-exercise/benefits-of-aerobic-exercise#benefits>





## Resistance exercises

Resistance exercise is beneficial for improving muscle strength, making everyday tasks easier, improving posture, reducing joint pain and improving balance and stability in older populations.

Increasing muscle mass in the body improves metabolism, will often reduce fat levels and leads to healthier body composition which reduces the risk of lifestyle diseases.

Any exercise that includes moving heavy loads can be considered to be resistance training.

Resistance training can be performed on machines safely, they may have plates, be pin loaded or have hydraulics as the resistance.

Free weight movements with barbells and dumbbells require more technique knowledge and a foundation of general strength for safe usage.

If a client is new to resistance training, they should be supervised by a personal trainer while they learn how to use free weights correctly to improve their strength.

Some classes are resistance based including pump, weight circuits, body weight or functional classes like cross-fit or older person strength programs. Most types of aerobic exercise will also require some strength improvements in the muscles, at least initially until the muscles get use to the movements.

Australian physical activity guidelines recommend that adults aged 18-64 should include muscle-strengthening activities as part of their daily physical activity on at least 2 days each week.

This can be:

- Push-ups
- Pull-ups
- Squats or lunges
- Lifting weights
- Household tasks that involve lifting, carrying or digging.

For more information on the benefits of resistance-based exercise:

<https://www.healthline.com/health/fitness/benefits-of-strength-training> <https://www.betterhealth.vic.gov.au/health/healthyliving/resistance-training-health-benefits>



## Flexibility exercise

Flexibility exercise is beneficial for reducing the risk of injury, increasing joint range of motion and therefore movement ability and reducing joint pain.

Flexibility training along with strength training can improve posture and balance, improve sports performance and reduce stress.

All types of exercise that includes moving into large ranges of motions where a stretch is felt can be considered to improve flexibility.

Classes that specifically focus on flexibility and mobility training include Yoga, Tai Chi, Pilates, Balance and stretch classes.

There is limited mention of flexibility exercise specifically in the Australian physical activity guidelines, but it is beneficial for most people if they have reduced range of motion in some joints or feelings of muscle tightness.

For more information on the benefits of flexibility exercises:

<https://www.healthline.com/health/benefits-of-flexibility#stretches>

## Low impact exercise

Low impact exercise include activities where minimal impact with the ground or other objects is experienced. It is particularly ideal for older populations when joints may be starting to degenerate and is beneficial for all types of people.

Low impact exercise includes cardiovascular exercise like walking, swimming, stepping and cycling and resistance exercises that do not include jumping or explosive movements.

You can still get a high intensity training sessions while keeping the exercise selection low impact to protect joints.

Low impact is also ideal for beginners that have not developed a strong base of general or core strength yet.

Classes that are low impact include Balance, Yoga, Pilates, Tai Chi, Spin or cycling classes, aqua aerobics, dance classes (most of the time) and resistance classes like Pump or strength-based circuits.

For more information on the benefits of low-impact exercise:

<https://blog.myfitnesspal.com/unexpected-benefits-of-low-impact-workouts/>



## High impact exercise

High impact exercise includes movements and exercise types where both feet come off the ground at once, requiring the body to cushion the impact of the landing with the muscles, bones and joints.

High impact exercise is a very good way to increase the intensity of an exercise or exercise session because the heart rate needs to increase significantly to maximise blood flow to working muscles.

There is a larger amount of calories burned due to the increased energy required to produce the power to get the body off the ground and then take the impact upon landing.

High impact requires the bones to become stronger to manage the impact which leads to stronger and more dense bone structure.

High impact exercises are not safe for all clients and should be avoided by clients that have joint pain or degeneration, low level of general strength or weak core muscles.

High impact can lead to injuries quickly in the muscles and ligaments if there is reduced range of flexibility or muscle and joints are not prepared and strong enough to manage the increased intensity. This type of exercise needs to be worked up to and should not be performed unless a strong base of full body strength has been achieved.

High impact exercises include burpees, running, jumping, hopping, skipping, medicine ball throws and catches and boxing.

Classes that are high impact include Body Attack (Les Mills), most types of aerobics and boot camps or HIIT circuit sessions.

For more information on the benefits and risks of high impact exercise:

<https://www.verywellfit.com/is-high-impact-exercise-right-for-you-1230821>



## **Body composition**

When gathering information about a client's body composition there are a few statuses that the client may present with that will affect their exercise programming.

### **Underweight clients**

Clients that have a BMI of less than 18.5 are considered to be underweight and may need a referral from a GP. If the client's goal is to increase body weight and muscle mass, then the need for a referral is lower as the client is aware that they need to gain weight to be in a healthy range.

In this case you can proceed with a program to help them increase body mass and a referral may only be necessary if the client shows signs of an eating disorder or desire to lose more body weight when they are already underweight.

### **Overweight clients**

Overweight clients are those with a BMI in the range of 25-30. The risk of a lifestyle disease presenting is higher in this BMI range and the client's goal should be to lower their BMI to a healthy range.

The client will likely need a referral if they have been sedentary for 12-months or more or have other health concerns that require a referral and clearance to commence training.

If the overweight BMI is the only risk, then the client can commence a low to moderate training program with the main goal being to bring their BMI into a healthy range.

### **Obese clients**

Obese clients will have a BMI of 30 or more.

Obese clients should gain a referral and clearance to start physical activity because they may have underlying health conditions and the risk of them having an adverse reaction to exercise is high.

Being obese increases the risk of the onset of lifestyle diseases significantly, even at a young age.

Goals for an obese client needs to be structured around body fat loss to bring them into a healthy weight range and progression of other goals slowly.

## **Taking basic body measurements**

Taking basic body measurements for each client will provide key information about their health status and help when setting health-related goals.

Basic body composition measurements will be completed during the pre-screening session.

The body measurements you will need to conduct for each client in your assessments are:

- Resting blood pressure
- Weight in kilograms
- Height in metres
- Calculation on Body Mass Index (BMI)
- Waist circumference in centimetres
- Hip circumference in centimetres
- Calculation of waist to hip ratio



## Resting blood pressure test

Blood pressure needs to be taken to discern if the client's blood pressure is a risk factor.

Refer to your learnings about blood pressure and how it is affected by exercise in study block 2.

You will need an automatic blood pressure machine to accurately measure the client's blood pressure, or a manual blood pressure monitor called a Sphygmomanometer. The most common machines are automatic and can be purchased online or at pharmacies.



View this link to learn how to take a client's blood pressure accurately and then practice on your friends and family before taking your client's blood pressure during the assessments.

Blood pressure test demonstrations: [Blood Pressure Test Explanation - YouTube](#)

## Interpreting blood pressure results

Use the table below to rate the results of your client's blood pressure test.

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

If your client has a result of Hypertension stage 1 or higher it is ideal to have them referred to a medical practitioner for clearance to exercise. Clients that have hypertension may need medication to control the situation and if they are on medication, then the test should not produce a hypertensive result. Training a client with high blood pressure is dangerous and outside of your scope of practice unless you have a referral and clearance from a medical practitioner in writing.

## Body mass index calculation (BMI)

When a clients BMI is in the overweight or obese category, their risk of developing a lifestyle disease is higher than when they are in the normal category.

For most people, BMI provides a reasonable estimate of body fat. However, BMI doesn't directly measure body fat, so some people, such as muscular athletes, may have a BMI in the obesity category even though they don't have excess body fat.

If a client is found to have an overweight or obese BMI rating, body fat loss should be one of their overall goals or a more detailed test can be performed such as a DEXA or body scan to confirm the percentage of their body fat.

Body mass index calculations require you to gain the clients weight in kilos, plus their height in metres and from these measurements you can calculate their BMI.

To calculate your BMI, divide weight in kilograms by height in meters squared.

### Example – Female: 61 kg and 164 cm = 22.67 BMI

Here is how to calculate this persons BMI:

To square the height in metres:  $1.64 \times 1.64 = 2.69$  Weight divided by height squared =  $61 / 2.69 = 22.67$

For more detail on how to calculate a clients BMI rate: <https://youtu.be/PLyxTU0TCgU>



<18.5	18.5-24.9	25-29.9	>30
UNDERWEIGHT	NORMAL WEIGHT	OVERWEIGHT	OBESITY

BMI	Weight status
Below 18.5	Underweight
18.5–24.9	Normal
25.0–29.9	Overweight
30.0 and higher	Obesity

## Waist to hip ratio

Many doctors also measure a person's waist circumference to help guide treatment decisions. Weight-related health problems are more common in men with a waist circumference over 40 inches (102 centimetres) and in women with a waist measurement over 35 inches (89 centimetres).

A waist to hip ratio is further indication of where a client's fat is situated, which can indicate an unhealthy body fat distribution.

To find a client's waist to hip ratio we need to measure their waist in centimetres and hips in centimetres and divide the waist measurement by the hip measurement.

The waist measurement is to be taken at the smallest point below the bottom of the lowest rib and the hip measurement is to be taken at the largest protrusion of the buttocks.

Waist to hip ratings can be compared below to see if a client has excess body fat in their abdominal area that is likely contributing to an unhealthy body composition.

Waist Measurement		Risk rating	Waist to hip ratio		Risk rating
MALE	FEMALE		MALE	FEMALE	
< 80 cm	<70 cm	Very Low	<0.85 cm	<0.75 cm	Very low risk
80–99 cm	70–89 cm	Low	0.85–0.89 cm	0.75–0.79 cm	Low Risk
100–120 cm	90–109 cm	High	0.90–0.95 cm	0.80–0.86 cm	Moderate risk
> 120 cm	>110 cm	Very High	>0.95 cm	>0.86 cm	High Risk

For more detail on how to conduct a waist to hip ratio test: [Waist to Hip Measurement - YouTube](#)



## Allied Health Practitioners and General Practitioners

After the client has completed a health screen you should be able to identify their health risk level and decide if they would benefit from a referral to an allied health practitioner (AHP). If the client is high risk, they must gain clearance from their General Practitioner (GP) before commencing a physical activity program and you will need to write a referral for them to take to their GP appointment. When recommending that the client sees an AHP completing the referral process is also necessary.

A referral will allow you to communicate to the GP or AHP reasons why you have recommended they seek the advice of the practitioner and what you would like to receive back from them, in the way of clearance or recommendations to proceed with their health and fitness goals safely. GP's may provide further referral to

AHP's if they believe the client will benefit from it and can also create a "GP care plan" for the client's condition which may include collaboration with a number of practitioners for a holistic outcome.

### Types of AHP's that you may refer the client to include:

<b>General practitioner</b>	Can provide general information and possibly a referral to a specialist that suits the specific need after considering the clients health condition from a general perspective.
<b>Accredited exercise physiologist</b>	Specialist in clinical exercise interventions for people with a broad range of health issues. They aim to prevent or manage chronic disease or injuries and help restore the client's optimal physical function, health and wellness.
<b>Rehabilitation physician</b>	Specialists who diagnose and assess a person's function associated with injury, illness or chronic conditions, to maximise their independence and improve and maintain quality of life. They evaluate medical, social, emotional, work and recreational aspects of function to develop a patient-centred and individual rehabilitation plan for patients in a variety of clinical settings.
<b>Sports physician</b>	Specialists in general medicine, orthopaedics, radiology and rehabilitation plus allied sport sciences including nutrition, biomechanics, exercise physiology and sports psychology. Sports physicians will have experience with elite athletes and be able to apply these principles to general populations that have needs related to physical activity.
<b>Physiotherapist</b>	Specialists in assessing, diagnosing and planning the management of muscle and joint injuries or pain to promote recovery and help the client return to optimal physical function.
<b>Accredited practicing dietitian</b>	Specialist in creating meal plans and providing nutritional advice to aid recovery, progression and achieve weight loss, allergies and intolerances management, diabetes management, improvement of energy levels, muscle gain and more.
<b>Podiatrist</b>	Specialist in issues related to the feet and lower leg issues of all kinds.
<b>Psychologist or counsellor</b>	Specialist in mental health and can assist if feelings of anxiety, depression or self-worth are commonly hindering progress.

For more information on allied health professions:

<https://ahpa.com.au/allied-health-professions/>

<https://www.acsep.org.au/page/about/SEM/SEMphysicians>

<https://www.racp.edu.au/docs/default-source/advocacy-library/role-of-the-rehabilitation-physician.pdf>



## **Referring Clients**

Once the full screening process has been completed with your client you must discuss the outcomes with them, explaining their health risk level, reasons why they are in that category and the implications this will have on their participation in certain types of exercise and levels of intensity.

If you decide that you require guidance from a medical practitioner or allied health professional, you must discuss your concerns with the client and explain the referral process and why you believe it is in their best health interest to gain such guidance before creating their physical activity program. Always keep the client informed, as a part of the referral process, and assure them that their privacy is important, and that consent will be requested and gained before sharing any of their personal health information with a third party.

### **Types of client guidance that can be provided by medical and AHPs:**

- Clearance for exercise in general or a level of exercise intensity
- Goal specific dietary advice
- Injury management advice
- Contraindications and precautions for types of exercises to include in their programs
- Exercise recommendations for client health improvements or collaborative rehabilitation

AUSactive (previously Fitness Australia) has developed a Referral Kit for Fitness representative to use when referring clients to AHP's and GP's.

They have developed this through extensive consultation with fitness service providers, General practitioners, Sports physicians, Physiotherapists, Exercise physiologists and other health professionals.

It is designed to help you establish and grow a referral network with likeminded health professionals and to give your clients the best service and advice to help them achieve their health and fitness goals safely and effectively.

Please familiarise yourself with this referral kit as we will use some of the templates during the assessments for this course.

For more information on the referral kit:

<https://fitness.org.au/articles/industry-business-support/exercise-referral-kit/94/19>

## **Inclusions in the Referral kit**

The Referral kit includes interactive guides, tools and templates. You can access the referral guides online with a computer or mobile device at any time.

### **Referral Essentials Guide**

Identifies the fundamental knowledge and priorities for successful client referrals.

### **Referral Skills Guide**

Provides deeper knowledge and capability for client referral activities, to help advance your referral skills.

### **Referral Tools and Templates**

Offers tools to maintain industry standards, and superior professional and ethical conduct.

Templates can be used and adapted to suit the type of AHP being applied to or the client's needs but there is some essential information that every referral should include:

- **Fitness instructor and facility details** – ensure you include your details and the fitness centres details that you are working within or your own businesses details if working independently.
- **Client details** – include the client's details that identifies them and that are relevant to the referral.
- **Client consent for release of health information** – client consent to share the screening information is essential.
- **Reasons for referral** – include the reasons you are referring the client to the practitioner including any concerns you have
- **Guidance being sought** – be specific and communicate clearly to the practitioner what type of guidance you are seeking from them. For example – do you want clearance for them to start exercising? Do you also want recommendations of types of exercises that are ideal for them and their condition, types of exercises that may make the condition worse that you need to avoid adding to their program, intensity levels that the practitioner recommends they remain within etc. Think carefully about the necessary information that you need to ensure the clients program is safe and will also help them gain the results they need to improve their fitness and health.
- **Copy of completed pre-exercise screening tool** – include a copy of the industry endorsed pre-exercise screening tool for the practitioner to refer to when consulting with the client.

## Client privacy

Respecting client privacy and confidentiality is our legal and ethical obligations under the Privacy Act. There is a very clear explanation of the Privacy Act and how it applies to health care professionals in the Referral Kit.

Please familiarise yourself with this document for more information on how to take reasonable steps to protect the personal information of club members and clients: [https://bp-fitnessaustralia-production.s3.amazonaws.com/uploads/uploaded\\_file/file/205/Client- confidentiality-and-privacy-obligations.pdf](https://bp-fitnessaustralia-production.s3.amazonaws.com/uploads/uploaded_file/file/205/Client- confidentiality-and-privacy-obligations.pdf)

Informed consent must be gained from clients before sharing screening information with medical and allied health practitioners – or anyone else for that matter.

The client must also authorise the health practitioner to release health related information and advice to you as the fitness representative – because they are also bound by privacy law legislation and cannot communicate to you about the client's health information without the permission of the client.

Here is an example of the client consent part of the referral form that the client must complete:

<b>Client Consent:</b>	I give my permission for Professional/Business to communicate with the referring Practitioner and/or my GP regarding my health status and my progress relating to my exercise program.		
<b>Client Name:</b>			
<b>Client Signature:</b>		<b>Date:</b>	

In some cases, the client may provide consent for some types of information to be shared and not others. In such a case you could include an extra section where the client can stipulate specifically the types of information that they are happy for you to communicate about to the health practitioner and vice versa.

It could look something like this:

<b>Client Consent:</b>	I give my permission for [Professional/Business] to communicate with the referring Practitioner and/or my GP regarding the following types of health information: [insert specific information that is allowed into the above sentence] i.e.: Physical health status and my progress relating to commencing an exercise program.		
<b>Client Name:</b>			
<b>Client Signature:</b>		<b>Date:</b>	

The health practitioner will need to gain consent from the client to provide feedback back to the fitness representative about the client's health and they may do this verbally or via email when the client presents them with an official referral letter from the fitness representative.

If you simply call the health practitioner for advice, and they don't have the client's consent to provide you with the information, they cannot share the client's private health information with you. The official referral process must be followed so that your interaction with the practitioner is professional and displays your duty of care and respect for the client and the AHP or GP.

## Referral process to follow

1. **Screen and Assess** – using the APSS screen your clients to identify their health risks and needs.
2. **Evaluate** – determine whether you can service the client's needs within your scope of practice or if you require guidance from a medical or allied health practitioner.
3. **Decide** – decide what expertise or specialist you need guidance from to develop your client's exercise program
4. **Prepare** – compile relevant, accurate and concise information for the referral using the systematic referral process and professional template forms.
5. **Consent** – involve your clients in the referral process, ensure they are informed, and you have gained consent to share their health information and with whom.
6. **Connect** – make a professional introduction, understand the health professionals needs and expectations, develop trust and be responsive.
7. Develop the exercise program using the guidance received from the AHP or GP.
8. **Commit** – commit to ongoing communication with the health professional about the referral and the clients progress to achieve a positive health outcome for the client.

Refer to this document for a detailed explanation of the referral checklist and links to relevant documents and templates that you can use within each step: [https://bp-fitnessaustralia-production.s3.amazonaws.com/uploads/uploaded\\_file/file/642336/Referral\\_Essentials\\_Checklist.pdf](https://bp-fitnessaustralia-production.s3.amazonaws.com/uploads/uploaded_file/file/642336/Referral_Essentials_Checklist.pdf)

## Record keeping

Keep clear and accurate records of all the documents involved in the client's health assessment and fitness journey. This involves making copies of any documents that you provide as their copies and storing organisation copies confidentially in a secure place.

Authorised persons need to be able to access client health records, referral advice received, fitness assessment results and programming history when required and this should be filed according to organisational procedures.

Clients also have the right to request any of this information for their personal use at any time, so it needs to be kept in a professional and orderly manner where it can be accessed by authorised persons only, when needed.





# PREPARE FOR FITNESS ASSESSMENTS

If you need to wait for clearance or guidance from an AHP or GP before allowing a client to commence physical activity, be sure to schedule their fitness assessment appointment once you have received the communication from the practitioner.

It is also important to explain the need for the client to refrain from certain types of physical activity while they are waiting on clearance from their GP or AHP.

Fitness assessments should then be conducted to identify where the clients starting level of fitness is. The fitness assessments that are chosen to be conducted should be relative to their health or fitness goals.

Once it is safe to start training the client the following steps can be taken to prepare to conduct fitness assessments with them.

1. Review the clients pre-exercise screening and medical guidance documentation for relevant information that pertains to the fitness assessment process. This may include what their goals are, the types of exercise they have engaged in previously and recently and any guidance that needs to be considered that was received from an AHP or GP referral.
2. Communicate the purpose, benefits and types of fitness assessments that you would like the clients to complete and gain their consent to participate in the assessments.
3. Ensure that you are clear on what the client's goals and preferences are so that you can select fitness assessments that are specific for their needs.
4. Select fitness assessments and equipment that is suited to the client's needs and goals.
5. Explain the assessments and assure the client that they will be safe during the assessments and ask them if they have any questions about the process or assessments themselves before commencing.



## Selecting Fitness Assessments

Fitness representative should conduct fitness assessments within their boundaries and responsibilities that are health and goal related and not outside of their scope of practice. They are to uphold a duty of care by not conducting fitness assessments on clients that need clearance before the guidance is received and not conducting fitness assessments that are too progressed for the client.

The purpose of fitness assessments is to evaluate the clients' base levels of fitness so that the exercise program written for them is of the right intensity to move them closer to their goals. Periodic fitness assessments can also be motivational for clients as they see their results improve in the same tests, they feel confident that their hard work is paying off and can celebrate small steps towards larger goals.

Fitness assessment results will help fitness representatives decide on the types of exercises to select, the intensities that are appropriate for the client's fitness level and can confirm that the program is working if the client improves in their test results. If a client's test results do not improve, after following a certain

exercise plan for a reasonable period, the fitness representative can look for reasons why they are not making adequate progress and help the client implement strategies to overcome barriers that may be hindering them.

By referring to the information in the client's pre-exercise screening you must review the following information and look for information that may inform the clients fitness assessment process.

1. **Client needs and exercise preferences** – what are the client's needs, goals and preferences. Fitness assessment types should be selected that are specific to their goals and so that progress can be measured now and compared to future measurements.
2. **Client body measurements** – when assessing the client's waist to hip ratio and BMI rating, this will indicate whether they have the risk of being overweight or obese. If this risk is present, fitness assessments should be selected with this in mind and be specific for goals related to lowering BMI to a healthy range amongst other goals they may have.
3. **Current physical activity levels and intensities** – fitness assessments should be selected to confirm a clients fitness level that would be presumed based on the amount and intensity of physical activity they are currently engaging in. It is safer to presume that their fitness level may be lower than expected then experience an adverse reaction to the intensity of a fitness assessment that was selected at too high a level for them.
4. **Contraindications and precautions to exercise that a medical or allied health professional have provided** – carefully consider the guidance received from an expert in relation to the client's health needs.
5. **Indicative recommended level of exercise intensity** – refer to the APSS Screening Tool for exercise intensity guidelines and be sure to keep the client within safe measures of intensity during their fitness assessment process.

### When selecting appropriate fitness assessments to conduct on the client the following questions should be asked:

1. Is this fitness assessment relative to their goals?
2. Can I use this fitness assessment in the future to measure clients progress toward one of their goals?
3. Is this assessment the right level of intensity for the client?
4. Will the client be able to perform this fitness assessment with correct technique?
5. Does this fitness assessment seem safe for the client based on the guidance received from an AHP or GP?
6. Is there any risk involved in conducting this fitness assessment with this client and have I taken every precaution to ensure the client does not experience an adverse reaction to the test?

### Important!

If there is any doubt about the safety or relevance of a fitness assessment being conducted with a client, or your ability to conduct the exercise correctly and safely with the client then you **should not continue** to administer the assessment and either refer them to an exercise specialist or select a test that is safer.



## Health-Related Fitness Components

The health-related fitness components are those that are essential for a healthy body and mind and that have the strongest correlation to lowering risks of, or preventing, lifestyle diseases and conditions.

Testing clients in each of these components is beneficial so that you can measure where their fitness level rates and track their progress.

Use the same tests to confirm whether they are achieving better ratings as an indication of their progress.

When clients improve or maintain moderate abilities in each of the following areas, their risk of disease and muscle and joint pain is decreased.

### **The health-related fitness components are:**

- Cardiorespiratory endurance
- Muscular strength
- Muscular endurance
- Body composition
- Flexibility and mobility

We are going to use the following website: <https://www.topendsports.com/testing/index.htm> to reference fitness tests for the various health-related fitness components.

There are over 400 different types of fitness tests in this online resource with instructions on how to conduct each one and normative data that you can use to rate the level of the participants.

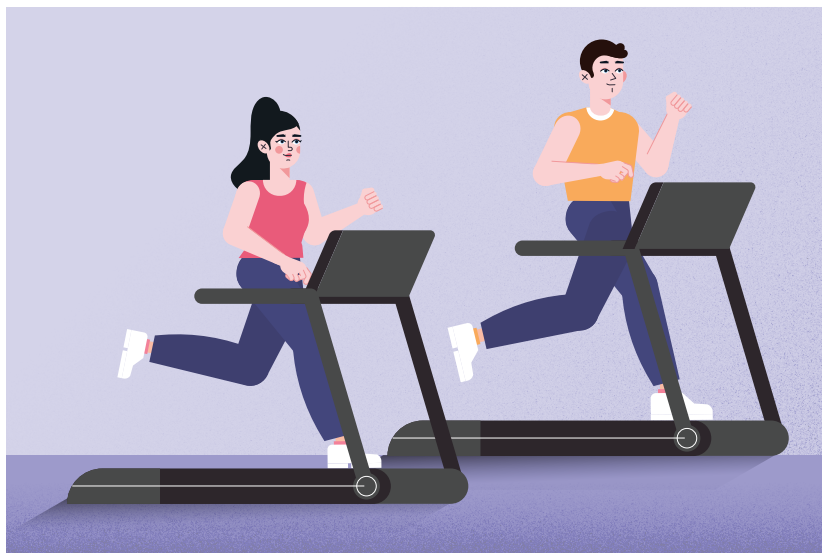
You may like to use this website to select fitness assessments for all types of client goals in the future and for safe and effective instructions on how to conduct a wide variety of tests.



## Cardiorespiratory endurance

Cardiorespiratory endurance refers to the ability of the heart and lungs to deliver oxygen to working muscles during continuous physical activity. This shows how efficiently your cardiorespiratory system is functioning and is an indicator of how physically fit and healthy you are.

Cardiorespiratory endurance is measured by maximum oxygen uptake or Vo2 max and how it is used during exercise. A submaximal Vo2 max test is safe to conduct on clients – but maximal Vo2 tests are done with an exercise physiologist or clinician in a laboratory.



### Some test that you may like to use with clients to assess their Vo2 max are:

- Queens College step test
- 2.4 km run test
- The Multistage Bleep tests

Below are some links that explain how these tests are conducted and places you can enter client results to gain their estimated Vo2:

<b>Queens College Step test</b>	<a href="https://www.topendsports.com/testing/tests/step-queens.htm">https://www.topendsports.com/testing/tests/step-queens.htm</a>
<b>Groningen walking test</b>	<a href="https://www.topendsports.com/testing/tests/walk-test-groningen.htm">https://www.topendsports.com/testing/tests/walk-test-groningen.htm</a>
<b>10m Incremental Shuttle Walk Test (ISWT)</b>	<a href="https://www.topendsports.com/testing/tests/10m-incremental-shuttle-walk.htm">https://www.topendsports.com/testing/tests/10m-incremental-shuttle-walk.htm</a>
<b>2.4 km run test</b>	<a href="https://www.brianmac.co.uk/24kmrunttest.htm">https://www.brianmac.co.uk/24kmrunttest.htm</a>
<b>The Multistage Beep test</b>	<a href="https://www.brianmac.co.uk/beep.htm">https://www.brianmac.co.uk/beep.htm</a>

Each test should be considered carefully before recommending it to a client, and you must decide if a client would find any parts of the test too challenging.

For example – both the run and the beep tests require that the client can run in the first place for longer than a few minutes. Many clients, that have medical conditions or have been sedentary would not be able to run safely in a fitness assessment yet. So, a step-up test or walking test would be safer for them.

## Benefits of cardiovascular endurance

Cardiovascular endurance fitness has the benefits of increased energy and stamina, weight loss or healthy body weight maintenance, reduced risk of heart disease, stroke and diabetes, mental health benefits and more. It is a very healthy fitness component to cultivate.

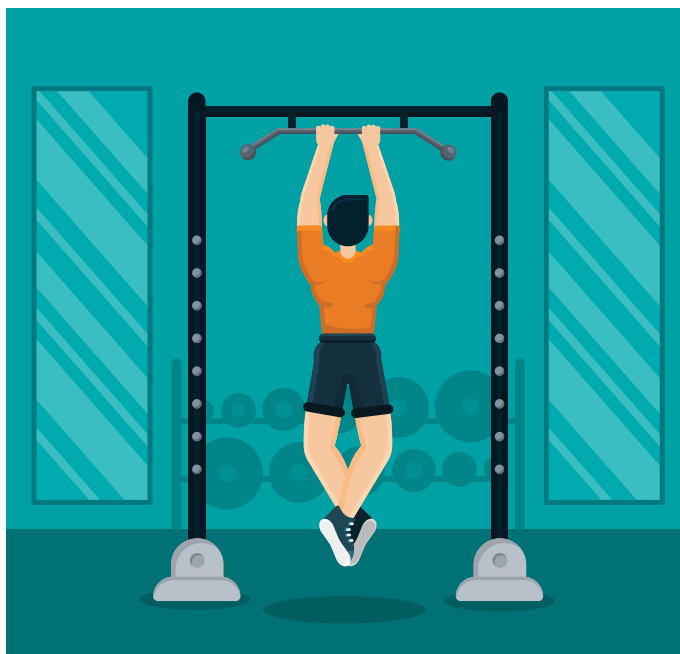


## Muscular strength

Muscular strength refers to the ability of a muscle to generate a force against a resistance. It is measured by how much force can be exerted and how much weight lifted over a short period of time.

Testing muscle strength is usually done using a 1-5 rep max test. It is safest to perform 3-5 repetitions with a maximal weight and then use a 1RM calculator to calculate the technical 1RM to use for programming rather than try to actually push only one maximal rep. Beginner and sedentary clients should not perform maximal strength tests as their joints are not prepared for it and injuries can happen easily.

Be sure to have a client develop a base of strength before trying a maximal rep strength test.



1-RM tests should only be completed if a client has prior experience lifting weights or are familiar with the correct technique of the exercise being used as the test.

Maximal rep tests are completed by choosing a certain exercise and finding out how much weight (in kilos or pounds) the person can lift for a certain number of repetitions before they can't lift the weight safely anymore. This is called lifting a weight "to fail" or failing to complete the last repetition in full.

Maximal repetition tests are usually completed using machines or exercises that are not too complicated and offer the body stabilisation during the exercise.

### For example:

- Leg press test
- Chest press or bench press test
- Squat test (intermediate or advanced)
- Deadlift test
- Pull up test

Here is an explanation of how a general 1-RM test and a 1-RM Bench Press test is conducted:

<https://www.topendsports.com/testing/tests/1rm.htm>

<https://www.topendsports.com/testing/tests/1rm-bench-press.htm>

## Benefits of muscular strength

As clients develop more strength in their muscles it will be easier to lift heavy objects daily or when they need to. Muscular strength development also promotes ligament and tendon strength to protect joints and make the body more balanced and stable.

## Muscular endurance

Muscular endurance refers to the ability of a muscle to sustain repeated contractions against the same resistance or weight for extended periods of time.

Activities that increase muscular endurance include long distance activity like running, cycling, swimming, circuit training and body weight exercises.

Tests for muscular endurance include exercises that require the client to repeatedly resist a weight or force of some type but not at a maximal intensity for an extended period of time.

### Common muscular endurance tests:

- Push up test
- Squat test
- Plank test
- Wall sit test
- Pull up test (depending on base strength)
- Step up test

Here are some muscular endurance test explanations that can be used to assess clients:

<b>Push up test</b>	<a href="https://www.topendsports.com/testing/tests/push-up.htm">https://www.topendsports.com/testing/tests/push-up.htm</a>
<b>Plank test</b>	<a href="https://www.topendsports.com/testing/tests/plank.htm">https://www.topendsports.com/testing/tests/plank.htm</a>
<b>Wall squat test</b>	<a href="https://www.topendsports.com/testing/tests/wall-squat.htm">https://www.topendsports.com/testing/tests/wall-squat.htm</a>

## Benefits of muscular endurance

Muscular endurance promotes a strong and healthy body. Correct postural positions can be maintained more easily reducing joint aches and pains and the risk of injury.

Activities such as hiking, climbing, surfing, or water sports will be easier and more enjoyable, and sports performance will be enhanced.



## Body composition

Body composition refers to everything in your body that can be measured in density and mass as separate tissues or fluid types.

**The different types of mass that are usually measured when analysing body composition are:**

- Fat mass or percentage
- Water percentage
- Muscle mass or percentage
- Bone mass
- Other fat free mass

Fat percentage is the amount of white and brown fat that is stored subcutaneously, (or under our skin and in pockets close to the skin) and viscerally (in and around our organs).

Water percentage is the amount of fluid in our bodies.

Our muscle and bone mass are the amount of skeletal muscle and bone density in our bodies and other fat free mass refers to organs, blood vessels, digestive system waste and everything else that is not in one of the other categories.

## Ways to measure body composition

A Dual-energy X-ray absorptiometry (DEXA) scan is an imaging test that measures bone density (strength). DEXA scan results can provide helpful details about a client's risk for osteoporosis (bone loss) and fractures (bone breaks). This test can also measure body composition, such as body fat and muscle mass.

Bio-electrical impedance analysis (BIA) tests involves the placement of two electrodes on the person's hands and/or feet. A low level, electrical current is sent through the body. The flow of the current is affected by the amount of water in the body. The device measures how this signal is impeded through different types of tissue. Tissues that contain large amounts of fluid and electrolytes, such as blood, have high conductivity, but fat and bone slow the signal down. As BIA determines the resistance to flow of the current as it passes through the body, it provides estimates of body water from which body fat and muscle is calculated using selected equations and based on the speed the current flows through the various tissue types.

Skin fold testing can be done to measure body fat percentage. Measuring skin folds is an inexpensive way to test for body fat, but the other tissues in the body are not measured.

Skin fold testing uses a tape measure to find the common sites for testing and then the skin fold at various sites is measured using callipers and a pinching method. The skin and fat fold, in millimetres, is recorded from each site to calculate overall fat percentage using standardised and researched tables and calculations.

Find more information on skin fold testing:

<https://www.topendsports.com/testing/tests/skinfolds.htm>

Using skinfold measurements is not a valid predictor of body fat percentage, however they can be used as a monitoring device to indicate changes in body composition over time.

## Benefits of a healthy body composition

Studies have suggested that bodyfat percentage (BF%) correlates with risk factors for cardiovascular disease and metabolic syndrome for both men and women, and that BF% may be a useful predictor of disease risk.

Maintaining a healthy body composition can have many benefits including lower risk of some lifestyle diseases, improved immune system, better self-esteem, and higher metabolic rate.

## Flexibility and mobility

Flexibility is the passive ability to extend the joints into a large range of motion and mobility is the ability to actively move into large ranges of motion using the muscles. When muscles have strength and can contract and relax effectively the body will have better mobility and flexibility.

Ways to test flexibility and mobility include measuring ranges of motion through the joints with active and passive tests.

Passive tests are where the joint is moved into a range of motion using an external force like a wall, object or a person moving the joint into a certain range.

Active tests are how far the person can move the joint into range of motion using only their muscle activation.

Active tests for range of motion are safer than passive tests as the persons stretch reflex can be effectively activated, reducing the risk of the joint being moved into a range of motion that it is not capable of safely.

Passive tests must be conducted carefully to ensure the muscle does not tear or become injured by being moved beyond a safe range.

### Active flexibility tests include:

- Sit and reach
- Toe touch
- Knee to wall
- Side bending
- Trunk rotation
- Back scratch

The angle achieved is often measured using tools such as a goniometer or flexometer.

For more information on these tests and other flexibility tests:

<https://www.topendsports.com/testing/flex.htm>

## Benefits of increased flexibility

Flexibility exercise is beneficial for reducing the risk of injury, increasing joint range of motion and therefore movement ability and reducing joint pain.

Flexibility training along with strength training can improve posture and balance, improve sports performance and reduce stress.



## Skill Related Fitness Components

Skill related fitness components are activities that require a person to demonstrate a variety of motor skills and movement patterns. These are generally not essential for a person's health or wellness but are used to excel in sports or other competitive activities.

### The most common skill-related fitness components are:

- Agility
- Speed
- Power
- Balance and Coordination
- Reaction time
- Proprioception

Testing for skill related fitness components usually takes the form of specific tests that are relatable to the outcome desired.

The development of skill related fitness components is generally achieved by practicing the particular skill and the stimulus to be based on speed, distance or both (speed over distance).

Nervous system adaptation is required to stimulate faster firing of muscle fibres and more muscle fibres being fired, quicker, to achieve power.

For example, if the sport requires speed, then a 50m, 100m or 200m sprint test may be conducted and the time recorded for the distance. Then this test will be practiced with the stimulus being to cover the distance in a faster time.

Agility tests will be conducted that contain specific agility movements required in the sport and practiced achieving a faster time or movement pattern.

## Types of Assessment Equipment

Equipment commonly used during fitness assessments include the following:

<b>Heart rate monitors</b>	Including smart phone apps, smart watches and fitness trackers. (Examples: FitBit, Garmin and Myzone belts) Heart rate can also be measured by finding the persons pulse and counting the number of beats per minute. All you need is a watch or timer to time the count.
<b>Tape measure</b>	Using a flexible tape measure will allow you to measure client girths, muscle size, waist to hip measurements and height. Tape measures are also useful when measuring ranges of motion as in the sit and reach and knee to wall tests and distance achieved in tests like the vertical leap or long jump tests (these are not health related tests).
<b>Goniometer or flexometer</b>	These tools can measure angles at joints for flexibility, mobility and postural position tests. These measuring tools are also available as smart phone apps.
<b>Stadiometer</b>	This is a wall mounted measure of a person's height. Height can also be measured by marking the persons height on a wall or door and measuring the length with a tape measure.
<b>Weighing scales</b>	Used to weigh a client's body weight.

<b>Cardiovascular equipment</b>	For running, walking, rowing or cycling tests. Running and walking tests can also be done without a treadmill and distances can be measured or estimated. If the same distance is used in the test each time, progress will be evident – even if the distance is not accurately measured. (For example, the distance may be twice around a block of houses or a distance between two points covered 10 times – then the clients time to complete and heart rate is recorded at the end of the test. If the same distance is covered and the new time and heart rate measured and compared to the previous results, this will be a reliable test of progression.
<b>Auditory tracks for beep tests</b>	These can be found on smart phone apps or alternate cardiovascular tests can be selected and conducted that do not require a beep track if unavailable.
<b>Step up box of different heights</b>	Many different step tests have different heights of step-up boxes that contribute to the difficulty of the test. Steps can be used that are not measured, as long as they are safe for the client to step up on for the duration of the time and the same height step is used each time the test is conducted so that the test is consistent and a reliable measure of progression.

For more information on various types of fitness equipment and how to use them correctly:

<https://www.topendsports.com/testing/products/heart-rate-monitors.htm>

<https://www.topendsports.com/testing/products/index.htm>

<https://www.youtube.com/watch?v=MkqBEs6AlnE>

## Methods for measuring intensity

### Heart rate response

When conducting cardiovascular fitness tests usually the clients heart rate response will be measured to find out how hard they can work before reaching a maximum heart rate.

A clients estimated heart rate is traditionally calculated as follows:

**220 – their age in years = estimated heart rate maximum.**

So, a client that is 43 years old would have an estimated max out heart rate of 177 beats per minute (BPM). Every client is a bit different, some max out heart rates are high and some lower than this estimate but it is considered acceptable to estimate a client's 100% heart rate capacity using the above calculation.

When performing fitness tests on a healthy client, we can measure their heart rate during various intensity of exercise and calculate what percentage that likely is of their heart rate maximum.

From there we can use this to train them at a low, moderate or high intensity based on the heart rate they are working at.



The below table will give you an idea of the various heart rate number and intensity indicators at various numbers based on their age.

# EXERCISE ZONES

	AGE	20	25	30	35	40	45	50	55	65	70
E	100%	200	195	190	185	180	175	170	165	155	150
F	HIIT TRAINING										
F	90%	180	176	171	167	162	158	153	149	140	135
F	HARD CORE TRAINING										
O	80%	160	156	152	148	144	140	136	132	124	120
R	CARDIO ENDURANCE										
T	70%	140	137	133	130	126	123	119	116	100	105
	**EXTENDED CARDIO**										
	*FAT BURNING*										
	60%	120	117	114	111	108	105	102	99	93	90
	WARM UP										
	50%	100	98	95	93	90	88	85	83	78	57

Image credit: [axfitness.com](https://axfitness.com)

## Rate of perceived exertion (RPE)

Using a rate of perceived exertion to measure exercise intensity is not as accurate as using a metric measure like their heart rate percentage or Vo2 max, but it is a simple way to gauge how hard a client is working in their minds.

That is why it is a perceived exertion, and you will find some clients will under rate the perception of how hard the intensity is and some will over rate it.

### There are two scales of RPE that can be used

1. Borg scale of RPE
2. Modified Borg scale of RPE

The original Borg scale was designed to correlate to the persons actual heart rate (when multiplied x 10), which would indicate 60 BPM at rest and up to 200 BPM at 100% maximum.

The modified Borg scale adjusted the number so that people could rate the intensity out of 10 or out of a 100% maximum scale when multiplied x10.

It is generally a little easier to explain the 1-10 rating system to clients than the 6-20 rating scale.



To use RPE as an intensity measure, we need to explain to the client how hard a rating of 10 would feel and how hard a rating of 1 would feel and encourage them to accurately describe how hard they would describe the exercise is for them.

We can then compare their rating to their breathing rate and their actual heart rate (if you have a monitor or can take their heart rate manually) and this will tell us how accurate their perceived rate of intensity is.






Borg RPE	Modified RPE	Exertion Level/Breathing	Example of Activity	Talk Test	% Max Heart Rate	14 Year Old
6	0	No exertion	Standing	Normal breathing, can talk normally 	50% - 60%	103-123 beats per minute (bpm)
7						
8						
9	1	Very light	Walking	Can carry on a conversation, light breathing	60% - 70%	124-144bpm
10						
11						
12	3	Light – breathing deeper, but still comfortable	Brisk walking 	Can carry on a conversation, moderate breathing	70% - 80%	145-164bpm
13						
14	4	Aware of breathing harder	Fast walk/jog 			
15	5	Starting to breathe hard and getting uncomfortable	Very fast walk/jog	Can carry on a conversation, heavy breathing	80% - 90%	165-185bpm
16	6		Run 	Only able to complete 1-2 sentences, heavier breathing		
17	7	Deep and forceful breathing, uncomfortable	Fast run	Broken sentences, heavy breathing	90% - 100%	186-206bpm
18	8		Very fast run 	Only able to speak syllables, very heavy breathing		
19	9	Extremely hard	Race pace	Can't talk, very heavy breathing		
20	10	Maximum exertion	Race pace, race to win	Can't talk, gasping for breath		

Image credit: <https://kids.frontiersin.org/>

## Breathing rate or talk test

The talk test is a simple and reliable way to measure intensity. As a rule of thumb:

- If you can talk and sing without puffing at all, you're exercising at a low level.
- If you can comfortably talk, but not sing, you're doing moderate intensity activity.
- If you can't say more than a few words without gasping for breath, you're exercising at a vigorous intensity.

When a clients breathing rate increases, we can take notice of how hard it seems for them to get enough air in each breath which will provide an indication of the intensity of the exercise for them.

Normal breathing rates at rest for a moderately fit adult is between 12–16 breaths per minute. During exercise breathing rate may increase to up to 40-60 times per minute to take in enough oxygen for the working muscles.

Breathing rates don't need to be counted specifically but you should take notice of a client's breathing rate at certain intensities of exercise. A good indicator of a client becoming fitter is that they don't need to breathe as hard during the same intensity of exercise.

## Power output

Power output is the rate of performing work measured as energy. Energy is created in each second that passes during exercise by the size of the force applied and the velocity at which it is applied.

**Exercise power output is measured when force is measured in newtons.  $\{(Force \times Distance) / time.\}$**

Watt output is a measure of the energy generated by a human to perform a certain activity, at a specific speed for a duration of time. This can then be calculated into calories or kilojoules of energy.

Watts is easiest to measure on cardio machines like spin bikes or rowing ergometers that calculate the watts the person is generating when the machine is moving at a certain speed. This is a measure of the power output of the person causing the machine to move and generate power.

Example: If a certain rowing machine is held at a steady and moderate pace of 2:12 minutes per 500m, this equates to a mechanical power output of 150 watts. The higher the watts, the more energy you are expending each stroke.

For more information on measuring exercise intensity:

<https://www.betterhealth.vic.gov.au/health/healthyliving/exercise-intensity>

<http://bodytransform.co/Blog/Power+output+during+exercise.html>



## Exercise Intolerance

During a fitness assessment, a client will be working harder than they may normally work in a training session and signs of exercise intolerance may show up.

Exercise intolerance can be described as the reaction a client has to a certain level of exercise when their body is not biologically coping with or performing the mechanism required to continue the intensity level or activity itself.

Basically, this means that there is something wrong and the client could be at risk of a severe adverse reaction or injury occurring if they continue to push themselves beyond their capacity.



### Signs of exercise intolerance include:

- Muscle cramps or pain
- Insufficient heart rate – when the heart fails to beat fast enough to oxygenate the body adequately when exercise intensity increases
- Chest pain or discomfort
- Unusual or severe shortness of breath
- Dizziness
- Unusual or excessive sweating or signs of overheating
- Discolouration of the skin – can indicate a lack of oxygen supply
- Severe fatigue

Clients should find exercise challenging but it should not be painful or distressing for them. Watching for signs of exercise intolerance, especially in beginner or previously sedentary clients is important so that we can adjust or stop the session before their health is damaged.

### Things to do if signs of exercise intolerance are noticed:

1. Reduce the intensity of the exercise
2. Change the exercise type
3. Cease the session
4. Refer the client to a GP or AHP
5. Call an ambulance (if the symptom is severe enough)

For more information on exercise intolerance:

<https://www.webmd.com/fitness-exercise/what-to-know-about-exercise-intolerance>

## **When to refer**

If a client has some concerning outcomes from the fitness tests conducted, they may need to be referred to an AHP or GP before commencing their physical activity plan.

Some concerning outcomes that may require referral could include:

- Severe shortness of breath at a low to moderate level of cardiovascular training
- Pain and discomfort in muscles or joints during a fitness assessment
- Chest pain or dizziness during an assessment or after
- Extreme fatigue during or after the fitness assessment
- Very poor level of body awareness or ability to perform exercises with correct technique

Refer back to the steps to take when a referral is required and follow these if a client has a reaction to a fitness assessment that isn't normal.

It is always better to be safe and have a symptom investigated by a medical professional, than to ignore it and think everything will probably be ok and have a serious health issue occur in the future.

Explaining your concerns to the client and the benefits of having the symptoms investigated can also convince the client that their health is paramount and exercise programs should only be commenced under the direction of a health care practitioner if exercise tolerance symptoms are displayed.

You may also like to refer the client to a service in the club or fitness industry that will help the client achieve their goals after considering the clients responses to the fitness assessments.

They may benefit from a physiotherapist, weight loss program, exercise physiologist sessions or even higher levels of fitness training like Cross Fit or Event training if they have a high level of fitness and need additional challenges to keep them motivated to improve their fitness and strength.

If joint pain is present or lack of core strength or flexibility is noticed, recommend they try some Yoga or Pilates classes or do some swimming or aqua cardio classes to reduce the impact on their joints.

The fitness representatives main focus is to help the client achieve their goals, using the most appropriate range of services and facilities in the industry (when possible) and to include diversity and enjoyment in their training schedules for a long-lasting relationship with physical activities.

## **Record Keeping**

You will find an example of a fitness assessment record form named the "Reporting Template" provided in the AUSactive referral kit.

This is an ideal document to use when conducting fitness assessments for clients, although it is quite elaborate and often it will not be necessary to conduct as many tests as suggested on a client starting a new exercise program.

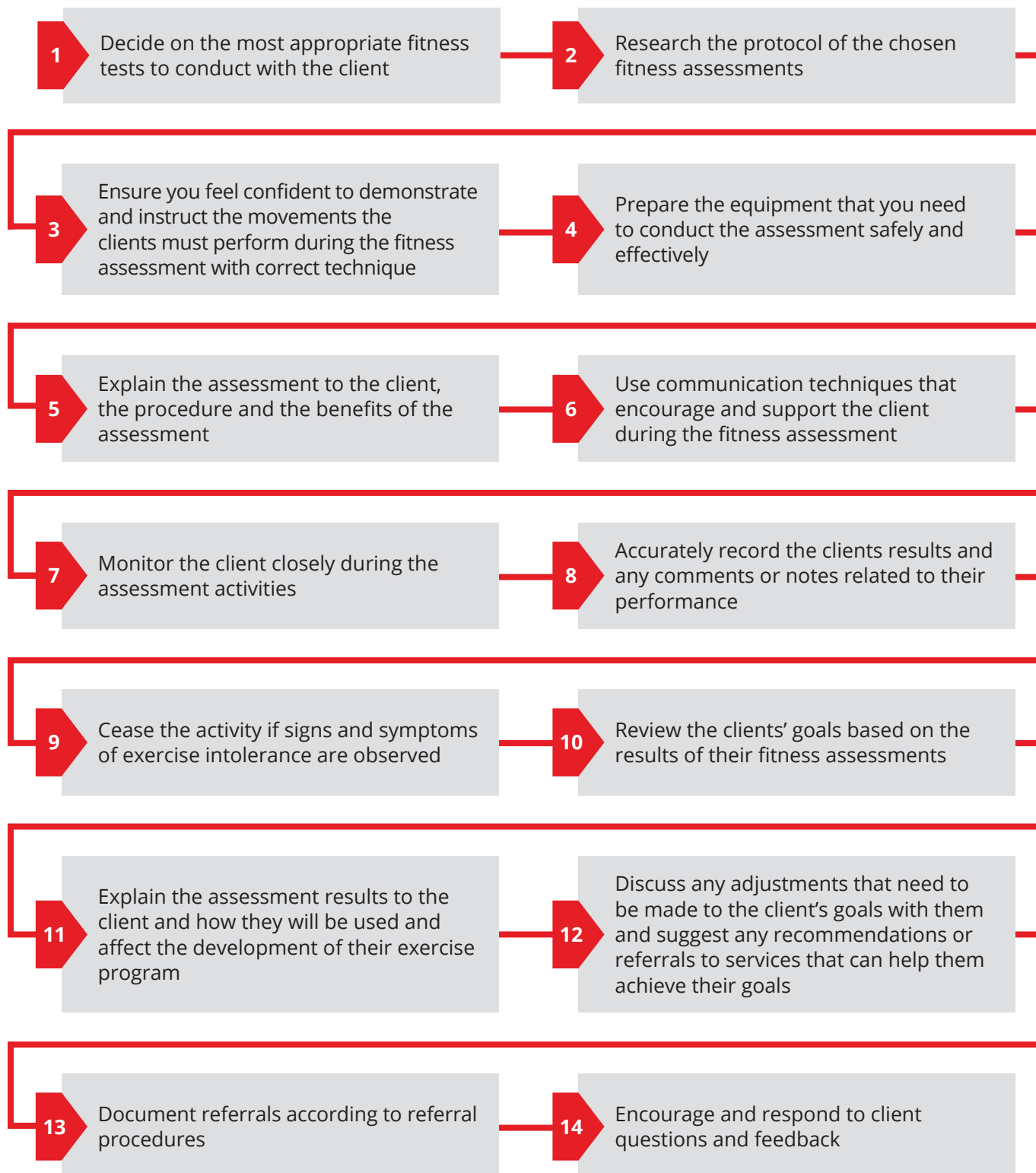
There is a more basic results template used in the practical assessment for this study block that you can use with clients, or you can use the one provided by your fitness facility or create your own.

Ensure there is a detailed record of the fitness test conducted and the clients' results, fitness assessment date and outcome of the assessments. Include any notes that were taken during the assessments and referral recommendations that were made after the assessment outcomes were recorded.

This will allow you to refer back to these results at the next assessment session and discuss the clients program and progress with them.

# CONDUCTING FITNESS ASSESSMENTS

Here are the steps to consider and take when conducting fitness assessments with clients:



# DEVELOP EXERCISE PROGRAMS

## Individualisation

When writing a client's exercise program there are a number of factors that need to be considered. This information will have been gathered during the pre-exercise health screening, goal setting and fitness assessment phase and will affect their exercise program plan and session plans.

### **Client exercise preference**

Programming exercise types that the client is familiar with, that they enjoy and can easily access is essential for consistency and adherence.

### **Client goals**

The exercise sessions and types must be designed for the outcome of achieving their specific goals.

### **Current abilities and fitness level**

Progression levels should be appropriate and can be discerned from their fitness assessment results.

Medical advice or AHP guidance – carefully consider any advice that has been provided by a medical practitioner or GP about how to proceed with the client's exercise program.

With these considerations in mind, you will be able to devise program plans and sessions that will suit the client individually and provide the right amount of intensity for them to adapt at a safe rate and achieve their goals.

## Writing a Program Plan

A session plan and a program plan are two different things.

Program plans are a weekly or monthly program that outlines what the client will do, for how long and when during the period.

This allows you to schedule types of exercise sessions, frequency or how often they should train and safe durations for their sessions.

Finding out how often the client can attend gym sessions each week or engage in some other physical activity at home or outside of the gym is all part of setting them up for success in their program plan.

It is also important to plan recovery into a program plan also – some active and some passive. Session plans are then to be written to follow during one session of exercise within the program plan.

A phase in a program plan would ideally be a week or a fortnight and followed for 4-6 weeks before being changed.

Clients can follow the same program plan for some time and simply increase the length or intensity of the individual sessions until they get bored or plateau in their progression. This may commonly occur if a client was to come and train themselves in the gym and request a program plan update every 4-6 weeks. When personal training a client, they will likely expect more variety in each session, rather than following the same program plan every week.

However, athletes will often follow the same program plan for a phase in their training cycle that is specifically designed to achieve a certain goal.



## Program plan variables

Variable that can be adjusted in a program plan to suit a client's needs and preferences are the Frequency, Intensity, Time and Type (FITT) principles.

### Frequency

Frequency refers to how many times each week the client can train and how many times per week they will dedicate to a certain fitness component.

On average, training each fitness component 2-3 times per week is adequate for realistic adaption and then the amount of time spent will largely depend on how much time they have available for the training sessions.

If the goal is adaptation in only one or two fitness components, then dedicating more training sessions or time to each one may achieve adaptation faster.

If a client trains a fitness component once per week, they will still achieve results, just at a slower pace.

Frequency and intensity of training needs to be counterbalanced with rest and recovery to promote optimal adaptation. Without the right balance, under or overtraining will occur.

### Intensity

Intensity refers to how hard the session is and/or how demanding on the body it feels.

Intensity can be measured in a few ways and must be counterbalanced with time. For example – a session that is planned to be 100% in intensity will unlikely be performed for longer than 20-30 mins (at the most) due to the demands on the energy and nervous systems.

Sessions such as power, agility, speed, and maximal strength may feel like they are 100% demanding on your systems and should not be programmed to go for too long otherwise the intensity will diminish as the energy systems deplete. Increasing the length of high intensity sessions is a progression in itself and may be required for certain athletes once a base of anaerobic and aerobic capacity is developed.

Sessions will often be between 70% and 85% for optimal adaption and less intense (like 50-60%) for endurance sessions.

There are also a few ways to measure intensity:

Strength training exercises may have weights that are programmed as a percentage of 1 rep max during sets or speed and cardio training may have percentages of Vo2 max or maximal aerobic speed that are maintained during sets to indicate the expected intensity.

These are considered to be numerical intensity indicators.

Intensity can also be measure as a perceived rate out of 10 or 20 as previously explained, using the Borg scales.

Asking the client to rate the intensity of a set or overall session can provide you with an understanding of how hard it felt for them, at that time, and may not be a true indication of the actual intensity of the activity.

Some clients are under or over-raters using RPE, and sometimes other factors will make a session feel harder than it is and so this exertion measure is perceived only.

In the client's program plan you could indicate how intense the session should ideally feel for them and explain that they should work to that intensity, rating how hard it feels throughout the session to keep the intensity up, but not overexert themselves. (This is explained in more detail in the individual programming section.)

## Time

The amount of time spent in each session can depend on a few things.

1. How much time can the client commit to each session?
2. What is the fitness level of the client and will a 30, 45, 60, 75 or 90-min session be too short or too long for them?
3. How much time will they need to train the fitness component adequately?
4. Is the session time appropriate for the intensity of the session?
5. Have you allowed enough time for adequate recovery periods in the session plan for the fitness component?

It is best to start off with shorter sessions, especially for a beginner and then increase the time spent training as they adapt to the physical activity demands on their body.

Remember doing something is always better than doing nothing and slow progress is usually safe progress.

## Type

The type of activity programmed should be specific to the outcomes desired. There's no point planning lots of running sessions if the client prefers cycling or their goal is to grow muscle size.

The client may also not be able to attend a gym session everyday but can do some physical activity from their home or during their lunch break. Finding out which types of physical activity will suit their lifestyle is essential to ensure they can maintain the regime.

Consider including a variety of types of exercises to avoid overuse injuries and for enjoyment and variety.

If a client goes running every day for weight loss, then their upper body strength will remain the same and the risk of an overuse injury in the feet and calves increases. If the client likes running, add it in a few days a week, and mix in some full body circuit sessions or classes on other days of the week to improve strength for posture maintenance and running improvements.

Remember the health-related fitness components and encourage clients to make improvements in a variety of components for balanced strength and variety of health benefits.

To write a client program plan follow these steps and refer to the above explanations of the FITT principle for guidance.

1. Review to the client's pre-exercise screening and goal setting form and decide on which fitness components to include in the plan.
2. Work out how much time in each week they can realistically dedicate to physical activity to achieve their goals.
3. Then add in the types of activities and sessions you recommend they do in each of these timeslots. Make sure you have allocated time for each fitness component – even once per week working on a certain fitness component will help them achieve results gradually.
4. Add in the time for each fitness component per week and be sure to be specific where necessary. (e.g. add class names and times, or how many minutes they should stretch or run for.)
5. Mark the planned intensity of each session out of 100% or out of 10 so that they know how hard to work in each session.
6. Be realistic on how many sessions you plan for them during the week and how they will feel the next day after the session intensity and length. When clients are new to physical activity or getting back into exercise after an extended period away, they may need more recovery in the first few months.

## Recovery

Recovery must be included in a client's training plan to make sure they allow time for their body systems to make adaptations.

Active and passive recovery to avoid injuries or overtraining is important for all levels of fitness.

Active recovery – sessions like Yoga or Tai Chi, stretching or walking are considered to be active recovery. Active recovery is anything that gets the blood flowing and heart pumping a little faster, and yet is no more demanding than about 50% intensity.

As the client improves in fitness, active recovery can become more intense. After a while a fast walk/jog will seem like it is active recovery, whereas previously a slow walk was considered active recovery.

Try to keep active recovery about 50–60% intensity, so that when reflecting on the session it can be rated at about 3–4 RPE.

Active recovery sessions are also very beneficial for clients wanting to lose body fat because they will burn excess calories but won't significantly drain their energy level.

Passive recovery - is total rest. If the exercise sessions are intensive, then some days of doing very little physically and drinking lots of water is necessary. On these days, the body will repair the body systems, ready for the next time the stimulus is applied.

It's also good for clients to rest their mind and enjoy not doing any physical activity. They have earned their rest day and it is essential for progress to be made!

See below for examples of how to write a program plan to meet various fitness component goals.

### Beginner – Improve full body general strength and lose body fat

	MON	TUE	WED	THU	FRI	SAT	SUN
<b>Week 1</b>	Time: 20 mins Type: fast walk Intensity: 50%	Time: 30 mins Type: circuit and stretch Intensity: 70%	Rest day	Time: 30 mins Type: circuit and stretch Intensity: 70%	Time: 20 mins Type: fast walk Intensity: 50%	Rest day	Time: 45 mins Type: Yoga in the park group sess. Intensity: 60%
<b>Week 2</b>	Time: 25 mins Type: fast walk Intensity: 50%	Time: 30 mins Type: circuit and stretch Intensity: 70%	Rest day	Time: 30 mins Type: circuit and stretch Intensity: 70%	Time: 25 mins Type: fast walk Intensity: 50%	Rest day	Time: 45 mins Type: Yoga in the park group sess. Intensity: 60%
<b>Week 3</b>	Time: 30 mins Type: fast walk Intensity: 50%	Time: 45 mins Type: Circuit and stretch Intensity: 70%	Rest day	Time: 45 mins Type: Circuit and stretch Intensity: 70%	Time: 30 mins Type: fast walk Intensity: 50%	Rest day	Time: 45 mins Type: Yoga in the park group sess. Intensity: 60%
<b>Week 4</b>	Time: 30 mins Type: walk/jog Intensity: 70%	Time: 45 mins Type: Circuit and stretch Intensity: 70%	Rest day	Time: 45 mins Type: Circuit and stretch Intensity: 70%	Time: 30 mins Type: walk/jog Intensity: 70%	Rest day	Time: 60 mins Type: Yoga in the park group sess. Intensity: 60%

## Intermediate - Muscle size and strength improvements

	MON	TUE	WED	THU	FRI	SAT	SUN
<b>Week 1</b>	Time: 45 mins Type: Upper body strength Intensity: 85%	Time: 45 mins Type: Lower body hypertrophy Intensity: 75%	Rest day	Time: 45 mins Type: Upper body hypertrophy Intensity: 75%	Rest day	Time: 45 mins Type: Lower body strength Intensity: 85%	Time: 30 mins Type: Flexibility Intensity: 50%
<b>Week 2</b>	Time: 45 mins Type: Upper body strength Intensity: 85%	Time: 45 mins Type: Lower body hypertrophy Intensity: 75%	Rest day	Time: 45 mins Type: Upper body hypertrophy Intensity: 75%	Rest day	Time: 45 mins Type: Lower body strength Intensity: 85%	Time: 30 mins Type: Flexibility Intensity: 50%
<b>Week 3</b>	Time: 60 mins Type: Upper body strength Intensity: 85%	Time: 60 mins Type: Lower body hypertrophy Intensity: 75%	Rest day	Time: 60 mins Type: Upper body hypertrophy Intensity: 75%	Rest day	Time: 60 mins Type: Lower body strength Intensity: 85%	Time: 40 mins Type: Flexibility Intensity: 50%
<b>Week 4</b>	Time: 60 mins Type: Upper body strength Intensity: 85%	Time: 60 mins Type: Lower body hypertrophy Intensity: 75%	Rest day	Time: 60 mins Type: Upper body hypertrophy Intensity: 75%	Rest day	Time: 60 mins Type: Lower body strength Intensity: 85%	Time: 40 mins Type: Flexibility Intensity: 50%

## Core Training Principles

Programming client exercise sessions will allow you or them to follow a set plan when training that incorporates everything important regarding their health and fitness needs in one place. It also allows you to include injury prevention strategies.

The success of each training program will be directly related to your ability to incorporate the core training principles into each session or their sessions overall each week. There are varying opinions about what the core training principles are officially made up of, but if you consider each of these and include aspects of them in your session plans you will have optimal chance of covering all of the essential training principles bases.

### The core training principles are basically:

- Specificity
- Overload
- Progression and regression
- Adaption
- Recovery
- Reversibility

### Specificity

Specificity refers to training specifically for the adaptation desired. To achieve a certain fitness component or training outcome – the client needs to train appropriately to allow the body and energy systems to adapt and make improvements in the related areas that will lead to specific improvements.

So, if you want mobility and flexibility, you must incorporate types of training that will lead to progress in this area.

If it's cardiovascular endurance that is needed, then exercises that involve cardiovascular endurance concepts must be performed. It's pretty simple really but becomes more complicated when training for sports specific outcomes. When training for sports then the specific movement patterns, equipment, planes of movement and game timings also need to be considered in the program.

For example, Rugby players need to look at the movement patterns, skills and energy systems that need to be developed to excel at that sport and then replicate these during training sessions so that the body gets better at those specific movements and demands.

We will not cover sports specific training protocols in this study block but the principle of specificity applies even to basic and beginner fitness outcomes.

### Overload

Overload has often been mentioned as one of the most important programming principles because too much overload can lead to injury and not enough overload will lead to lack of adaptation and progress.

Overload needs to be appropriate and sufficient. It is important to start at a low level of overload and progress safely by applying this advice:

1. Exercise technique and correct muscle activation should be confirmed with body weight only before overloading with additional load.
2. Competence needs to be displayed with body weight load or light loads before additional weight is added. Injuries can cause major disruptions to a clients progress if too much weight is added too soon.

Best practice protocol is to check the client's technique in the major six movement patterns before adding any load.

- Pull
- Push
- Squat
- Lunge
- Rotate
- Overhead reach



If they can perform 15 repetitions with body weight only and with correct technique in these movements, then it's safe to add a light to moderate weight and see if they can maintain the same technique, only with additional effort this time.



Have clients perform each of the following exercises and assess whether they can achieve each technique point.


Movement	Considerations	Y/N	Comments
<b>Pull (bent over row):</b> Hold a bar or rod like object with both hands, shoulder width apart.  Move your body into a 90-degree bent over angle with a straight back and slightly bent knees.  Row the bar from your knees, up your legs and into the crease of your hips toward your belly.  Perform 2-3 reps maintaining the bent over position with a straight back.	Spine remains in neutral (or straight) position throughout the test		
	Can hinge hips to 90-degree angle		
	Feet remain evenly placed – hip width apart		
	Full range of motion – bar to hips.		





Movement	Considerations	Y/N	Comments
<b>Push (push-up):</b> Start in the straight arm plank position with core engaged and spine in neutral or straight position.  Hands are slightly wider than shoulder width.  Lower body down toward the ground while maintaining the neutral spine position.  Push back up to straight arm starting position. Perform 3-4 perfect push ups with correct technique.  	Spine remains neutral or straight		
	Chest lowered to within 10 cm from the floor		
	Weight distributed evenly through hands		
	Shoulders remain stable through the move. Do not drop into the shoulder blades – keep shoulder blades apart and controlled.		
<b>Squat:</b> Place feet slightly wider than hip width apart with feet turned out slightly.  Push your hips back behind you and keep the weight of your body primarily in the heels of your feet as you lower your hips toward the ground.  Rise back up to the straight leg starting position.  Perform 5-6 repetitions with knees tracking in line with the toes.  	Spine remains neutral or straight		
	Lower squat so that the hamstrings are parallel to the ground – heels maintain contact with the ground.		
	Torso parallel to shin angle		
	Weight distributed evenly through feet – heels remain in contact with the ground		


Movement	Considerations	Y/N	Comments
<b>Split squat:</b> Start with legs in a split stance – body weight primarily in the front foot and back toe with light weight through it.  Engage core to remain balanced. Lower down until the back knee is within 5 cm of the ground. Front knee should be behind the toes still and torso straight.  Repeat the split squat 4-5 times with each leg forward.  	Spine remains neutral		
	Weight primarily in front leg/heel		
	Hips remain level		
	Balance maintained through the movement – knee lowers to within 5 cm of the ground		
<b>Rotate:</b> Stand with arms wide and hips facing forward.  Hold the hips facing forward and rotate the arms and head 90 degrees to the left and then 90 degrees to the right.  Repeat twice on each side.  	Spine remains neutral		
	Torso moves to 90-degree rotation on left side		
	Torso moves to 90-degree rotation on right side		
	Hips remain forward facing		


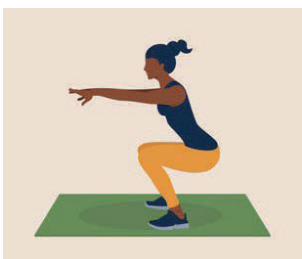
Movement	Considerations	Y/N	Comments
<b>Overhead press: (no weight required)</b>  This is best performed with a light rod or no weight at all until technique is perfect.  Stand with hands wider than shoulder holding onto a light rod placed across collar bone.  Maintain tall body with neutral spine and press the bar overhead until the bar is directly above your head and elbows by your ears.  Extend arms to straight. Lower back to starting position and repeat 3 times.  	Spine remains neutral and body upright.  Shoulders stacked in alignment with hips.		
	Elbows achieve full extension		
	Shoulder angle achieves 180-degree extension		
	Head remains neutral		


## Technique tests – coaching points

After assessing how the client went with each movement pattern, work on correcting their technique with these coaching cues and you can include some of these cues in their programs so that they remember how to correct their own technique and do the exercise safely and effectively.


You can also include beneficial exercises and stretches in their session plans to improve their functional movement patterns and posture.


Movement	Considerations	Corrective action
<p><b>Pull (bent over row)</b></p> <p>Hold a bar or rod like object with both hands, shoulder width apart.</p> <p>Move your body into a 90-degree bent over angle with a straight back and slightly bent knees.</p> <p>Row the bar from your knees, up your legs and into the crease of your hips toward your belly.</p> <p>Perform 2-3 reps maintaining the bent over position with a straight back.</p> 	Spine remains in neutral (or straight) position throughout the test	If the spine can't remain neutral this indicates weakness of the erector spinae and core muscles and/or tightness in the back and spine or hamstring muscles. Work on improving spinal flexion and extension, core strength and hamstring flexibility.
	Can hinge hips to 90-degree angle	If the hips cannot hinge to 90 degrees with neutral spine this indicates tight lower back and hamstring muscles. Stretch hamstrings, lower back area, and improve core strength.
	Feet remain evenly placed – hip width apart	If body weight is not distributed evenly through the feet this can indicate imbalance in leg strength or hips being misaligned. Work on leg flexibility and leg and glute strength.
	Full range of motion – bar to hips.	Lack of ability to bring the bar to the hips indicates weakness of the back and biceps. Work on pulling exercises to improve back strength and stretch the chest muscles.
	Chest lowered to within 10cm from the floor	If the range of motion is reduced this can indicate weakness of the chest and back into deep range of motion or tightness of the shoulders or chest. Try stretching the chest to improve range of motion or increase the depth of the movement gradually. You can also regress the exercise until you can achieve full range and then progress as strength builds.
	Weight distributed evenly through hands	If the weight seems to be distributed through one hand more than the other, then your body may be compensating for weakness or an injury. Try to consciously load evenly through both arms until strength becomes more balanced through both arms.
	Shoulders remain stable through the move. Do not drop into the shoulder blades – keep shoulder blades apart and controlled.	This issue can indicate weakness or lack of strength through the shoulder blade stabilisers. Try to perform a regressed version of the exercise with correct shoulder blade positioning and only progress as strength builds and the shoulder position can be maintained.

Movement	Considerations	Corrective action
<b>Push (push-up)</b> Start in the straight arm plank position with core engaged and spine in neutral or straight position.  Hands are slightly wider than shoulder width.  Lower body down toward the ground while maintaining the neutral spine position. Push back up to straight arm starting position. Perform 3-4 perfect push ups with correct technique. 	Spine remains neutral or straight	If the spine cannot remain in the neutral position, it is often due to core weakness.  Regress the exercise (onto the knees or incline the body position), engage the core muscles tightly and perform the movement with neutral spine – then progress the exercise only as long as the neutral spine can be maintained.
	Chest lowered to within 10cm from the floor	If the range of motion is reduced this can indicate weakness of the chest and back into deep range of motion or tightness of the shoulders or chest.  Try stretching the chest to improve range of motion or increase the depth of the movement gradually. You can also regress the exercise until you can achieve full range and then progress as strength builds.
	Weight distributed evenly through hands	If the weight seems to be distributed through one hand more than the other, then your body may be compensating for weakness or an injury. Try to consciously load evenly through both arms until strength becomes more balanced through both arms.
	Shoulders remain stable through the move.  Do not drop into the shoulder blades – keep shoulder blades apart and controlled.	This issue can indicate weakness or lack of strength through the shoulder blade stabilisers.  Try to perform a regressed version of the exercise with correct shoulder blade positioning and only progress as strength builds and the shoulder position can be maintained.
<b>Squat</b> Place feet slightly wider than hip width apart with feet turned out slightly.  Push your hips back behind you and keep the weight of your body primarily in the heels of your feet as you lower your hips toward the ground. Rise back up to the straight leg starting position.  Perform 5-6 repetitions with knees tracking in line with the toes. 	Spine remains neutral or straight	If the spine cannot remain in the neutral position, it is often due to core and spinal muscle weakness. Lower back rounding can indicate tight hamstrings or lower back muscles.  Only squat as deep as you can while maintaining neutral spine and work on improving back extension ability and hip and lower back flexibility.
	Lower squat so that the hamstrings are parallel to the ground – heels maintain contact with the ground.	If you cannot squat to parallel with correct technique, then squat to where you can with good technique and work on the above and increasing range each session. Squat a little deeper each time while activating the core muscles and trying to keep the spine and hips in neutral.
	Torso parallel to shin angle	If your body is coming forward more than the angle of your shins (view from the side) this indicates that you are using your upper body weight to counteract weakness in the quads. Work on wall sit holds in the correct position while purposefully activating your core and quad muscles so that you can maintain an upright torso position in a free squat.

Movement	Considerations	Corrective action
	Weight distributed evenly through feet – heels remain in contact with the ground	<p>If the weight seems to be distributed through one foot more than the other, then your body may be compensating for weakness or an injury.</p> <p>Try to consciously load evenly through both feet and legs until strength becomes more balanced. This issue can also be a sign of misalignment of the hips or lower back muscles or joint imbalance. If your heels rise off the ground during the squat this indicates that you are not loading into your hips and glutes enough or that your calves are tight and pulling your heels up.</p> <p>Try stretching your calves and specifically loading your body weight into the heels and glutes and sit back into your hips when performing the squat. This can also reduce knee pain associated with knee/quad dominated squatting technique.</p>
<p><b>Split squat</b></p> <p>Start with legs in a split stance – body weight primarily in the front foot and back toe with light weight through it.</p> <p>Engage core to remain balanced. Lower down until the back knee is within 5cm of the ground. Front knee should be behind the toes still and torso straight.</p> <p>Repeat the split squat 4-5 times with each leg forward.</p> 	Spine remains neutral	<p>If the spine cannot remain in the neutral position, it is often due to core and spinal muscle weakness. Lower back rounding can indicate tight hamstrings or lower back muscles. Be careful to only go into the range of motion that you can achieve while maintaining neutral spine and work on increasing range of motion with correct technique.</p>
	Weight primarily in front leg/heel	<p>Weight being placed primarily in the back leg can lead to knee injuries and often indicates a lack of core strength.</p> <p>Load majority of your body weight into the front leg, through the glutes and thigh muscles and activate abdominal muscles to maintain balance.</p> <p>If you cannot maintain balance primarily on the front leg, then add a support like holding onto a stick or anchored object until your balance improves.</p>
	Hips remain level	<p>Hips not remaining level often indicates lack of core strength or quad tightness pulling the hip down on one side.</p> <p>Perform the split squat in front of a mirror with your hands on your hips and specifically try to keep hips level. If you feel a stretch in your quads and hip flexors trying to pull your hip down – do a quad stretch in both legs for a few minutes and see if that helps you maintain level hips in the next set.</p>
	Balance maintained through the movement – knee lowers to within 5 cm of the ground	<p>Lack of balance and range of motion indicates weakness in legs and core muscles.</p> <p>Continue to work on the best technique split squats that you can and increase range of motion as you can maintain balance and strength increases.</p>



Movement	Considerations	Corrective action
<p><b>Rotate:</b></p> <p>Stand with arms wide and hips facing forward. Hold the hips facing forward and rotate the arms and head 90 degrees to the left and then 90 degrees to the right.</p> <p>Repeat twice on each side.</p> 	Spine remains neutral	If the spine cannot remain neutral during this rotation it indicates tightness in the back muscles. You can continue to do this test as a stretch daily to improve the mobility of your spine and your ability to maintain neutral spine. Core strength improvements is also recommended.
	Torso moves to 90-degree rotation on left side	If your torso can not rotate to 90 degrees, this indicates a lack of rotational ability through your spinal muscles. Continue to perform this test regularly, pushing further into the stretch and increasing range of motion gradually for improvements.  You can also perform exercises into the same range of motion like cable rotations or Russian twist movements to improve strength and mobility in torso rotators.
	Torso moves to 90-degree rotation on right side	Same as above
	Hips remain facing forward	If your hips do not remain facing forward this means you are lacking range of motion or flexibility in your torso muscles and are probably trying to achieve a greater range of motion by moving your hips also.  Ensure that your hips remain straight and push into the stretch a little more each time to improve range of motion.  Stretches like side lying windmill, cat camel and yoga movements like seated spinal twist can also improve the mobility through your thoracic spine.
<p><b>Overhead press: (no weight required)</b></p> <p>This is best performed with a light rod or no weight at all until technique is perfect.</p> <p>Stand with hands wider than shoulder holding onto a light rod placed across collar bone.</p> <p>Maintain tall body with neutral spine and press the bar overhead until the bar is directly above your head and elbows by your ears.</p>	<p>Spine remains neutral and body upright.</p> <p>Shoulders stacked in alignment with hips.</p>	<p>If your spine can not remain upright or in the neutral position this can indicate lack of core strength or tightness through the latissimus dorsi.</p> <p>You may be swaying over your hips in a back bend to compensate for the lack of flexibility in your back muscles.</p> <p>Try to maintain upright neutral spine and see where your arms can truly extend to without moving your torso position.</p>

Movement	Considerations	Corrective action
<p>Extend arms to straight. Lower back to starting position and repeat 3 times.</p> 	Elbows achieve full extension	<p>If elbows cannot achieve a straight position or full range of motion, then it is likely that the biceps need to be stretched or the teres major is tight.</p> <p>Be sure to work biceps and triceps evenly in your exercise programs and perform the below stretches to encourage the arms to be able to fully extend.</p>
	Shoulder angle achieves 180-degree flexion	<p>If you can't get your elbows to your ears without moving your spine, then it's likely the latissimus dorsi is tight and shortened.</p> <p>Latissimus dorsi stretching in positions like child's pose or seated lat. stretch on a table or bench or hanging positions can encourage the lats to relax and allow the arms to fully extend.</p>
	Head remains neutral	<p>If your head comes forward from neutral during the move it indicates tightness at the front of your neck and weakness at the back.</p> <p>Include some chin tucks or head retractions to strengthen the back and stretch the front of your neck to create a more even balance.</p>

## Progression

The principle of progression implies that there is an optimal level of overload that should be achieved, and an optimal period for this overload to occur. This is called the progression of the exercise or program in general. If the overload or progression is increased too slowly improvement is unlikely. If the progression is too rapidly it will result in injury or muscle damage or simply the inability to perform the exercise at all or safely. Exercising above the optimal progression levels is counterproductive and can be dangerous.

Exercises can be regressed if the exercise is too hard for the client or unsafe or progressed if they are finding it easy and need more overload to stimulate adaption.

### Ways to REGRESS an exercise or program:

- Make the exercise or program less complicated
- Reduce the load/weight
- Slow the movement down
- Reduce the lever length
- Reduce the range of motion
- Increase the rest periods
- Change the order of the exercises to alternate muscle groups
- Train less often

### Ways to PROGRESS an exercise or program:

- Make the exercise or program more complicated
- Increase the load/weight
- Speed up the movement
- Increase the lever length
- Increase the range of motion
- Decrease the rest periods
- Change the order of the exercises to overload similar muscle groups
- Train more often

## Adaptation

The adaptation principle is based on the theory that when a stimulus is applied to the body, or the body is exposed to a certain stimulus, then the body will adapt to cope better with the stimulus the next time it encounters it. Adaptation occurs in relatively predictable ways based on the frequency, intensity, and type of stimulus and how long the stimulus is applied for (time). Adaptation also requires recovery time and conditions for the body to perform certain processes and be better prepared for the next time the stimulus is applied.

Fitness adaptations occur primarily in the following body systems, depending on the above variables of the stimulus from fitness activities:

- Cardiovascular system
- Respiratory system
- Nervous system
- Musculo-skeletal system
- Endocrine system

Adaptation usually occurs after exposure to the stimulus is repeatedly encountered and progression and overload are optimal. If the same stimulus is applied and with the same intensity, then the body will adapt and maintain this level of achievement.

Ongoing improvements or adaptations require progressive increases of overload.



### Cardiovascular adaptations

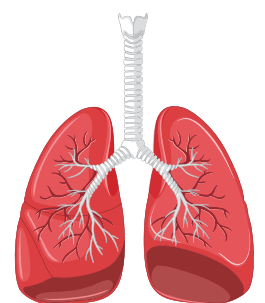
Aerobic exercise leads to cardiovascular changes that increase aerobic power and lead to improved endurance performance. The functional adaptation is the improvement in maximal cardiac output which is the result of an enlargement in heart dimension, improved ability to contract, and an increase in blood volume, allowing for greater filling of the heart's ventricles and a larger stroke volume or amount of blood pumped out with each heartbeat. To accommodate the higher aerobic demands and requirement of blood flow, arteries, blood vessels and capillaries adapt in structure and number. They increase in flexibility which allows more blood to flow through them at one time.



### Respiratory system adaptations

In response to exercise, lungs increase their ability to expand enabling a greater quantity of air to move in and out (this is a similar adaptation to the increase in stroke volume in the cardiovascular system). The strength and endurance of the diaphragm and intercostal muscles improves. This results in an improved ability to breathe in more air, for longer with less fatigue.

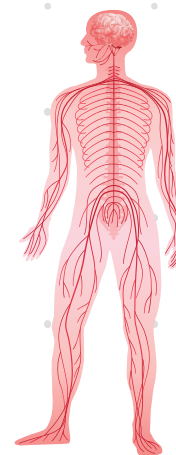
Aerobic training also tends to improve the endurance of respiratory muscles so that they can continue to perform for longer. More capillaries are formed in the lungs over time allowing more blood to flow in and out of the lungs. This improves the uptake of oxygen as there is a greater surface area for blood to bind with haemoglobin. The effectiveness of alveoli in the lungs increases to enable more gas exchange to occur.



## Nervous system adaptations

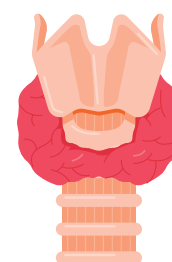
The nervous system is designed to protect the body from injury. Which means if our muscles are not strong or are deconditioned then the nervous system inhibits movement to avoid the muscles moving into a position that could injure them. One of the most significant adaptations to the nervous system when training the muscles is disinhibition of these inhibitory mechanisms. Allowing us to feel less “tight” and more capable to move and function.

The nervous system also adapts in other ways. The timing of muscle contractions can become more coordinated and faster to meet greater force, load or stimulus requirements. More motor units are activated in muscle fibres for more force, power or speed to become possible.



## Endocrine system adaptations

Hormones play a key role when it comes to physiological adaptations to exercise. Hormonal adaptations from exercise can improve metabolic risk from increased insulin sensitivity and increase muscle mass by upregulation insulin-like growth factor-1. Hormones are also responsible for improving bone mineral density by favouring bone calcium deposition rather than reabsorption due to the requirement of stronger bones when regular physical activity is performed. Hormones can also become maladaptive if overtraining is occurring or excessive physical activity is engaged in, which can trigger impaired spermatogenesis or disrupt ovulation in women.



## Recovery

Rest and recovery are essential to achieving all different types of fitness goals. The more intense the exercise session, the more recovery is required. Strength training and intense cardiovascular sessions place strong demands on all body systems and therefore require from 1-3 days' rest in between.

If calorie burning is the ultimate goal for a client, then hard sessions should be followed with days of active recovery to ensure calories are still burnt but that the intensity is low enough for recovery and adaptation to occur.

Other forms of recovery that are very important are nutrition, hydration, and good quality sleep.



## Reversibility

Reversibility needs to be considered because we need to maintain the adaptations we have achieved with minimal levels of physical activity. No matter how much progress we make, if we stop training altogether or fail to perform minimal maintenance training, we will see a reversing of the results gained.

This occurs in all fitness components. Weight loss may not necessarily be reversed without exercise, depending on how many calories the client consumes once the goal is achieved. Reversibility applies mainly to strength, hypertrophy, power and agility adaptations.

How quickly the effects of detraining occur depends on a person's age, level of fitness, type of exercise that was performed, and the time period that the person has been exercising for.

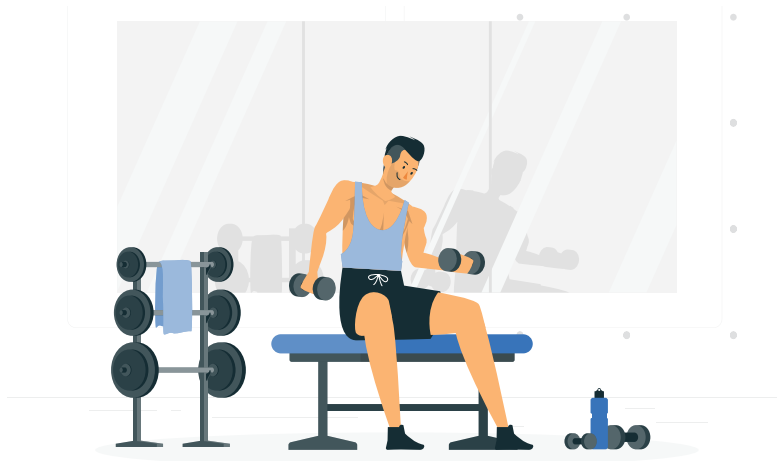
Many athletes that have been training for a long time will have slower reversibility effects than a beginner that quits after a few months of training.

If you don't use it, you will likely lose it!

## Programming Variables

Finding the perfect balance of overload can be challenging and it is smart to start at a lighter intensity first, see how it is handled and gradually progress or overload the program as the client demonstrates they can handle the added intensity safely.

Here is a general list of programming variables that can be used to overload and progress programs and to design various types of programs that are interesting and continually challenge the body and mind.



### ➔ Volume

Volume can be adjusted based on the intensity or the level of fitness it is being designed for. If the client is a beginner who has not done any structured exercise for a very long time, or ever, then the volume of even 15 minutes of exercise can be challenging and a good place to start.

The volume of the program is generally how many sets and reps of exercises there are, or how long the muscles are under tension for.

Volume can be applied to muscle groups individually or the body as a whole. Volume would often be counted as number of reps on a certain muscle group or the amount of weight that was lifted in a session. The goal would be to increase the volume of the session each time by either lifting more weight, performing more sets and reps faster or more sets and reps over a longer training session time.

### ➔ Intensity

Intensity can be manipulated in sessions in a few ways. A session will usually be more intense if a certain heart rate is maintained for a longer period of time or the rate of perceived exertion is measured as higher than a previous session.

Intensity can be increased by reducing the rest in the session, moving faster, lifting more weight at the same speed or performing more demanding movements that require recruitment of more muscles at once. Stimulus for higher intensity can be the goal of achieving more distance or repetitions in a shorter or similar time or aiming to work harder so that the exercise intensity is rated at 8/10 instead of a 6/10.

Doing more in a shorter or similar time is generally how intensity is increased.

### ➔ Frequency

Training more often is another way to vary an exercise program plan and create overload. Frequency needs to be carefully balanced with recovery to allow for adaptation.

A beginner may start by training with a frequency of 2-3 sessions per week and progress to training 4-5 times as they feel they can handle it. This is a good way to progress and overload.

Some athletes train 2-3 times per day because they need the frequency for overload of an advanced fitness level, and they also have various fitness components to train that need to be trained in separate sessions.

Frequency of training certain muscle groups and fitness components is also a consideration to create enough overload for optimal adaptation.

Frequency is something that needs to be realistically programmed based on the time that a client has available to dedicate to training to achieve their goals.



## ➔ Load and number of repetitions

The load used during an exercise is how much weight is added or how much body weight applies to the movement. Weight can be increased fairly easily on most equipment and body weight exercises can be increased by changing the lever length, body position or removing aids like support sticks, assistance bands or using one leg or arm rather than two.

Load can also be described as a 1 rep maximum (1 RM), and a percentage of a person's 1 RM of a certain exercise is programmed based on the desired adaptative outcome.

The number of repetitions possible is directly related to the amount of load the exercise has applied to it. Generally, the heavier the load, the less repetitions will be possible in one set.

## ➔ Exercise order

When considering exercise order in a program the general rule is, after warming up, the most demanding exercises should be performed, while energy levels are at their highest. Compound movements should be programmed before isolated ones, due to body system demands being higher in compound movements than isolated. Core specific exercises should be performed toward the end of the program so that the core muscles are not fatigued during the session and can perform optimally to maintain good posture and neutral spine position during more demanding exercises.

Exercise order can also be used as an overload technique. It is less challenging to perform upper and lower body movements alternating to allow for muscle recovery between exercises than to program a few exercises in succession that target the same muscle group or section of the body.

### For example:

A circuit session for beginners may have stations set out that alternate upper, lower and core in sequence, whereas a more advance circuit for conditioned participants may be all upper body in the same session.

Beginners will be better off doing full body strength training sessions and an advanced program may simply be 45 mins of chest only exercises. Intermediate programs may include three lower body exercises in the succession and then three core exercises in one training session.





## ➔ Set types

Programs can include various types of sets to add variety to the session and provide volume and overload.

### Straight Set

Straight sets are the standard way of arranging your workout – you perform a number of sets using the same number of repetitions and using the same weight, with a rest period in-between. Most basic and beginner programs start with this style and build up to the more complicated ones.

Example: Barbell Bench press

10 reps for 3 sets with 60 seconds rest between each set.

### Drop set

Drops sets are effective for increasing the volume of training while still maintaining good technique for the purpose of muscle growth or fat loss. Basically, you begin the set with a heavy weight that you can perform about 10-12 reps of, then with minimal rest drop the weight and perform as many reps as you can until failure, drop the weight again and do the same – do as many reps as possible before failure. This technique ensures that you are training hard enough and doing as many reps as possible.

Example: Barbell Bench press

12 reps @ 40 kg – minimal to no rest between each set 10 reps @ 40 kg – minimal to no rest

35 kg to fail – minimal to no rest 30 kg to fail – minimal to no rest 27 kg to fail – minimal to no rest

Rest 2-3 minutes at the end of the complete set

### Pyramid set

Pyramid training is a group of sets, of identical exercises, which begin with the lightweight and higher reps, increasing to a heavier weight and fewer reps.

Full pyramid training then decreasing the weight and increases the reps after you have reached the peak until you complete the pyramid.

Example: Dumbbell chest press:

12 reps – 10 kg

10 reps – 12 kg

8 reps – 15 kg

4 reps – 17.5 kg

8 reps – 15 kg

10 reps – 12 kg

12 reps – 10 kg

Pyramid training is a good way to utilise training time effectively, burn calories and achieve volume for muscle growth and overall strength gains. It can also be very challenging and a good addition to programs for variety and intensity.

## Superset

A superset is a combination of two or three moves that either work the same muscle group or opposing muscle groups — the key is that the exercises are done back-to-back with no rest in between. A superset can contain any number of exercise combinations, but common examples are:

- A strength and cardio exercise together for weight loss – like leg press and fast step ups
- Two exercises to target the same muscle group – like bench press and push ups
- A compound and isolated exercise combination with agonist and synergists for pre or post fatigue. (Triceps kickbacks combined with push ups or squats combined with leg extensions)
- Different body parts targeted in each exercise – like seated row and shoulder press

Supersets can fatigue muscles faster and recruit smaller muscles to help with movement as larger muscles become fatigued, burn more calories in a session time, utilise training time more effectively, increase session intensity and add variety and a challenge factor.

## Giant set

A giant set is a circuit of three or more moves for one muscle group performed one after another with little to no rest in between.

Example: Shoulders or deltoid group of muscles. (Minimal rest in between each exercise and 5 mins rest between rounds)

1. Overhead press x10 reps
2. Lateral raise x10 reps
3. Rear-delt raise x10 reps
4. Upright row x10 reps

Giant sets can be effective for cardiovascular improvements, hypertrophy and fat burning and generally increasing the intensity for a certain body part. Not for beginners or even intermediate clients as they can pull up very sore the next day from so much overload on one muscle group and may risk an injury.

## ➡ Pre-fatigue techniques

Pre-fatigue techniques consists of working a smaller muscle group directly before you go to work a larger muscle group, or, training with single-joint or an isolated exercise directly before a multi-joint or compound exercise.

It is an overload technique theory that aims to target an isolated muscle more during an exercise when a combination of muscles all work together to move a load.

For example: A cable crossover would isolate the pectoralis major and minor, exhausting the muscle fibres so that during a push up or bench press, the pectoralis group muscles would have to work harder and would be exposed to more overload. It's basically a superset for an isolated muscle group.

Other good combinations for pre-fatigue or pre-exhaustion sets would include:

- Quad extensions before squats
- Hamstring curls before deadlifts
- Glute bridges before deadlifts
- Cable extensions before chest dips
- Reverse flies before wide grip bent over rows

## Exercise Selection

Exercise selection could be one of the most complicated parts of writing session plans. Becoming familiar with the different types of exercises, movements and equipment types can take time, but there are basic principles to keep in mind when selecting exercises for your clients sessions and when we look at specific types of programs, we will discuss the most appropriate movements and equipment to use to achieve the fitness component goal.

### Main muscle groups (revision)

The skeletal muscle system is broken up into main areas of the body. Each area contains many small muscles that work together to create a wide variety of movement patterns.

As a fitness professional it is important to be familiar with the primary muscle names in each major muscle group and the types of actions that they create when they contract.

Refer back to Study Block 2 for more information on the main muscle groups and muscle names.

Upper Body	Lower Body
<p><b>Back:</b></p> <ul style="list-style-type: none"><li>• Latissimus dorsi</li><li>• Trapezius</li><li>• Rhomboids</li><li>• Erector spinae group (three muscles)</li></ul> <p><b>Shoulders:</b></p> <ul style="list-style-type: none"><li>• Anterior deltoids</li><li>• Lateral deltoids</li><li>• Posterior deltoids</li><li>• Rotator cuff group (four muscles)</li></ul> <p><b>Chest:</b></p> <ul style="list-style-type: none"><li>• Pectoral group (two muscles)</li><li>• External and internal intercostals</li></ul> <p><b>Abdominals:</b></p> <ul style="list-style-type: none"><li>• Rectus abdominus</li><li>• Transversus abdominis</li><li>• Internal and external obliques</li></ul>	<p><b>Hips:</b></p> <ul style="list-style-type: none"><li>• Iliopsoas (two muscles)</li><li>• Gluteal group (three muscles)</li></ul> <p><b>Thighs:</b></p> <ul style="list-style-type: none"><li>• Quadriceps (four muscles)</li><li>• Hamstrings (three muscles)</li><li>• Adductor group (four muscles)</li></ul> <p><b>Calves:</b></p> <ul style="list-style-type: none"><li>• Gastrocnemius</li><li>• Soleus</li></ul>

## Movement types

The types of movements we should add to each program will be based on what the client specifically wants to achieve and where.

If they want to develop strength and muscle growth in a certain area, then doing certain types of movements that are performed by particular muscles will develop the muscle responsible for the movement.

Fat loss is not the same though. You can't lose fat just from your abdominal muscles by doing lots of sit ups.

Fat will be used from all fat stores in the body based on genetic disposition and usually the last place that stored fat was deposited will be the first place the body will take the fat from when using excess fat for energy.

Some people will naturally store more fat on their arms and others will have it in their abdominal region. Hormones, stress, gender and age can also play a part in where each body chooses to store and lose fat from and when.

The main movement types and the muscle groups that are responsible for their execution are as follows:

Movement type	Agonist Muscles	Synergist muscles	Exercise examples
<b>Upper body push horizontal</b>	<ul style="list-style-type: none"> <li>Pectoral group</li> </ul>	<ul style="list-style-type: none"> <li>Anterior Deltoids</li> <li>Triceps</li> </ul>	<ul style="list-style-type: none"> <li>Push up</li> <li>Bench press</li> <li>Seated chest press</li> <li>Dumbbell bench press</li> </ul>
<b>Upper body push vertical</b>	<ul style="list-style-type: none"> <li>Deltoid group</li> </ul>	<ul style="list-style-type: none"> <li>Triceps</li> </ul>	<ul style="list-style-type: none"> <li>Handstand push up</li> <li>Seated shoulder press</li> <li>Dumbbell or barbell shoulder press</li> </ul>
<b>Upper body pull horizontal</b>	<ul style="list-style-type: none"> <li>Trapezius Rhomboids</li> </ul>	<ul style="list-style-type: none"> <li>Biceps</li> <li>Teres major/minor</li> </ul>	<ul style="list-style-type: none"> <li>Bent over row</li> <li>Pendlay row</li> <li>Seated row</li> <li>Under bar pull up</li> </ul>
<b>Upper body pull vertical</b>	<ul style="list-style-type: none"> <li>Latissimus dorsi</li> </ul>	<ul style="list-style-type: none"> <li>Biceps</li> <li>Teres major/minor</li> <li>Trapezius</li> </ul>	<ul style="list-style-type: none"> <li>Pull up</li> <li>Chin up</li> <li>Lateral pull down</li> </ul>
<b>Lower body push horizontal</b>	<ul style="list-style-type: none"> <li>Quadriceps Glutes</li> </ul>	<ul style="list-style-type: none"> <li>Hamstrings Calves</li> </ul>	<ul style="list-style-type: none"> <li>Horizontal leg press</li> </ul>
<b>Lower body push vertical</b>	<ul style="list-style-type: none"> <li>Quadriceps Glutes</li> <li>Calves (calf raise)</li> </ul>	<ul style="list-style-type: none"> <li>Hamstrings Calves</li> <li>Core</li> </ul>	<ul style="list-style-type: none"> <li>Squats</li> <li>Split squats</li> <li>Lunges</li> <li>Calf raises</li> <li>Step ups</li> </ul>

Movement type	Agonist Muscles	Synergist muscles	Exercise examples
<b>Lower body pull horizontal</b>	<ul style="list-style-type: none"> <li>Hamstrings</li> </ul>	<ul style="list-style-type: none"> <li>Calves</li> </ul>	<ul style="list-style-type: none"> <li>Lying hamstring curl</li> <li>Swiss ball curls</li> </ul>
<b>Lower body pull vertical</b>	<ul style="list-style-type: none"> <li>Glutes Hamstrings</li> </ul>	<ul style="list-style-type: none"> <li>Core</li> <li>Hip stabilisers</li> </ul>	<ul style="list-style-type: none"> <li>Deadlift</li> <li>Single leg deadlift</li> </ul>
<b>Torso rotation</b>	<ul style="list-style-type: none"> <li>Obliques</li> </ul>	<ul style="list-style-type: none"> <li>Rectus abdominus</li> <li>Erector spinae group</li> </ul>	<ul style="list-style-type: none"> <li>Russian twist</li> <li>Woodchops</li> <li>Cable rotation</li> </ul>
<b>Hip hinges</b>	<ul style="list-style-type: none"> <li>Glutes</li> <li>Hip flexors</li> </ul>	<ul style="list-style-type: none"> <li>Erector spine group</li> <li>Hamstrings</li> <li>Abdominals</li> </ul>	<ul style="list-style-type: none"> <li>Good morning</li> <li>Back extension</li> <li>Leg raises/drops</li> </ul>
<b>Torso flexion</b>	<ul style="list-style-type: none"> <li>Rectus abdominus</li> </ul>	<ul style="list-style-type: none"> <li>Hip flexors</li> </ul>	<ul style="list-style-type: none"> <li>Sit-ups</li> <li>Crunches</li> <li>Knee raises/curls</li> </ul>
<b>Torso extension</b>	<ul style="list-style-type: none"> <li>Lower back Erector Spinae</li> </ul>	<ul style="list-style-type: none"> <li>Glutes</li> <li>Transverse abdominus</li> </ul>	<ul style="list-style-type: none"> <li>Back extension</li> <li>Supermans</li> </ul>
<b>Core brace</b>	<ul style="list-style-type: none"> <li>Transverse abdominus</li> <li>Obliques</li> <li>Erector spinae (isometric hold)</li> </ul>	<ul style="list-style-type: none"> <li>Deep core muscles</li> <li>Glutes</li> </ul>	<ul style="list-style-type: none"> <li>Plank</li> <li>Side plank</li> <li>Dead bugs</li> <li>Pallof press</li> <li>Hollow hold</li> </ul>

Once you become familiar with the muscle groups that should be working during a certain movement pattern, you can practice noticing if the client is using the right muscles when they perform the movement pattern.

You may notice if those muscles look like they are working or ask the client if they are feeling the movement in a certain area or muscle groups as a feedback request.

These above movements should all be included in a weekly program plan to allow all areas of the body to strengthen and adapt rather than some areas becoming stronger than others, which can lead to joint aches, injuries, and muscle imbalances. Especially when developing general strength.

## Equipment

Movement types can be varied by using different types of equipment for variety and different types of loads and stimuli to challenge the muscles.

Common types of equipment:

Equipment Name	Description	Benefits	Limitations
<b>Free weights (Dumbbells, Barbells and Kettlebells)</b>	Free weights allow free range of motion in any plane of motion, for exercises which involve any muscle groups. "Free weights" is the generic term which refers to the combination of dumbbells and barbells.	<ul style="list-style-type: none"> <li>• Easy to use and can readily be increased as required.</li> <li>• Don't need access to a gym for use of free weight exercise. Good for home or outdoor use.</li> <li>• Easily transported.</li> </ul>	<ul style="list-style-type: none"> <li>• Can be unstable for beginners if weight is too heavy</li> <li>• Some kettlebell movements need special instruction to avoid injury</li> <li>• must be stored safely</li> </ul>
<b>Weight Plates</b>	Weight plates are added to certain types of barbells for extra resistance. Weight plates come in many sizes, shapes, and weights but there are 2 primary differences – being Standard Olympic Plates and Olympic Bumper Plates.	<ul style="list-style-type: none"> <li>• Handles on weight plates can be useful because they allow easier grip and make the plates more versatile to use for exercises without the barbell.</li> </ul>	<ul style="list-style-type: none"> <li>• Storage required</li> <li>• Generally, also needs barbell for use</li> <li>• Limited loading on large muscle groups for beginners as core strength foundation is required</li> </ul>
<b>Cables</b>	<p>Cables refer to any exercise equipment with adjustable cables which allow you to perform many different motions.</p> <p>Cable set-ups involve a weight stack at one end, through a set of pulleys which ends up with a carabineer attachment for a handle, rope, or bar. You pull the cable which lifts the amount of weight you select on the weight stack.</p>	<ul style="list-style-type: none"> <li>• The weight stack can be adjusted up or down, depending on the fitness level of the athlete.</li> <li>• Many ranges of motion can be achieved and loaded for sports specific movement patterns</li> </ul>	<ul style="list-style-type: none"> <li>• Cable machines can be expensive</li> <li>• Requires plenty of space for use</li> </ul>



Equipment Name	Description	Benefits	Limitations
<b>Exercise Machines</b>	<p>Weight machines control the motion completely, usually through a single plane of motion, leaving the body's important stabiliser muscles unrecruited.</p> <p>Machines take out much of the improper form associated with free weight exercises.</p> <p>Weight machines make up the bulk of the sea of gym equipment which you see when entering most gyms.</p>	<ul style="list-style-type: none"> <li>Weight machines were designed to isolate a muscle group; therefore, they</li> <li>are best used for muscle building.</li> <li>Easy to adjust and increase the weight with pin loaded machines</li> <li>Great for muscle loading in beginners with low core strength foundation</li> </ul>	<ul style="list-style-type: none"> <li>Low ability to train various ranges of motion</li> <li>Machines provide far less functional strengthening benefits than free weights or free motion exercise equipment.</li> <li>Machines are expensive and space consuming</li> <li>Not transportable</li> </ul>
<b>Dumbbells</b>	<p>Dumbbells are a small bar with round fixed or adjustable plates. The dumbbells you will find in most gyms have fixed plates which aren't adjustable.</p> <p>Gyms contain many different forms of dumbbells. There are dumbbells with round edges as well as dumbbells with hexagonal edges. The benefits of dumbbells make them the must-have piece of gym equipment for all gyms.</p>	<ul style="list-style-type: none"> <li>Dumbbells are a true free weight because they allow the user to perform motion in all planes.</li> <li>Dumbbells are the best way to build functional strength, muscle, tone up and lose weight in a complete weight training program or other workout routines.</li> <li>Great for home or outdoor use and easily transportable.</li> <li>Cost effective</li> </ul>	<ul style="list-style-type: none"> <li>Overload is limited to ability to hold weight load with hand grip strength</li> <li>May be too unstable for beginners to achieve effective overload</li> </ul>
<b>Specialised equipment (bands, instability balls, steps/boxes, agility ladders, boxing equipment, suspension trainers, power bags and other unique types of equipment)</b>	<p>There are many types of specialised equipment that can be used to train for different fitness component outcomes.</p> <p>The list could be endless, and the benefits of such equipment may be questioned in some instances.</p> <p>The key to using specialised equipment is to fully understand how to use it safely and overload the movement adequately for a stimulus effect.</p>	<ul style="list-style-type: none"> <li>Add good variety to training sessions to avoid boredom</li> <li>Adds unique stimulus specific to a sporting movement or outcome</li> <li>Easily transported and often cost effective</li> <li>Great for balance and functional training outcomes</li> </ul>	<ul style="list-style-type: none"> <li>Can be unsafe if the correct technique is not used</li> <li>May be a fad or a gimmick and not be very effective</li> <li>May have limited use</li> </ul>

## Selecting Exercises for Clients (Revision)

When training clients, fitness instructors need to be able to select appropriate and beneficial exercises for various client types.

**The types of exercises that are appropriate for a client are based on the answers to the following questions:**

**1. What does the client want to achieve?**

This should be categorised into fitness components. The client may have health related or skill related fitness goals or both. The exercises we select for them must be specific so that the outcomes they desire are achieved.

**2. What sorts of movements does the client need improvement and strength in?**

Does the client need sports specific fitness improvements? Or are they looking to be more efficient and stronger in movements that they perform during their daily duties? The exercises you program should mimic the movement patterns that they want to become more efficient in.

**3. What is their current level of fitness?**

Knowing how advanced the client is in regards to movement efficiency, technique efficiency and strength levels will help you decide what progression of exercise is appropriate for that client.

**4. Are there any types of exercises that are not appropriate for this client?**

A client may have certain conditions due to an existing illness, injury, joint pains or lack of strength that make some types of exercises an inappropriate selection. Exercise that are too intense or too advanced will only put the client at risk of losing confidence in you as their trainer, in their own bodies and will increase the risk of an injury.

There are many more questions that you will ask during a health screening interview, but the ones mentioned above can help you select basic and safe exercises for various types of clients that will help them achieve their goals without injury.

Client programs should also include the most common movement patterns, trained with even numbers of exercises so that their muscle groups are balanced for postural improvements.

### **The big basic movement patterns essential for all clients are:**

- **Upper Body Push** – Shoulder press, chest press, triceps, pushdown
- **Upper Body Pull** – Rowing, pullup or pulldown, bicep curl
- **Lower Body Push** – Lunge, squat, machine leg press, step up, knee extension
- **Lower Body Pull** – Deadlifts, hamstring curl, glute bridge
- **Torso Rotation, Flexion and Extension** – Russian twist, crunches, back extension
- **Core Stability and Bracing** – Plank, pallof press, dead bug

Each of the movement patterns have a wide variety of types of exercises that are considered to be a version of that movement pattern. The next step is to choose a progression of the exercise that suits the client's fitness level and ability to perform the exercise safely and correctly.

## Phases of an exercise (revision)

Each exercise has a concentric and an eccentric phase plus the time between each of these phases.

<b>Concentric phase</b>	This is the push or pull phase or action of a movement. Muscles are loading while flexing, shortening or contracting during this phase.
<b>End of concentric phase</b>	This is the pause or hold that may or may not have time allocated to it after the concentric phase is completed. Muscles may or may not be loaded during this time, depending on the exercise.
<b>Eccentric phase</b>	This is the opposite phase to the concentric phase, usually where muscles are controlling a lowering of the load or moving back into position to start the concentric phase again. Muscles are often loaded while extending or lengthening during this phase.
<b>End of eccentric phase</b>	This is the pause or hold that may or may not have time allocated to it after the eccentric phase is completed. Sometimes the muscles will continue to be loaded during this time or they may be unloaded depending on the exercise.

## Functions and actions of major muscles during movement and exercises (revision)

During a movement pattern muscles take on various roles at different times.

<b>Agonist role</b>	This is the muscle or group of muscles that are primarily contracting to cause a movement during the concentric phase of an exercise (i.e., the chest muscle during a bench press)
<b>Antagonist role</b>	This is the muscle or group of muscles that are on the opposite of the main joint moving that are relaxing (or allowed to lengthen) while the agonist (or prime mover) contracts. (i.e., the latissimus dorsi during a bench press)
<b>Synergist role</b>	These are the muscles that assist with the movement pattern to perform it correctly or to move or stabilise secondary joints moving during an exercise. (i.e., triceps and anterior deltoids during a bench press)
<b>Fixator role</b>	<p>These are the smaller muscles that stabilise the origin or the agonists so that can achieve maximum and effective contraction. The fixator muscles increase in tension but do not allow any movement to take place (i.e., the rotator cuff muscles that stabilise and decrease the forward movement of the shoulder joint during a bench press).</p> <p>When the fixator muscles are not recruited to keep joints in the correct positions during movements or exercises the joints are pulled into positions that they should not be loaded in, and this can lead to injuries.</p> <p>Insisting on correct technique being achieved and observing that joints are remaining in correct positions when loaded will encourage synergists and fixators to activate to perform their role and prevent incorrect movement, poor posture and injuries.</p>

In the below table you will be able to connect the major movement patterns of the body, with the muscle groups, joints involved, joint movement names during the concentric phase of the movement and some exercise suggestions that are versions of each type of movement.

<b>Movement terminology (joint action)</b>	<b>Joints involved</b>	<b>Agonist muscles</b>	<b>Synergist muscles</b>	<b>Exercise examples</b>
<ul style="list-style-type: none"> <li>• <b>Shoulder horizontal flexion</b></li> <li>• <b>Elbow extension</b></li> <li>• <b>Upper body push horizontal</b></li> </ul>	<ul style="list-style-type: none"> <li>• Shoulder (gleno-humeral)</li> <li>• Elbow</li> </ul>	<ul style="list-style-type: none"> <li>• Pectoral group</li> </ul>	<ul style="list-style-type: none"> <li>• Anterior Deltoids Triceps Brachii</li> </ul>	<ul style="list-style-type: none"> <li>• Push up</li> <li>• Bench Press</li> <li>• Seated chest press</li> <li>• Dumbbell bench press</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Shoulder abduction</b></li> <li>• <b>Elbow extension</b></li> <li>• <b>Upper body push vertical</b></li> </ul>	<ul style="list-style-type: none"> <li>• Shoulder (gleno-humeral)</li> <li>• Elbow</li> </ul>	<ul style="list-style-type: none"> <li>• Deltoid group</li> </ul>	<ul style="list-style-type: none"> <li>• Triceps brachii</li> </ul>	<ul style="list-style-type: none"> <li>• Handstand push up</li> <li>• Seated shoulder press</li> <li>• Dumbbell or barbell shoulder press</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Shoulder horizontal extension</b></li> <li>• <b>Elbow flexion</b></li> <li>• <b>Upper body pull horizontal</b></li> </ul>	<ul style="list-style-type: none"> <li>• Shoulder (gleno-humeral)</li> <li>• Elbow</li> </ul>	<ul style="list-style-type: none"> <li>• Trapezius Rhomboids</li> </ul>	<ul style="list-style-type: none"> <li>• Biceps brachii</li> <li>• Teres major/ minor</li> </ul>	<ul style="list-style-type: none"> <li>• Bent over row</li> <li>• Pendlay row</li> <li>• Seated row</li> <li>• Under bar pull up</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Shoulder adduction</b></li> <li>• <b>Elbow flexion</b></li> <li>• <b>Upper body pull vertical</b></li> </ul>	<ul style="list-style-type: none"> <li>• Shoulder (gleno-humeral)</li> <li>• Elbow</li> </ul>	<ul style="list-style-type: none"> <li>• Latissimus dorsi</li> </ul>	<ul style="list-style-type: none"> <li>• Biceps brachii</li> <li>• Teres major/ minor</li> <li>• Trapezius</li> </ul>	<ul style="list-style-type: none"> <li>• Pull up</li> <li>• Chin up</li> <li>• Lateral pull down</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Hip extension</b></li> <li>• <b>Knee extension</b></li> <li>• <b>Lower body push horizontal</b></li> </ul>	<ul style="list-style-type: none"> <li>• Hip Knee</li> </ul>	<ul style="list-style-type: none"> <li>• Quadriceps Glutes</li> </ul>	<ul style="list-style-type: none"> <li>• Hamstrings Calves</li> </ul>	<ul style="list-style-type: none"> <li>• Horizontal leg press</li> </ul>

<b>Movement terminology (joint action)</b>	<b>Joints involved</b>	<b>Agonist muscles</b>	<b>Synergist muscles</b>	<b>Exercise examples</b>
<ul style="list-style-type: none"> <li>• <b>Hip extension</b></li> <li>• <b>Knee extension</b></li> <li>• <b>Lower body push vertical</b></li> </ul>	<ul style="list-style-type: none"> <li>• Hip Knee</li> </ul>	<ul style="list-style-type: none"> <li>• Quadriceps</li> <li>• Glutes</li> <li>• Calves (calf raise)</li> </ul>	<ul style="list-style-type: none"> <li>• Hamstrings</li> <li>• Calves</li> <li>• Core</li> </ul>	<ul style="list-style-type: none"> <li>• Squats</li> <li>• Split squats</li> <li>• Lunges</li> <li>• Calf raises</li> <li>• Step up</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Knee flexion</b></li> <li>• <b>Lower body pull horizontal</b></li> </ul>	<ul style="list-style-type: none"> <li>• Knee</li> </ul>	<ul style="list-style-type: none"> <li>• Hamstrings</li> </ul>	<ul style="list-style-type: none"> <li>• Calves</li> </ul>	<ul style="list-style-type: none"> <li>• Lying hamstring curl</li> <li>• Swiss ball curls</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Hip extension</b></li> <li>• <b>Lower body pull vertical</b></li> </ul>	<ul style="list-style-type: none"> <li>• Hip</li> </ul>	<ul style="list-style-type: none"> <li>• Glutes</li> <li>• Hamstrings</li> </ul>	<ul style="list-style-type: none"> <li>• Core</li> <li>• Hip stabilisers</li> </ul>	<ul style="list-style-type: none"> <li>• Deadlift</li> <li>• Single leg deadlift</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Torso rotation</b></li> </ul>	<ul style="list-style-type: none"> <li>• Vertebral column</li> </ul>	<ul style="list-style-type: none"> <li>• Obliques</li> </ul>	<ul style="list-style-type: none"> <li>• Rectus abdominus</li> <li>• Erector spinae group</li> </ul>	<ul style="list-style-type: none"> <li>• Russian twist</li> <li>• Woodchops</li> <li>• Cable rotation</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Hip extension</b></li> <li>• <b>Hip hinges</b></li> </ul>	<ul style="list-style-type: none"> <li>• Hips</li> <li>• Vertebral column</li> </ul>	<ul style="list-style-type: none"> <li>• Glutes</li> <li>• Hip flexors</li> </ul>	<ul style="list-style-type: none"> <li>• Erector spine group</li> <li>• Hamstrings</li> <li>• Abdominals</li> </ul>	<ul style="list-style-type: none"> <li>• Good morning</li> <li>• Back extension</li> <li>• Leg raises/drops</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Torso flexion</b></li> </ul>	<ul style="list-style-type: none"> <li>• Vertebral column</li> </ul>	<ul style="list-style-type: none"> <li>• Rectus abdominus</li> </ul>	<ul style="list-style-type: none"> <li>• Hip flexors</li> </ul>	<ul style="list-style-type: none"> <li>• Sit-ups</li> <li>• Crunches</li> <li>• Knee raises/curls</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Torso extension</b></li> </ul>	<ul style="list-style-type: none"> <li>• Vertebral column</li> </ul>	<ul style="list-style-type: none"> <li>• Lower back</li> <li>• Erector Spinae</li> </ul>	<ul style="list-style-type: none"> <li>• Gluteal group</li> <li>• Transverse abdominus</li> </ul>	<ul style="list-style-type: none"> <li>• Back extension</li> <li>• Supermans</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Core brace</b></li> </ul>	<ul style="list-style-type: none"> <li>• Vertebral column</li> </ul>	<ul style="list-style-type: none"> <li>• Transverse abdominus</li> <li>• Obliques</li> <li>• Erector spinae (isometric hold)</li> </ul>	<ul style="list-style-type: none"> <li>• Deep core muscles</li> <li>• Gluteal group</li> </ul>	<ul style="list-style-type: none"> <li>• Plank</li> <li>• Side plank</li> <li>• Dead bugs</li> <li>• Pallof Press</li> <li>• Hollow hold</li> </ul>

## Progressing and regressing exercises (revision)

When selecting an exercise, we may need to progress or regress it to suit a client or a client group. The following progressions and regressions apply to all exercise types.

When choosing an exercise, consider if it would be best to progress or regress it for the client's needs.

**Important:** It is best to choose a progression level that the client will be able to perform and make it more challenging once you can see that they can achieve that level safely and effectively. It is much safer to increase an exercises intensity than to program something too difficult and risk an injury occurring.

### Ways to REGRESS an exercise or program:

- Make the exercise or program less complicated
- Reduce the load/weight
- Slow the movement down
- Reduce the lever length
- Reduce the range of motion
- Increase the rest periods
- Change the order of the exercises to alternate muscle groups
- Train less often

### Ways to PROGRESS an exercise or program:

- Make the exercise or program more complicated
- Increase the load/weight
- Speed up the movement
- Increase the lever length
- Increase the range of motion
- Decrease the rest periods
- Change the order of the exercises to overload similar muscle groups
- Train more often





## **Phases of a Session Plan**

When writing a session plan there is a certain structure that should be followed to ensure that the body is prepared for the conditioning part of the program, where optimal stimulus is added for adequate overload and then the body should be cooled down to bring it back to a state of relaxation for optimal recovery.

### **Warm up**

The warmup phase of the program should be planned and specific to ensure that the body is prepared well to avoid injury and perform adequately during the conditioning phase for optimal overload and adaption to occur.

Warmups can take a few forms based on the type of session that is going to follow. Here are some examples of the types of warmups you can program to prepare your body to perform:

- 5 to 10 minutes jogging or other cardio exercises to increase body temperature and promote blood flow and oxygenation of the muscles.
- 10 minutes dynamic stretching exercises to increase mobility, reduce stiffness and lubricate joints ready for movement.
- 10 to 15 minutes general and event specific drills to practice technique or activate nervous system and optimal arousal.
- Warm up sets before the exercise at full intensity to imitate movement patterns and gauge range of motion on the day.

### **Cardio warmup**

The goal of a cardiovascular warm up is to gradually increase blood flow to the muscles and promote oxygenation to the muscles. This generally takes at least 5-10 mins and should be performed gradually to avoid overusing muscles and allow the body to adjust effectively.

There is no point jumping on a treadmill to warm up at a fast run if it gets you out of breath too quick and makes your muscles burn within a few minutes. This means that the warmup is too intense and may cause injury.

Make sure clients warmup slow and steady and progress at a rate that is comfortable. By the end of a warmup, they should feel motivated to start training harder, warm and a little sweaty, but not exhausted or sore.

### **Dynamic stretching**

Dynamic stretches are active movements where joints and muscles go through a full range of motion. They can be used to help warm up the body before exercising.

Dynamic stretches should be functional and mimic the movement of the activity or sport about to be performed. For example, a swimmer may circle their arms, in a swimming motion, before getting into the water to increase range of motion.

Dynamic stretches can also be a series of movements in general before other types of exercise. Some examples include trunk twists, walking lunges, or leg and arm swings or circles.

The movements are called stretches because the client moves into a full range of motion so that the muscles are stretching a very small amount more each time they move through the range.

The goal is to challenge the muscles a small amount each movement but not so much that the risk of injury increases. Dynamic stretching as a warmup stimulates muscles to become more flexible and yet remain activated ready for performance.

## Individual specific

It's beneficial to include stretches and muscle activations that are specific to the clients postural, or muscle imbalance needs. This will prepare their body for the movement and range required in the session.

Some exercises that promote good posture when warming up may include:

- Band pull aparts (for posterior muscle activation)
- Chest stretches (to allow for back muscles to activate effectively)
- Glute and core activation (to allow lower back muscles to relax)
- Hamstring stretches (to promote neutral lumbar spine and hip position)
- Hip flexor stretch (to promote neutral hip position)
- Adductor stretch (inner thigh release to promote correct knee position)
- External rotation of the hips (to activate glutes and Abductors)
- Thoracic/torso rotation (to promote functional movement into rotation)

These exercises and stretches are beneficial to promote correct posture and counteract common postural misalignments that occur from frequent sitting positions and anterior dominated activities.

## Conditioning phase

The conditioning phase will contain 30-45 mins or more of conditioning type exercises, specific to the fitness component or sport being prepared for and at an intensity that is high enough to cause damage and adaptation.

The conditioning phase is where the principles of programming are used to ensure the program is hard enough, and yet doesn't cause injury.

## Cool down

The benefits of a cool down after exercise is to allow the heart rate and breathing rate to return to normal and prepare the body to relax and recover.

The cool down will often depend on the type of exercise performed during the conditioning phase and can include static stretches to increase the range of motion in the joints and encourage the blood flow to slow to a more normal rate.

Static stretches are those that are held for one to two minutes to allow the nervous system to relax and the joint range of motion to increase.

Static stretching leaves the muscles relaxed and ready to repair. Choose static stretches that relate specifically to the muscles that were worked during the session.

Other relaxation exercises can be done during a cool down like some yoga positions, deep breathing or meditation to calm the mind and bring a relaxed state to the body.

**Let's bring it all together now and write some session plans!**

# PROGRAM TERMINOLOGY

## Exercises

Exercises are the names of the movements in the session plan.

During the warmup, select warm up appropriate exercises referred to earlier.

### **Conditioning phase exercises should be arranged in a certain order:**

1. Compound, large muscle groups or most demanding exercises early in the program
2. Isolated muscle group exercises after all compound movements
3. Core exercises last

Cardiovascular exercise can be done in the program after strength work, or on another day in a separate session.

Remember that after a decent strength session clients should feel energy depleted. So, it won't be the best time to squeeze in some cardio for maximum fat burning or fitness component development.

Cool down exercises should include mobility exercises, stretches dynamic or static and relaxing activities to calm the body back to its natural state.

Don't add too many exercises into a clients program as they can be more time consuming than you may realise and simple is better, especially if they are doing the sessions on their own when they come to the gym.

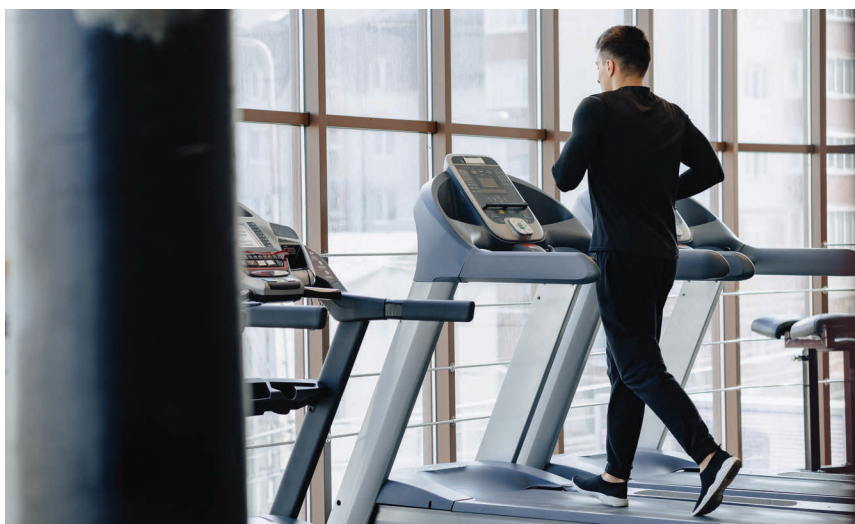
Generally, about 3-4 sets of an exercise, with 1-2 minute rest between each one will take about 8-10 mins per exercise – so 4 exercises will take about 35-40 mins to complete.

Reduce the rest between exercises to burn more calories and increase the rest if the intensity of the load or reps is higher.

You can calculate how long the program will take if the client follows the reps, sets, tempos and rest times strictly. Explain this to the client so that they know how long their program will take if they adhere to the details you have programmed for them.

Here is the calculation to work out how long a programmed session will take:

Per exercise:  $(\text{Total reps} \times \text{tempo}) + (\text{sets} \times \text{rest in seconds}) / 60 = \text{minutes per exercise.}$



## Repetitions

This is how many repetitions of the exercise they will do in each set.

Here are the average number of reps that would be appropriate in a set for various fitness outcomes:

- Maximal strength – 3-6 reps
- General strength – 8-12 reps
- Hypertrophy – 8-15 reps
- Endurance – 12-20 reps
- Power – 1-3 reps

## Sets

A set is a certain number of repetitions, all performed together, with no rest in between each repetition.

Sets can have different number of reps in each one, even in the same exercise, depending on the set type (refer to “set types” under the “Programming Variables” heading).

## Load

The load will indicate the weight recommended to add to the exercise. This can be described as kg of weight, intensity as in a percentage of 1RM or perceived exertion (like 8/10 effort). Tracking the weight on each lift for strength programs is a great way for clients to stay motivated and see their progression. They can increase the load when they can easily complete a certain number of repetitions.

As a guide – the more repetitions you have programmed, the lower the weight will need to be to complete all the repetitions.

### Load vs reps guide

Repetition range	Load percentage of 1RM	Rest in between sets	Fitness component
1-3	95-100%	5+ mins	Maximal strength and power
4-6	85-95%	4-5 mins	Strength
7-10	75-85%	2-3 mins	General and functional strength
10-12	65-75%	30-90 seconds	Hypertrophy
12-15	55-65%	30 -90 seconds	Endurance and hypertrophy
15-20+	55% or less	30-60 seconds	Endurance

## Rest periods

Rest periods are the amount of time spent fully resting between sets to allow muscles to recover slightly, replenish energy stores and have the ability to push the next set with as much intensity as possible.

As you can see in the table above, the more intense the set, the more rest is needed to be able to perform with similar intensity.

Rest periods can be adjusted to make sessions more intense or allow for more recovery to achieve more load in each set. As rest is reduced, so is performance and the muscles become more depleted of energy stores with each set.

A sporting event may have very little rest during the game or between “on” periods and so this should be simulated in the session to allow the body to adapt to the conditions it needs to, to perform optimally.

There is no point resting for 3 minutes between sprints in a training session if this would rarely occur on the playing field.

Whereas, if the athlete was a 100m sprinter, then after the event they can rest as long as they want and its maximal speed training that is the desired outcome, in this case long rests between sets would be recommended to allow for the maximal speed gains.

Competition weightlifters need to lift as heavy as possible in the event for 1-2 reps and so they would perform 1-3 reps at maximal load and then rest for 5+ minutes to ensure they are fully recovered for the next set.

There has been some evidence that when the training goal is muscular hypertrophy, the combination of moderate intensity sets with short rest intervals of 30-90 seconds might be most effective due to greater acute levels of growth hormone during such workouts.

## Tempo

The tempo is the speed at which each repetition is performed at.

Tempo is usually described in 4 numbers with each phase of the repetition being a certain number of seconds long.

### Tempo in seconds

Exercise	Eccentric phase of the exercise	Pause at the end of the eccentric phase	Concentric phase of the exercise	Pause at the end of the concentric phase
Bench press for power	3	0	1	0
Triceps push down for hypertrophy	4	0	2	1
Box jump	3	1	X (explosive)	3
Split squats – general strength	2	1	1	0



From the above table you can see that different exercises can have different tempos that guides the client on how long to spend in each phase of the exercise for various training outcomes.

You may be able to imagine if you had a load of 90% of 1 RM on the bench press, had 6 reps planned and spent 3 seconds on the down phase and 1 second on the up phase that would be 24 seconds of time under tension, which is ideal for maximal strength or muscle activation gains.

If you programmed 10 reps of bench press, at 80 percent 1RM for a tempo of 4021, then you would need to be pushing 80% of 1RM for 70 seconds, which would become much harder, even impossible to complete as the time under tension would be too long for the weight percentage.

Increasing or decreasing the tempo can be a way to progress or regress to make a load harder, can stimulate hypertrophy growth and recruit more small muscles fibres as the movement is slowed down and controlled.

## Program notes

Notes on client session plans can be made before, during and after the session. Notes should remind clients of a technique cue that they need to keep in mind like “core engaged” or “hips level”.

Clients can also add notes to their programs about the intensity such as; Was it too hard? A little easy? Perhaps it felt a bit fast or slow?

If you decide to modify a program during the show through session, make notes so that the client has current directions that apply to them specifically when following their session plan. You may also provide a regression option for them until they can work up to the progression you had in the initial session.

Perhaps the push ups on the toes was too difficult for them and you write they should perform the push ups on their knees until they increase their strength to attempt the toe push ups.

Explain to client that they can make notes about lots of different things when they are training. They may want advice on how an exercise felt or the technique they weren't getting right, making notes will ensure they don't forget any particular questions when consulting a fitness representative about a program update or for more instructional advice.





# TYPES OF PROGRAMS

## Types of cardio training

There are many different things clients can do to train their cardiovascular system. It is ideal to choose a method that suits their preferences and that they will enjoy, because cardio needs to be a part of any healthy person's weekly schedule.

Here are a variety of suggestions that you can recommend and see which one they might enjoy the most. They might also like to try a few different types over a period, because variety is essential to keep the body adapting and changing and you don't want them to get bored with their cardio sessions.

The gym you are working in might offer some of these as part of their client services.

- Walking
- Running/jogging
- Hiking
- Swimming
- Dancing
- Aerobics/classes
- Aqua aerobics
- Stair climbing
- Rowing
- Cycling
- Cross-trainer
- Circuits
- Fartlek training
- Sports – tennis, golf, soccer, netball, touch rugby etc
- Surfing
- Boxing
- Sprints/speed drills

## Steady state cardio

Steady state cardio is performing an activity that increases the heart rate to about 60-70% heart rate maximum and maintains it there for a period of time.

Remember - a client's maximum heart rate can be calculated averagely with the following equation:

$$220 - \text{age} = \text{max heart rate}$$

So that means a person who is 40 years old would have a heart rate max of about 180 beats per minute. 70% of 180 is 126.

So steady state for a 40-year-old person would mean performing an activity that keeps their heart rate at 120-130 beats per minute for 30-60 mins. This would be considered as low to moderate activity level.

Steady state cardio is often performed by fast walking, hiking, swimming, dancing, playing a sport like golf or tennis, cycling, rowing or other cardio where the intensity is not extremely high.



In a gym environment, steady state cardio could be programmed as follows:

Warm-up						
Exercises	Reps	Sets	Load	Tempo	Rest	Notes
Leg swings	10 each leg	2	Body weight (BW)	1010	20 seconds	
Arm circles	20	2	BW	0	20 seconds	
Lunge to a stretch	10 each leg	1	BW	0	0	
Heel and toe walks	20 steps	2 each	BW	1010	10 seconds	

Cardio						
Exercises	Reps	Sets	Load	Tempo/Intensity	Rest	Notes
Treadmill hill walk	5 mins	2	Incline 2	5 km/h	30 seconds	
Cross trainer	3 mins	2	Level 6	8 km/h	30 seconds	
Rower	5 mins	2	Level 5	Try to row 500 m	30 seconds	
Cycling	5 mins	2	Level 2	Try to cycle 5 km	30 seconds	

Cool-down						
Exercises	Reps	Sets	Load	Tempo	Rest	Notes
Hamstring stretch	1 each leg	2	BW	Hold 30 seconds each	0	
Quad stretch	1 each leg	2	BW	Hold 30 seconds each	0	
Calf stretch (walk stretch)	1 each leg	2	BW	Hold 30 seconds each	0	
Cat cow stretch	10	2	BW	3232	20 seconds	

This program is performed like a cardio circuit on the gym machines with a 5 min warm up and about a 10 min cool down. The whole session would take about 55 mins to complete.

A similar program could be conducted in the gym with intervals added to intensify the session, burn more calories and provide more stimulus for faster adaption.

### Benefits of steady state cardio

- Provides adaption in the cardiovascular system slowly and gradually
- Low risk of injury as the intensity is not extreme
- Low stress or cortisol release
- Mood enhancing and enjoyable for mental health (can be used like a meditation)
- Good for people that are very overweight and need to burn calories in a safe way
- Low impact
- Great for blood sugar stabilising
- Ideal for weight maintenance

### Limitations of steady state cardio

- May be boring for some
- Time consuming for time poor people
- Results are slow and gradual
- Gym and cardio machines may not be readily accessible
- Overuse of joints, bones or muscles can occur if too much of the same exercise type is performed



### Tips for enjoyable and safe steady state cardio

- Listen to music, podcasts or audiobooks so that the time is spent wisely, and your mind is stimulated
- Phone a friend while you are doing steady state cardio to catch up on conversations
- Use the time to enjoy meditation or thinking time with your mind
- Enjoy the great outdoors and breathe in the fresh air
- Play a sport with a friend and gain new skills
- Develop a personal skill like swimming, dancing or surfing
- Mix up the cardio type to avoid overuse injuries
- Take different walking tracks or plan new hikes to do each weekend
- Don't neglect warming up and cooling down before and after steady state cardio

## Fartlek training

“Fartlek” is a famous Swedish name for speed (fart) play (lek). The key to a speed play workout is the idea of changing the running rhythm and speed while completing a continuous run. So, you would mix in parts of slow running and faster running. Fartlek is a particularly great training method to achieve a faster running pace or intensify your workout above a steady state level.

How you program a fartlek run is only limited by your own imagination! Mix different speeds and distances.

However, keep in mind that the fast sections of a fartlek workout should not be sprinting because the client needs to keep on moving the whole time. For a beginner, they may feel that fast running or jogging is followed by too much fatigue, so they can walk the slower parts and jog the fast parts.

Explaining the concept of Fartlek training to a client can help them overload their session for speed and endurance improvements, without it needing to be too structured. As long as they include intervals of faster paced movement with the slower paced periods, they will then be achieving overload.



### Example Fartlek Workout

#### Warm-up:

- 5 mins Legs swings
- Heel and toe walks
- Travelling lunges to a twist

#### Fartlek:

- 20 min. Keep running, repeating sections of 2 minutes of slow running followed by 30 seconds of fast running. Repeat until 20 mins are up.
- Another option is to take some natural landmarks, such as lamp posts, and use them as your guiding light. Run past two lamp posts fast, then recover for the next 3 or run until you feel fatigued and slow jog or walk until you feel recovered enough to run faster for a period again.

#### Cooldown:

- 10 mins
- 5 mins jog
- 5 mins lower body static stretches

## Interval cardio

Interval cardio is different to Fartlek in that there are usually periods of work to periods of complete rest. Interval training can also be applied to all different types of cardiovascular exercise types, not just running or walking.

Any type of cardiovascular exercise can be overloaded and intensified using intervals.

### Benefits of interval training

- Burn more calories
- Workouts are more time efficient
- Improved aerobic capacity
- Less boredom, more challenging

Intervals can take many forms and will depend on the adaptation required. If the client wants to increase their heart rate for fitness improvements, then set them a work to rest ratio of a certain rate of perceived exertion (RPE) during each interval then allocate a period of complete rest.

For example – swim one lap at an 8/10 RPE (fast swimming) and then rest for 30 seconds at the side of the pool. Repeat this 20 times and note how long it takes. Try to complete 20 laps next session in a faster time.

Another example may be to run 400 m laps of the running track as fast as possible, record their time and then rest for 2 minutes before repeating 6 times.

By recording your time, they can work on reducing the time that the distance takes for speed improvements or increase the number of laps for distance improvements.

Intervals can also be done by fast walking, stair walks or runs, cycling on a stationary bike or using cardio equipment in the gym.

### An interval cardio program in the gym may look like this:

Warm-up						
Exercises	Reps	Sets	Load	Tempo	Rest	Notes
Leg swings	10 each leg	2	Body weight	1010	20 seconds	
Arm circles	20	2	BW	0	20 seconds	
Lunge to a stretch	10 each leg	1	BW	0	0	
Heel and toe walks	20 steps	2 each	BW	2 each	10 seconds	

Interval Cardio						
Exercises	Reps	Sets	Load	Tempo	Rest	Notes
Treadmill running	6 mins	6	Incline 2	10 km/h 30 seconds on	30 seconds	Complete all sets at once for each exercise
Cross trainer	9 mins	6	Level 8	12 km/h 1min on	30 seconds	
Rower	4-5 mins	4	Level 5	100 m fast as possible	30 seconds	Record best 100 m time
Cycling	10 mins	5	Level 5	1 min fast	1 min easy	

Cool-down						
Exercises	Reps	Sets	Load	Tempo	Rest	Notes
Hamstring stretch	1 each leg	2	BW	Hold 30 seconds each	0	
Quad stretch	1 each leg	2	BW	Hold 30 seconds each	0	
Calf stretch (walk stretch)	1 each leg	2	BW	Hold 30 seconds each	0	
Cat cow stretch	10	2	BW	3232	20 seconds	



## Metabolic training

Metabolic training (MT) is a hybrid of anaerobic strength training and aerobic cardio exercise. In a nutshell, effective MT training ignites the metabolism, allowing for a longer period of calorie burning after the session itself.

The workout needs to be both intense and loaded to ensure as many energy systems as possible are stimulated and the metabolism is boosted for hours after in recovery. An hour of weight training with plenty of rest or a 30-minute steady state jog around the park is not enough stimulus to activate the metabolic response of a true MT session. The goal is to work as hard as possible within the time frame.

MT is a strength training strategy that keeps the heart rate up and is demanding on the body systems. In this style of training, the client works through a series of strength-focused exercises (typically compound strength exercises) with very little rest between sets. Work periods are intense for 30-60 seconds before resting for 30 seconds or less. Not only will this train the cardiovascular system, due to the increased blood flow demands to your muscles and body systems, but it will highly challenge the muscular and nervous systems also.

A MT workout would usually include exercises in a circuit style session with work to rest periods of 45-60 seconds on and 30-45 seconds' rest.

6-8 exercises are a good number for a 45 mins training session or 4-6 exercises if the client only has 30-45 mins to train.

The idea is to choose exercises that are uncomplicated, that they can perform fast with good technique, but that involves some sort of load or weight bearing move that's not just upright body weight.

Load for exercises should be about 60+ percent or feel like a 6/10 RPE. The weight starts to feel much heavier than anticipated after it is lifted at a fast pace 10-12 times!

### Benefits of MT training

- Time efficient workouts
- Increased muscles strength
- Improved cardiovascular fitness
- Higher fat burning capacity activated during and after workout
- Improved power and speed of muscle fibre firing



## Here is an example of a MT circuit training program:

Warm-up						
Exercises	Reps	Sets	Load	Tempo	Rest	Notes
Body weight squats	10	2	Body weight	1010	30 seconds	
Light band pull aparts	20	2	BW	2020	30 seconds	
Inch worms	6	1	BW	0	0	
Lunge walk with a twist	20 steps	2	BW	0	30 seconds	

MT circuit						
Exercises	Reps	Sets	Load	Tempo	Rest	Notes
Squat and DB press	60 seconds	3	6 kg DB	8 RPE	30 seconds	Complete one set of each exercise per round
Mountain climbers	60 seconds	3	BW	8 RPE	30 seconds	Complete 3 rounds
TRX Row	60 seconds	3	BW	8 RPE	30 seconds	
BB Travel lunges	60 seconds	3	20 kg BB	8 RPE	30 seconds	Rest 2 mins between rounds
Burpees	60 seconds	3	BW	9 RPE	30 seconds	
Cable wood chops	60 seconds	3	15 kg	8 RPE	30 seconds	

Cool-down						
Exercises	Reps	Sets	Load	Tempo	Rest	Notes
Pigeon glute stretch	1 each leg	2	BW	Hold 60 seconds each	20 seconds	
Quad stretch	1 each leg	2	BW	Hold 30 seconds each	20 seconds	
Static chest stretch	1	2	BW	Hold 60 seconds each	20 seconds	
Child's pose	1	3	BW	Hold 60 seconds	20 seconds	

## High intensity interval training (HIIT)

HIIT is working at full capacity during the work periods and then resting adequately to be able to perform at 90-100% intensity again in the next interval.

The work to rest ratio for HIIT intervals may be 1:2 or 1:3 to allow for adequate rest for the work intensity.

For example: You may work at 90% intensity for 20 seconds and then take 40 seconds recover ready for the next 20 second interval.

OR

You may work for 60 seconds at 85% intensity and then take 2 mins to recover. The length of the intervals can be varied or specific for a sports improvement outcome. Having work intervals of any more than 60 seconds will reduce the intensity of the interval. HIIT intervals should only be as long as you can sustain maximal output before fatigue starts to reduce the intensity output.

Recovery periods should be long enough for the client to recover so they can give the next interval maximum effort again. (Or a touch less effort as the session progresses and body systems fatigue in general)

The type of exercise can take any form but generally needs to be a form of exercise that they feel confident to perform with good technique at 90-100% intensity. That means the exercises should be uncomplicated and intense. Bodyweight exercises are often best as adding weights can require more technique.

### Some exercises that may suit a HIIT session may include, but not be limited to:

- Burpees
- Jumping squats
- Box jumps
- Stair runs
- Sprints
- Boxing rounds
- Jumping jacks
- High knees
- Skipping
- Mountain climbers
- Pull ups

## **Another method for HIIT training is to do the intervals according to the Tabata method.**

Tabata, named after its founder, Dr. Izumi Tabata, is a form of HIIT that takes four minutes per round. What makes Tabata a little different from other HIIT workouts is that it consists of the same exercise for four minutes whereas other HIIT routines could be for time or for reps and can include a variety of exercises.

During the first 20 seconds, you give around 95% of your power. Then, you rest for 10 seconds. Repeat the exercise for another 20 seconds repeating the intensity with maximal effort, then rest again for 10 seconds. Complete these intervals eight times for a total of four minutes and you've got one Tabata.

Even just two rounds (8 minutes total) of Tabata can be very intense, burn fat and promotes the release of endorphins and metabolic stimulation. You can continue adding more rounds as clients increase in fitness. It can be adapted to whatever areas of the body they wish to strengthen or the exercises that they feel most confident to perform correctly and that they can push to high intensity in.

Tabata training is not ideal for beginners or anyone with injuries as it can be intense and just 1-2 rounds can be exhausting and too much overload for a person that is newly exercising.

## **Plyometric training**

Plyometric training is quick, powerful movements involving a system of reactive eccentric contractions, followed immediately by an explosive concentric contraction. This is accomplished through any movement utilising the Stretch-Shortening Cycle (SSC).

### **Plyometrics is basically power training with an explosive component to the movement.**

Plyometric training can add fun and challenge to a client's training programs. However, it must be introduced, coached, and progressed systematically to avoid injuries.

### **There are three phases to plyometric exercises:**

**Eccentric Loading** – Where the muscle is stretched, storing potential energy in its elastic element. This is the deceleration phase.

**Amortization Phase** – This is the point at the end of the eccentric loading phase where the muscle transitions from overcoming gravitational acceleration and loading ready to release the energy built up. Not too much time should be spent in this phase otherwise potential elastic energy can be lost.

**Concentric Phase** – This is the unloading phase the release of the elastic tension occurs to create a high-power movement like a jump, leap, swing or hop etc.

Before incorporating plyometric exercises into a client's program, they must have the ability to balance efficiently and possess adequate core strength, joint stability, and range of motion. Plyometric drills or exercises are not appropriate for beginners or clients that have not developed general strength and ability to balance and coordinate first.

Warmups before plyometric training must be adequate including mobility drills and blood flow directed to the muscles that will be working. Landing surfaces should also be considered and soft or impact absorbing landing surfaces used where possible to reduce the wear and tear on joints and tissues surrounding them.

Plyometric ability can be improved by doing more plyometric specific training sessions with the goal to achieve more distance in the concentric phase. Elastic muscle energy can be improved with practice. The nervous system must adapt significantly for this progress by allowing the muscles to stretch and quickly activate a large number of muscle fibres at once to create the powerful concentric phase. Fast twitch muscle fibres are activated, and the ATP-PC anaerobic energy system is used during plyometric training sessions predominantly.

## Recovery

Cardiovascular fitness is highly beneficial for our body systems, health and long-term wellness. The more intense the exercise session, the more stimulus is applied to the body and therefore more and faster adaptation can occur.

Although it can become addictive and overdoing the cardio in a clients program can do more harm than good.

Recovery time for cardiovascular fitness sessions should match the intensity and length of the session and the fitness level of the person training.

A beginner may need 48-72 hours recovery between cardiovascular training sessions, based on how intense the session was for them. Conditioned athletes may be able to perform cardiovascular fitness sessions everyday with little rest, depending on the intensity also.

Overtraining is a consideration and can occur if the body systems are not given enough time to adapt and recover between training sessions.

### **Common cardiovascular overtraining symptoms could include:**

- Gaining weight despite training often and at moderate to vigorous intensity
- Feeling tired all the time
- Feeling thirsty constantly during the day
- Sleeplessness or insomnia
- Low sex drive
- Muscle soreness that doesn't go away
- Pain in the joints or muscles that worsens
- Getting sick more often
- Not being able to train as hard as previously able to
- Losing healthy muscle mass
- Losing strength
- Doing cardio every single day for longer than 30-45 mins at high intensity
- Losing concentration and focus

Be sure to monitor a clients cardio training sessions and mix them up with strength training which is also essential to boost metabolic rate and increase muscle strength.

Include a variety of types of cardiovascular training, intensities and durations to challenge a clients fitness level. Also, include active recovery days of steady state cardio for mental health and enjoyment and to give the body the rest it needs for optimal adaptation.

Don't forget to provide the client with healthy eating advice, including vegetable and complex carbohydrate intake like wholegrains so that they are not nutritionally depleted. Protein is also important to ensure soft tissue can repair and rebuild itself, especially if clients are doing moderate or vigorous intensity.

Recommend they replace fluid from sweat adequately with plenty of water and electrolytes during the day.





## **Weight Loss/Body Composition**

Exercising for a weight loss goal is very common and can often mean that the person has not been very active recently, and the weight crept on, or they have been focusing on other training goals and not on losing body fat. Healthy weight loss includes losing body fat and retaining or increasing muscle where possible. Muscle increases can boost our metabolic rate a little as muscle demands more energy to maintain than fat, and also look better on our bodies. Muscle strength helps us feel stronger and doing resistance training is great for bone strength and variety in our programs.

The best approach to a weight loss training program is to incorporate a variety of training types into a weekly exercise plan, which burns optimal fat levels at each session and avoids overuse injuries or overtraining symptoms.

If someone starting a weight loss program has not been physically active for over 6 months and has increased in body fat by more than 5% of what they were, then they need to have a health check and clearance from their General Practitioner to ensure their blood pressure is stable and that their health is adequate for them to start a moderate intensity training program.

## **How does weight loss work?**

Weight gain and weight loss occur when there is either a surplus of energy compared to the persons activity level, or a deficit. When we consume less calories in our diet than we need, then we will need to dig into our fat stores to make more energy for our body systems to function, and we lose fat weight.

If we eat or drink more calories than we need for our energy levels, we will store the energy as fat ready for one day when we may be in a deficit and need the energy. If we rarely need the stored calories because we are rarely in a deficit, then we will keep storing more and more fat.

The more calories we consume, over our energy needs each day, the faster we gain weight and the same generally applies to losing weight.

Losing weight too fast is not ideal because the process of converting fat into energy is complicated and if we expect our bodies to use too much of our fat stores each day as energy, then we will feel tired, lethargic and possibly crave unhealthy foods. This is where people often give into binge eating and then the weight loss attempts are sabotaged.

The other way to lose weight fast is to exercise lots of calories away each day, which can lead to overtraining and overuse injuries and increased cortisol levels from the stress exercise causes in the body.





## Programming for weight loss/body composition

When planning a weight loss session, the idea is to burn as many calories as possible in the time that the client has available. The harder they work in the session, the more calorie expenditure they will achieve.

The exercises that you select should include as many large muscle groups as possible. So, think of exercises that are not complicated to perform but require them to use their arms and legs at the same time.

Here are some exercises that would be ideal to use in a weight loss program:

- Squat thruster or squat and shoulder press
- Lunge with a twist
- Lunge and punch
- Push-ups
- Pull ups or assisted pull ups
- Mountain climbers
- Burpees
- Renegade row
- Steps ups
- Step ups with shoulder press
- Squat to a jump
- Shuttle runs



As the client progresses in their strength, fitness and technique performance you can add some more complicated exercises into their programs.

Circuits are a good way to burn more calories in less time.

During a circuit program they can set the intervals at a challenging level and pick a few exercises that work the whole body evenly and then just follow the plan to burn as many calories as possible.

Here is a good example of a fat burning circuit that has a balance of upper and lower push and pull exercises for a full body workout.

The rest to work ratio is 60 seconds on 30 seconds off to allow for maximal calorie burning and not too much rest between exercises to get more work done in less time.

### Example weight loss circuit:

Warm-up						
Exercises	Reps	Sets	Load	Tempo	Rest	Notes
Light walk/jog	5 mins	1	Body weight			
Light band pull aparts	20	2	BW	2020	30 seconds	
Inch worms	6	1	BW	0	0	
Lunge walk with a twist	20 steps	2	BW	0	30 seconds	

MT circuit						
Exercises	Reps	Sets	Load	Tempo	Rest	Notes
Squat and press	60 seconds	3	6 kg medicine ball	7 RPE	30 seconds	Complete one set of each exercise per round
Power band torso twist/ woodchop	60 seconds	3	Power band	8 RPE	30 seconds	Complete 3 rounds
Star jumps	60 seconds	3	BW	7 RPE	30 seconds	
Shuttle runs between cones	60 seconds	3	20 kg BB	8 RPE	30 seconds	Rest 2 mins between rounds
Burpees	60 seconds	3	BW	8 RPE	30 seconds	
Band assisted pull ups or under bar row	60 seconds	3	Power band	8 RPE	30 seconds	

Cool-down						
Exercises	Reps	Sets	Load	Tempo	Rest	Notes
Pigeon glute stretch	1 each leg	2	BW	Hold 60 seconds each	20 seconds	
Dead bugs	10 each leg	2	BW	Slow and controlled	30 seconds	
Quad stretch	1 each leg	2	BW	Hold 30 seconds each	20 seconds	
Static chest stretch	1	2	BW	Hold 60 seconds each	20 seconds	
Cat cow stretch	10	2	BW	Slow and controlled	20 seconds	

## Skill-related component training protocols

When clients have specific skill related goals they must be programmed for specifically and include the following types of training:

- Power
- Speed
- Agility
- Coordination
- Balance
- Reaction time
- Proprioception

Skill-related training methods involves programming targeted exercises, drills and movement patterns that the athlete or person wants to improve in and then repeatedly performing them with the intent to be better, faster, higher or further than previously demonstrated.

Often the physiological adaptation for skill-related fitness components comes from nervous system improvements, certain muscle fibre types being activated and more of them activating quicker and proprioception development. Feedback between the nervous system and the muscle fibres becomes faster and more motor recruitment occurs to achieve a higher level of performance.

Basically, the more the athlete practices with the intent to be better than last time, the harder the body will strive to adapt to achieve the expectations.

### Power

Power training typically involves exercises which apply the maximum amount of force as fast as possible. Power can be defined as strength + speed = power.

Power is what helps an athlete hit, kick or throw a ball faster, run, cycle or row faster, be a powerful force in a contact sport and able to get up off the floor quickly if they are knocked down.

Power is also necessary, at lower levels, for everyday clients so that they can use their strength, quickly to walk or run faster across the road or to catch a bus, play games with the kids or socially and many other types of movements where the speed of the movement is important.

Power training needs to be developed after a strong foundation of core and general strength has been achieved. If a client has not been developing strength already and attempts power training techniques, they sustain a high risk of injury as their muscles and nervous system will not be prepared for the intensity and demands on the systems.

Athletes should also be fully recovered from previous training sessions before doing a power training session to gain the full benefit.

Power exercises can take the form of normal strength exercises, with the intent and coaching cues to move the load as fast as possible. Plyometric exercises are also considered to be power exercises.

Programming for a power training session needs to include an adequate warm up, normal programming principles like compound movements before isolated and core towards the end of the session.

Then an adequate cool down is required to bring the “fired up” body systems back to a state ready for recovery.



## Speed

Speed is the ability to move ourselves at a fast pace. Speed training is related to power training, but it is not necessarily with a heavy load.

Speed relates to how fast we can move our body weight over a distance, or how fast we can move our bodies and another object like a boat, bicycle or other object like kicking or dribbling a ball.

The stimulus for speed is simply the desire to get from one place to another, using a certain modality, as fast as possible.

Developing power in the muscle groups that cause the movement is important for speed training. For example, developing power in the legs will improve running or cycling speed and developing upper body pulling power can improve rowing speed.

Certain drills are often performed when training to improve speed such as hill sprints, interval running, shuttle runs, sled or prowler pushes and power exercises like high knees, depth jumps or medicine ball throws.

When writing a program for speed training for a client, they should have a strong foundation of general and core strength prior, and drills should be specific to what they are training for. The distances should be similar to the distances in the sport they will need to cover or shortened to develop short term speed and then extended to maintain the speed for a longer duration.

## Agility

Agility is the ability to change direction when moving quickly and efficiently. Agility is related to speed and body weight power.

Athletes will often need to change direction in response to a stimulus like other players or a ball or target of the game's location. Therefore, agility training involves a range of exercises designed to improve your ability to change directions while moving.

This fitness component is also important, in general populations, and should be maintained through the years to keep mobility high and reduce the risk of falls.

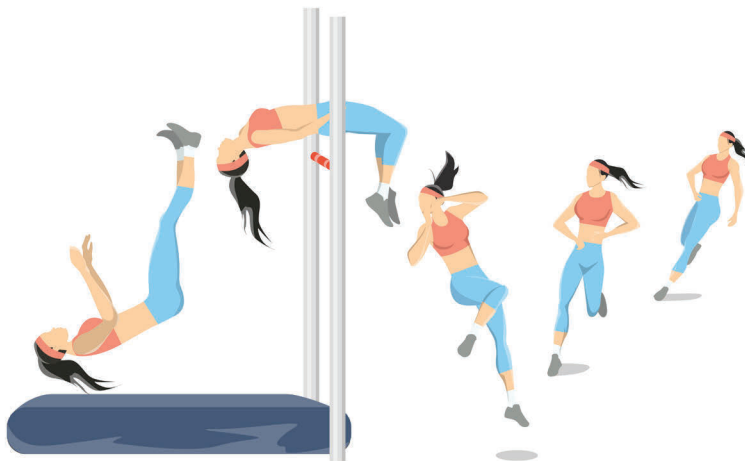
Agility improvements are primarily made when the nervous system and the muscular system coordinate well, muscle fibres fire faster and in optimal sequence and stabilising muscle endurance improves to maintain ideal posture while moving in various directions quickly.

A strong foundation of core activation and general muscle strength is required. Agility is improved by practicing various agility type movements and drills with the stimulus of completing them with more precision or faster.

### **Some examples of agility drills are:**

- The Illinois Agility Test
- Various speed ladder drills
- The 5-10-5 shuttle run
- Dot drills
- Forward-backward sprints
- Lateral jumps
- Tuck jumps and hopping drills

The more often a client/athlete practices these drills, the better the body systems will become at working together to improve the skill of agility.



## Coordination

Coordination is the ability to use different parts of the body together, smoothly and more efficiently. Improving coordination can enhance sporting ability, help prevent injuries and help people stay more effective at everyday activities as they age.

A foundation for coordination is good balance. Learning to stand safely and with good control is the start of good coordination and then learning how to move effectively from there. Another key aspect of coordination is self-awareness or proprioception. When a client is learning a sequence of movements like dancing, swimming, sports skills or a more complicated exercise they should perform it correctly with slow movements first, so that the bodies proprioceptors can memorise the sequence of muscle movements before speeding it up.

Visualising the final result is also very important so that the mind knows what it is trying to achieve. This may involve watching others that have mastered the skill or watching the movements in slow motion so that the individual sequence of movements can be broken down and mastered, before putting it all together and speeding it up for a final result.

The application of these processes of developing better coordination can be applied to any type of sequenced activity a client may want to become more coordinated in.

Engaging in the activity itself and learning good movement patterns in each aspect of the movement patterns is an ideal way to improve coordination.

Clients can use exercises like martial arts, tai chi, yoga, pilates, swimming, dancing, ball control skills and more to improve coordination.

## Balance

Balance training improvements focuses on strengthening the core muscles, lower back and legs. Lower body strength exercises in general are important when it comes to improving balance.

Balance improvements are achieved with a combination of strength and practice in unbalanced positions.

It's important that balance training is progressed to suit the client and that they are not required to go into unbalanced positions that are too advanced for them as the risk of injury increases.

Sometimes a client may have more balance on one side of their body compared to the other and then the balance exercises can be practiced more on the side that needs more improvements.

### Here are some ways to progress balance exercises:

1. Reduce the base of support – This involves moving feet closer together or removing a supportive object altogether like one leg or one hand etc.
2. Adjust the stability of the surface – this may include standing on uneven surfaces, wobble boards or a Bosu trainer.
3. Reduce the base of support and then locomote – this would suggest feet closer together and then moving like a tandem walk or a single leg stand while moving limbs.
4. Reduce or change the base of support and add other exercises – this is a more advanced technique which integrates overcoming balance challenges with coordination of other actions. For example: single leg stands with a ball catch, shoulder press while standing on a Bosu, banded leg raises on one leg and many more.
5. Perform activities with closed eyes – closing the eyes removes one of the bodies senses and makes balancing more difficult. Only progress to this option when the client has a good foundation of balance skill.

Balance ability is improved by developing a strong core, lower body and proprioception skills combined into sequences of movement. It is integral for performance of all kinds.

## Reaction Time

Reaction time training consists of exercises that train the brain and nervous system to produce the correct response when a certain stimulus is applied, as quickly as possible. It is designed to train the brain's ability to improve cognitive processing functions when a specific signal elicits a prompt response.

Reaction time is the interval between the presentation of a stimulus and the muscular response that initiates thereafter. Sometimes there is a choice of reaction required which is another aspect of reaction time training.

Reaction time development is important for athletes that need to respond to the randomness of the ball or player positions during a sporting game or to the starting gun that signals a race commencement.

### **Reaction time and speed drills that can be used to help clients improve include:**

- Drop and catch
- Get up drills
- Lying race start
- Actual race start – react to a gun or other stimulus
- Reaction or reflex ball catches

Reaction time improvements are made by simulating the reaction that needs to occur and practicing responding effectively and quickly. The stimulus is the desire to make the best decision as fast as possible and can only be achieved by repeating the process and building effective mind and muscle reaction.

## Proprioception

Proprioception is the body's ability to sense where it is in space and adapt to sudden changes in the environment, such as those relating to force, tension and body position.

A certain amount of proprioception is essential for everyday activities and the more a client practices an action, the better they will get at being able to do it without needing to think carefully about it or watch it or themselves.

Have you ever moved into a new house and for the first few weeks, finding the light switch in the dark is challenging. Then after a few weeks your proprioceptors start to adjust your muscle movements so that when it's dark, you can put your hand straight on the light switch and even know how many steps it is to the door without being able to see the distance.

This is our proprioceptors adapting to an environment.

Proprioception is also crucial in all sports and fitness activities. It allows an athlete to dribble a soccer ball and run without looking down or thinking through each step. It also allows a volleyball player to know where the ball is in the air to spike it or a basketball player to dribble and throw the ball the correct distance to another player or through the hoop with accuracy.

Improving proprioception is important to reduce the risk of injury and falls while also beneficial for athletic performance.

### **Here are some exercises that can be used to improve proprioception:**

- One-leg balance test
- Three-way kick on one leg
- One leg pick ups
- Reverse lunges (try touching your back toe on a box or the same spot on the ground each time)
- In and out of tree pose or other balancing yoga poses
- Tandem or tight rope walking
- Sumo squats to one leg stand
- Step up to one leg stand
- Touching your nose with alternate fingers with your eyes closed

Incorporating Yoga and Tai Chi types of exercise sessions into a client's exercise program will help to develop control, stability and improve proprioception.



## **Instructional Techniques**

When instructing a client, they need to hear and see clear information about the exercises and exactly how you want them to perform each exercise so that it is safe and effective for them.

One of the best ways for you to learn how to coach clients effectively is to watch experienced trainers coaching their clients or explaining correct exercise technique in instructional videos.

You have already had practice instructing clients in the correct technique for some of the basic exercise types. Please view the Master Coaching Workshop which has 26 video demonstrations you can learn from and use to coach clients in various exercises if you have not already.

Please also view the Exercise Demonstration Video Library in the practical section of study block 2 for additional resources displaying ideal exercise instruction.

There are also exercise session coaching demonstration videos in this study block and study block 4.

More exercise demonstrations can be found at the NASM YouTube channel: <https://www.youtube.com/c/NasmOrgPersonalTrainer> #WorkoutWednesday - YouTube

### **When instructing a client to execute an exercise correctly the following steps can be taken:**

1. Explain the reason for the exercise and how it will benefit the client and help them reach their goals.
2. Explain the exercise, correct technique points and any safety notes they should remember.
3. Demonstrate the correct exercise technique while explaining the most important technique points again.
4. Have the client attempt to perform the exercise in the same way that you demonstrated.
5. Cue their body into position so that they complete the exercise correctly.
6. Once they can perform the movement effectively with body weight, add load to increase the challenge. (Often body weight load will be enough the first few times the client attempts the exercise)
7. If the client cannot achieve the exercise with correct technique, regress the exercise until they can achieve it or stop the exercise altogether and choose another exercise that works the same muscle group that is safer and more effective.

For example:

You may have selected a lunge for a client to work their lower body. If the client cannot achieve the lunge correctly and/or mentions that their knees are hurting, regress the exercise to a supported lunge or a single leg press which will achieve the training goal of strengthening the legs, unilaterally, while removing the complication of the lunge technique until they are stronger or have mastered the technique.

## **Client learning styles**

People have different learning styles which means that they learn new things, most effectively, in different ways.

### **Verbal**

Some clients may respond particularly well to the exercise and correct technique being explained verbally and be able to grasp the concept from listening to your words. For clients like this it is very important that the words that you use are not overly complicated and directly tell the client what to do, in clear, understandable terms.

Example: You need to keep your knee in alignment with your toes during this lunge.

### **Visual**

Some clients will respond well to watching you show them the technique points or demonstrating what you want them to do. They learn best by seeing what needs to be done and copying.

Example: (while demonstrating and pointing to your knee: "Can you see how my knee is staying in alignment with my toes as I lunge?")

## Tactile/kinaesthetic

Tactile or kinaesthetic learners like to physically try or feel something to learn effectively. These clients may not listen or pay much attention when you are explaining the exercise or technique, but they want to get started on the movement and will respond well to cues and possibly physical touch to guide them into the right positions.

Be sure to ask for the client's permission if you need to touch their body to encourage the right technique or move a body part into the right place and always touch clients in an appropriate manner.

Example: "I am going to put my hand here and I need you to keep your knee behind or from touching my hand each time you lunge"

Most clients will respond well to a combination of explanations, demonstrations and cues when perfecting their technique and as you train them more often, you may notice some of them responding better to certain types of learning/communication styles than others.



## Motivation

Being motivated is what causes a client to act in all areas of their lives, but particularly when developing fitness components. Biological, social, emotional or cognitive factors may have shaped their personal motivational qualities.

If they are generally a motivated person, they may be moved intrinsically (or personally) to do something about their fitness and will be energised or activated from within to do what it takes to achieve their goals.

On the other hand, if they are generally not very motivated, they may feel less inspired to act personally and need more external factors to keep them motivated.

It should be recognised that motivation levels in individuals not only vary on different amounts (i.e., how much motivation), but also different kinds of motivation. Orientation of motivation concerns the underlying attitudes and goals that give rise to action. Hence, "why" they want to achieve the goal that the action will lead to must be important to them.

## Intrinsic motivation

This refers to doing something because it is inherently or personally interesting or enjoyable for them, for example, a student can be highly motivated to do homework out of curiosity and interest (intrinsically motivated).

If clients enjoy exercise for the challenge, personal skills they are developing, because they know it's healthy or the feelings of virtue they experience after a session, knowing that they did something positive to improve your body, then generally this is considered to be intrinsic motivation.

## Extrinsic motivation

This refers to doing something because it leads to a separable outcome, for example, a student can be highly motivated to do homework because he or she wants to procure the approval of a teacher or parent or achieve a high grade. (Extrinsically motivated).

It's important to recognise the motivation type that will work for your client, so that you can set them up for success to adhere to their program and achieve the goals.

**To illustrate:** An athlete's goals need to be largely self-governed (intrinsic motivation) otherwise the motivation to take the steps to achieve those goals may be lacking. For example, an athlete may want to do well at a particular race because friends and family will be watching.

This is unlikely to be a sustainable source of motivation as it comes from outside the athlete and when the going gets tough the athlete may decide that they don't care what anyone else thinks and give up on their goal.

Clients can also be like this – perhaps they initially want to lose weight because friends or a partner want them to change, (extrinsic motivation), but ultimately doing what it takes to get there may not be worth it to them if it's not for their personal gain.

Fitness representative can do a lot to help a client develop intrinsic motivation and want to lose weight for themselves, their health, feelings of energy and focus and to feel more self-confident with their body shape. This would likely be more sustainable and lead to more consistent adherence to their program to achieve the goals.

Help your clients realise how good exercise is for them by speaking of the benefits often, being excited about exercising yourself from your intrinsically motivated perspective and take a personal interest in the good feelings they are experiencing from exercising. This can help them develop their own intrinsic motivational factors that may lead to them being active for life.

Most clients don't have the intrinsic desire to exercise consistently when they first start, that is normal and here are some effective ways to incorporate extrinsic motivators to keep them adhering to their program plan.

## Choose activities that they enjoy

If they dislike running, there is a good chance they will not keep up with running 3 times a week on their program plan. Ask them what they would like to do and try programming swimming sessions, group fitness, boxing or dance class to get those calories burnt!

## Plan to train at a convenient time

Do they find it impossible to get up in the morning to exercise? Then plan their training sessions after work or the opposite may be the case and they may need to get exercise done in the morning so that they can rest after work due to being mentally and physically exhausted. Find a time of the day that they can commit to that suits their lifestyle and body clock.

## Prepare to succeed

Recommend clients prepare clothes the night before so that there are no barriers in their mind to get up and go for their session or make sure they pack their gym bag and clothes to take to work the night before so that being prepared for their session is easy.

## Invite a friend to train with them or hire a PT

Social support is very important so inviting a friend to train with them or having an appointment to meet can keep clients accountable. Cancelling a class booking, PT session or trip to the gym with a friend can be harder than cancelling on themselves.

## Inspire others

Recommend clients post their goals and progress notes on social media or tell a friend or family member about their fitness goals. Accountability is stronger if others know what they are trying to achieve, and they may even inspire someone else to set their own goals and get fitter.

## Track progress

Tracking results can be very satisfying and help build their confidence and consistency. They can mark off their sessions on the program plan or keep a weightlifting journal and record the loads and sets and reps they achieve. Keeping records can remind clients of how far they have come and if they are not achieving the progress they would like, they can look back and see where adjustments may need to be made to achieve their goals.

## Plan rewards for milestones

Plan rewards for when they hit a milestone like a massage, sauna and float, facial or treating themselves to a new dress or activewear. Select rewards that are healthy that will encourage them to achieve the next milestone and feel rewarded for their hard work.

## Positive reinforcement

Commendation is very powerful when it comes to developing new, healthy habits and reinforcing fresh thinking patterns that are positively inclined towards the benefits and merit of exercising regularly. With your regular positive affirmations, they may start to value exercise as a personal belief which can lead to building intrinsic motivation to remain active long-term.

Praise the client as much as possible when they achieve small or large milestones or make effort to achieve their goals. You may be the only person cheering them on with these goals and so every piece of encouragement you can give them will help them stay on track to achieving their goals.

### When to use positive reinforcement to confirm an encourage:

- When the client improves in the technique of an exercise – this doesn't need to be when they get the technique perfect – commend every small improvement so that they know they are on the right track to getting it right.
- When the client shows up for their sessions – you may not realise the effort they had to make physically and mentally to show up to a session so praise them for every effort.
- When they hit a milestone – commend, celebrate and encourage small milestones or goals they hit on their fitness journey.
- When they consciously make a better choice with their diet or incidental activity that shows they are trying to change their habits – get excited when they even think about having fruit instead of chocolate because thinking about changing is progress.
- When they didn't give up – commend them for the extra reps or any time they wanted to give up and didn't.
- When they progress in load, exercise type or duration of session etc.
- When they tell you about someone else being inspired by their efforts – inspiring others is such an achievement, and you may even get referral clients from the people your client can inspire to get healthier and fitter.
- Any time they take a step closer to their goals.

Positive reinforcement can be provided through various types of communication mediums. Send them a text, get excited with them during their session, give them a call or email telling them how pleased you are with their progress and so on. Whatever seems the most appropriate at the time is ideal and writing it in a text or email can last longer than a verbal commendation, so they can refer back to it for inspiration in the future.

You could send them a text after their session like: "Hi Julie,

The effort you put into your session today was awesome! I was so impressed with how many pushups on your toes you did and the range of motion you have in your hamstring stretch is so much better than it was a few months ago. All the hard work is paying off...keep it up! See you next week!"

It's often the small touches like this that have the greatest impact on a client's motivation level and progress.



## **Providing feedback**

Providing feedback plays a large role in a fitness representatives position and can be responded to in various ways by the client. If too much praise is given the client may not feel like it is genuine and too little praise may lead to them feeling discouraged.

There needs to be a balance of feedback, that both commends and encourages the clients in areas they are doing well and guides them to adjust or change certain things to achieve an outcome.

There are times that we need to give the client critical feedback that is not of a positive nature and the way we present the information can affect the way the client responds to it.

Try using a "feedback sandwich" in which you frame the constructive/negative feedback in between two pieces of commendation or positive feedback.

It is also essential to focus less on what the client is doing wrong and highlight how or what they can change to do it right or better/more safely etc.



Situation	Example of how to deliver	Desired outcome
<b>When a client's technique is not ideal</b>	Nice work on the depth of that lunge! This time try to keep you knee more aligned with your toes and it will be perfect!	Improve the client's technique and reduce the risk of injury.
<b>When a client's technique is unsafe</b>	That was a great effort with that lunge movement, well done! We are going to change the exercise now so that it's safer and more effective to target your goals. Let's go to the leg press.	Change the exercise that was programmed to avoid injury when they can't achieve the technique.
<b>When a client has not progressed enough to achieve a certain type of exercise</b>	You have done so well on those knee push ups, but I want you to stay at this level until you can do 10 perfect ones before we move on to the toe push ups. We can increase the weight on your bench press in the meantime to get you stronger.	Avoid deflating their enthusiasm and teach them about progression rates.
<b>When a client is not putting in enough effort</b>	I'm impressed by your consistency attending each session, I think we can increase the intensity a little more now so that your sessions are more of a 7/10. What do you say? Can you give me more effort?	Motivate them to work harder in their sessions.
<b>When a client's habits are a barrier to their goals</b>	Your assessment results show that you are stronger in all of your lifts Julie, but your body fat is the same and I reckon it's all those snacks you are having before bed that are hindering your progress.  Do you have some ideas on how you can change that habit so that you can fit into your dress for your daughter's wedding? Let's come up with a strategy together.	Help them feel motivated to adjust habits that are hijacking their results.
<b>Client missing sessions</b>	I know how much your goals mean to you, and missing sessions in your program plan is going to impact that greatly. We made that plan together, has something changed so that you can't adhere to the schedule? What can you shift around or arrange in your life so that you can prioritise your health and fitness? Let's work this out together so that it's achievable for you.	Reduce missed session rate and motivate them to prioritise fitness training and their health.
<b>When a client's goals are unrealistic</b>	I am so impressed with your enthusiasm to change your health and fitness. From my professional experience I believe that this goal would be more achievable if you allowed extra time to achieve it, based on the information you have provided. If you were to hit this goal in this current timeframe, you would need to train (XX) times per week and change (XXX) in your life. I want you to achieve this in a way that is enjoyable and realistic. How about this timeframe? (Then negotiate the variables and what they are willing to commit to etc)	More closely align the clients' expectations with realistic results.



## **Clients managing their own sessions**

As a gym instructor you will often provide program and session plans for members to follow when they come into the gym on their own. It can be more challenging to monitor their progress and technique as you will not be there every time they perform their sessions.

Clients can lose interest and not achieve the results they want if they don't continue to challenge their body systems with harder session intensities.

Therefore, there are some important points that need to be conveyed to the members to ensure they can progress the session themselves or know when to come to you for a program update.

## **Program show throughs**

Once you have written a clients program plan and session plan, you will need to show them through the plans to confirm that they can perform the technique of each exercise, know how to increase the load when necessary and are confident on their own when they come in for their sessions.

You will need to take the client through one to two sets of each exercise and make notes on their program, specific for them and their needs.

They need to have clear instructions and communication about their programs and have anything adjusted that is not ideal for them to manage themselves.

1. Show them each exercise and ensure they are clear on how to perform them with good technique. For example, if you program squats for them, but they struggle to keep their knees apart with body weight, you may need to change the exercise to a leg press or box squats.
2. Add important cues and comments to their program so that they remember the technique points that are most important for them and their movement patterns.
3. Ensure they know how to increase the intensity or load themselves and when, to progress over time.
4. Ensure they are happy with the program plan, and it is realistic for them to adhere to.
5. Modify the program with agreed upon adjustments before finalising.
6. Ensure they know when to return for a progression evaluation based on their preferences and desired time to achieve their goals.

## **Progression**

Clients are ready to progress in their session intensity, volume or load when:

- They can complete 10-15 reps of the exercise with ease or a rating below 4/10 RPE.
- They can complete 15 reps of a weighted exercise and keep going (unless endurance is the goal)
- They can complete an exercise session and rate the overall session below 4/10 RPE.
- They are not sweating and can talk easily during the session (again depending on the goal of the exercise or session – use discernment)
- They don't have to concentrate on pushing the weight or performing the exercise correctly any more
- They are bored and want new exercises for a challenge
- They look disengaged and it's not challenging for them anymore

Explain to the members, when you are showing them through their session and program plans, the principles of reversibility and progression and how to identify themselves, that they need to increase the intensity to continue to make progress toward their goals.

You can also notice these things when working the floor and ask the members if they would like a program update or some tips on how to increase the intensity of the session. This can open the conversation for a PT session or a program update booking – which may or may not cost them extra – but is essential if they are to continue to make progress.

Ways to approach this may be to notice members that look like they are not being challenged anymore and approaching them on the gym floor to book a program evaluation session in or noting their name and emailing or messaging them formally with the offer to update their program.

The cost involved will need to be communicated with the features and benefits of the service to their health and progress highlighted.

Program evaluations and updates may be formally offered, on a regular basis to the members, at an additional cost or included in their membership as a way to promote longevity of membership retention and a results-based service.

## **Technique correction**

Member technique correction can be a touchy subject, because some members think they know it all when it comes to their training protocol and interrupting them on the gym floor, mid-session, may not be the best option.

On the other hand, many members will appreciate your help and some pointers on how an exercise can be performed so that they are safer, and it is more effective.

A good rule of thumb is that if the exercise technique could harm the member, or someone else, you should approach them mid-session, if not, then discern the situation and decide whether you can directly intervene or approach it indirectly.

Also, avoid focusing on what they are doing wrong and highlight the opportunity for them to learn a new exercise or a better approach to protect their joints and be more effective in the movement so they can achieve their goals. Highlighting how they can benefit from accepting your advice will hopefully make them more receptive to correction.

An effective intervention can often lead to a booked personal training or coaching session to help them with their technique or goals.



## Here are some ways to approach technique correction in the gym:

Situation	Suggestions on what to do/say	Good outcome	Bad outcome
<b>Member is squatting with weights too heavy – technique is not good.</b>	<p>This is an unsafe situation so it's important to approach the member directly.</p> <p>You could say something like “ You are lifting some heavy loads there – great progression! Are your knees/lower back etc feeling ok during each rep? I can help you with some technique pointers to reduce the impact on your joints if you are open to it? (Wait for response and gauge whether you can give some pointers to improve technique or if they are not open to your suggestions, speak with your manager as the move may be unsafe enough for higher intervention.)</p>	The member welcomes your advice and books a technique session for some of their other lifts as they have had a number of joint issues since increasing their weights recently.	<p>They don't want your help and continue to put their body at risk of injury – also providing a bad example to other members who may be watching their incorrect technique.</p>
<b>Member is using a piece of equipment incorrectly</b>	<p>“Hello, I am not sure if you know this but there is a different way that we recommend this piece of equipment is used. Would it be ok if I showed you?</p> <p>I think you will benefit more from the exercise if you use it this way.”</p>	They are happy for you to show them the correct way to use the equipment.	They don't want your advice, and you need to ask the manager to intervene as their strategy may be unsafe and other members may be learning bad habits from this member.
<b>Member is doing an abdominal crunch ineffectively</b>	<p>“Hello, I was wondering where you could feel that exercise that you are doing there? Is it in your abs or your neck or in your back?” (Wait for response, then ask if you can show them a more effective way to perform it or a better abs exercise altogether (like a dead bug or a plank) to work their abs.)</p>	They are keen to hear your advice.	They don't want your advice and keep doing it wrong.
<b>Client is walking on the treadmill, looking bored.</b>	<p>Hello, great to see you in the gym this evening. Which goal are you aiming for on the treadmill here and how is your progress going?” (Engage them in a conversation about their goals and bring the topic around to the current level of their intensity and what intensity they need to work at to achieve their goal.</p> <p>Explain how they can rate their own intensity using RPE or book a session for additional motivation to work harder)</p>	They want to achieve their goals and you can show them how to put the incline up or do some intervals to increase the intensity and reduce their boredom.	They are happy walking and don't want any more progression.

Situation	Suggestions on what to do/say	Good outcome	Bad outcome
<b>Member is on a weight machine doing 20+ easy reps</b>	"Hello, that weight/load looks like a piece of cake for you. Would it be ok if I show you how to increase the weight so that you can improve your muscle strength?"	They are keen to hear your advice on how to increase the weight now or in the future when it gets too easy for them again.	They don't want to get stronger and reject your advice.
<b>Member is doing jerky or ballistic stretching movements</b>	"Hello, looks like you want to improve your flexibility? That's awesome. Did you know that those ballistic stretches can damage your muscles more than benefit them? Can I show you some really effective stretching techniques that have helped me improve my flexibility?"	They are excited to learn some new stretches and techniques from you.	They want to keep stretching like this – perhaps management may need to explain the risks of ballistic stretching to them or send them an article via email on how to stretch safely.

## Client program evaluations

Great customer service in a fitness facility includes ongoing service to the client. Program evaluations and adjustments should be offered at regular intervals, formally and informally to ensure clients know how to access this service and how often this is needed.

If a client is performing their program 2 times per week, they should need a program update every 6-8 weeks to increase their loads and reduce boredom of doing the same exercises every time.

The organisation that you are a part of may have a certain systematic approach to program evaluations for the members, which you should follow.

Programs should be modified with updates to the frequency, intensity, time and type of sessions and exercises that are included to maintain a variety of activities and progressive overload.

New exercises still need to be achievable for the client so performing their fitness tests again is an excellent way to quantify their progress and effectively write them new programs based on their updated fitness test outcomes.

Performing fitness testing on a regular basis can, not only motivate clients to focus on and achieve these goals but show them the benefits of being consistent and adhering to their training schedule.

Client records should be updated thoroughly with the new programs, fitness testing results and any additional details that are of significance for their health, goals achievement and overall wellness.



# ANATOMY AND PHYSIOLOGY

Anatomy is the study of the structures in the body. Essentially, it is learning the scientific names for the actual organs, bones, tissues, muscles and so on, in the body.

Physiology is the study of the functions of living organisms. It includes how body systems work independently and together to achieve certain outcomes and maintain homeostasis.

So, anatomy is “what is there and what is its name” and physiology is “how does it work.”

Homeostasis in the body is the process of the body systems maintaining a stable environment despite changing internal and external conditions.

Our bodies work hard to maintain a certain set of standards that are considered to be optimal conditions for us to look and feel well and perform efficiently.

Many external factors challenge our bodies each day and it is always looking for ways to adapt and become more efficient to maintain a healthy, optimal environment to support longevity.

For more detail on homeostasis: <https://www.khanacademy.org/science/biology/principles-of-physiology/body-structure-and-homeostasis/a/homeostasis>

## **Anatomy and Physiology Knowledge Benefits**

The specialised role and service to clients that a fitness instructor provides is to select correct exercises that will ensure they achieve their goals and desired fitness outcomes.

There are a lot of factors involved in programming exercises in the right order and correct intensity, but the first place to start is to learn about the human body and how various exercise types and intensities impact on anatomical structures and physiological functions during and after exercise.

When a fitness instructor has a strong foundation of knowledge about human anatomy and physiology, they understand how exercise will impact each client individually. This will allow them to select the most appropriate types of exercises to avoid injuries and help the client reach their goals.

### **Benefits of having anatomy and physiology knowledge**

- Understand what's happening in the body when a client exercises
- Know which muscles a certain exercise is activating or working
- Understand why selecting a certain exercise is the most appropriate for a client's specific needs
- Recognise signs and symptoms of adverse reactions to exercise types
- Be able to communicate professionally with other health professionals

Many clients will not understand anatomical and physiological terminology, so when we train them, we may still need to communicate in client level language, so that they know what we are talking about. However, clients will highly regard a fitness instructor that knows the “fancy” (scientific) language when it comes to the body and how it works and may even enjoy learning some of this scientific language from you during their sessions.

It will also be essential when communicating with allied health professionals about a client treatment plan, sending referrals or reading a report about a health condition that you need to consider when training them.

Types of activities where you will use anatomy and physiology concepts and terminology during your career as a Fitness Instructor include:



## **Interpreting client information and related terminology**

Client information can come to you from many sources, and you will need to be able to interpret what it means and apply it to their fitness programming. For example, if a client has a sore knee, their GP may send them for a scan to find out what is causing the pain.

When the client presents the report to you, it will likely be written in medical terminology, and you will need to understand how to interpret this accurately and modify their exercises accordingly. Often a physiotherapist will then identify the best types of exercises for the client, and it will be your responsibility to help the client perform them correctly. Having an accurate understanding of the anatomical parts that are affected is essential so that you know how to help the client recover or reduce the pain.

### **Read this report for an example of the types of client details you may need to interpret:**

Ultrasound report: "There is mild patella tendinopathy and moderate quadricep insertional tendinopathy. Some fluid in the bursa, deep to the patella tendon is noted. The examination shows features of deep infrapatellar bursitis and bulging menisci as the primary cause of pain."

Physiotherapist recommendation – "Include exercises that strengthen the hamstrings, quadriceps and gluteal group, with minimal knee flexion. Avoid knee flexion beyond 45 degrees until pain reduces.

Movements to include are knee extension and flexion within 45 degree – body weight load only.

Hip flexion, extension, adduction and abduction and internal and external rotation strengthening. Isometric contractions are highly recommended for the first 4 weeks of the client's treatment plan."

After interpreting this information, you would be expected to write the client a program to strengthen their lower body and help reduce the knee pain being experienced. You can see why understanding the terminology and anatomy is essential to being able to write programs and train the client effectively.

## **Developing programs and sessions that are suitable to achieve various goals**

Clients will come to you with many different goals related to fitness component adaptation. It is essential that you have a thorough understanding of the body systems, their roles in the body and how they work together so that you know what is required physiologically and anatomically for a client to achieve a certain type of adaptation.

Whether they want endurance strength in a certain movement sequence or muscle group, hypertrophy or growth of muscle size or improvements in cardiovascular fitness, your understanding of what is happening in the body when a client exercises in a certain way is paramount to writing and coaching effective exercise programs for each individual's needs and goals.

## **When providing instruction about exercise technique**

One of the main roles that a fitness instructor must fulfil is to guide people to perform correct exercise technique. Various types and variations of exercises are chosen and performed to activate and strengthen certain muscles and it's a personal trainer's job to know what these are and which exercises to choose that suits a client best.

For example – a push up can be performed in a few ways and for different outcomes based on how you coach the technique and who the exercise is for.



Can you see in the table below that as you adjust certain anatomical positions or aspects of the exercise it makes it more suitable to various types of clients and client goals?

Task	Objective	What	Who
<b>Incorrectly executed</b>	<ul style="list-style-type: none"> <li>Core not engaged</li> <li>Elbows flared</li> <li>Hands too wide</li> <li>Shoulder blades collapsing</li> </ul>	<ul style="list-style-type: none"> <li>None effectively</li> <li>Muscle imbalances and poor posture promoted</li> </ul>	<ul style="list-style-type: none"> <li>Unsafe</li> <li>Likely injury</li> <li>Will not achieve the adaptation goal</li> </ul>
<b>Traditional regressed</b>	<ul style="list-style-type: none"> <li>Perform traditional on knees (reduce the lever length)</li> <li>Hands a safe distance apart</li> <li>Core engaged and neutral spine maintained</li> </ul>	<ul style="list-style-type: none"> <li>Agonist – Pectoral group</li> <li>Synergist – Triceps and core/abs muscles</li> </ul>	<ul style="list-style-type: none"> <li>Safe for low level strength/beginners</li> <li>Can be performed correctly by beginners for confidence</li> <li>Correct muscles activated</li> <li>Upper body strength improvements</li> </ul>
<b>Traditional</b>	<ul style="list-style-type: none"> <li>Hands a safe distance apart</li> <li>Core engaged and neutral spine maintained</li> <li>Shoulder blades stabilised throughout</li> <li>Lower to a safe depth/range</li> </ul>	<ul style="list-style-type: none"> <li>Agonist – Pectoral group</li> <li>Synergist – Triceps and core/abs muscles</li> </ul>	<ul style="list-style-type: none"> <li>Safe for intermediate clients with effective core control</li> <li>Builds confidence in bodyweight strength ability</li> <li>Functional strength improvements</li> </ul>
<b>Triceps push up</b>	<ul style="list-style-type: none"> <li>Hands close to the body</li> <li>Core engaged and neutral spine maintained</li> <li>Shoulder blades stabilised throughout</li> <li>Possible to increase range/depth safely</li> </ul>	<ul style="list-style-type: none"> <li>Agonist – Triceps</li> <li>Synergist – Pectoral group and core/abs muscles</li> </ul>	<ul style="list-style-type: none"> <li>Safe for intermediate to advanced clients</li> <li>Functional strength improvement</li> <li>Specific triceps strength increase</li> <li>Ideal loaded shoulder position</li> </ul>

Your expert knowledge about exercise technique, how to match certain exercises correctly for particular outcomes and when to adjust the way an exercise is performed so that it is safe and effective, is one of the primary reasons people seek out a fitness instructor to help them achieve their goals.

## Explaining the purpose of exercises and answering client questions

Clients are usually quite motivated when you can explain to them why they are doing a certain exercise. It's their body after all and most clients thrive on learning which exercises are best for their body, to achieve their goals and why.

When you can demonstrate to a client that you have effective anatomy and physiology knowledge, this will build their confidence in your ability to select the right exercises, at the right intensity for them to achieve their goals.

Also, them achieving their goals, due to your knowledgeable programming and coaching skills will have them raving about how great of a trainer you are to their friends and family, leading to referred clients and improved client retention.

## Using terminology that clients understand

When training your clients, it's important that you use terms and communicate exercise concepts that they can understand. You will learn the scientific terms for many anatomical and physiological concepts in the body but speaking to clients in a way that they understand is essential so that they don't feel condescended and actually understand what you are referring to.

If you explain a movement pattern to a client, and they give you indications that they are not sure what you mean, then you may need to simplify the terminology.

You can ask them if they like you using the correct terminology, or if they would prefer that you use "layman" terms when speaking to them. This way they have the choice and also know that you have knowledge of the scientific terms if they would like to draw on it.

Be sure to help clients feel comfortable and confident by using terminology they understand and can relate to. You can also use visual aids to help clients understand terminology by pointing to the muscles or demonstrating the movement pattern that you are speaking about. Visual instruction is very effective when training clients and they respond well to being shown the movement, as you explain how to perform it to reinforce the correct technique and what it looks like.

Some examples of terminology that clients may not understand and alternative terms you can use that they may understand more easily could be:

Scientific terminology	Common terminology
Can you please raise your arm laterally?	Lift your arm straight out to the side
You should feel this in your quadriceps	Can you feel the front of your leg working?
Engage your transverse abdominis.	Hold your abs/tummy in tight
Pull your scapula back	Keep your shoulders blades close to each other
Extend your pelvis using your gluteal muscles	Lift your hips and activate your butt cheeks equally
Rotate your torso using your oblique muscles	Use the muscle on each side to twist your trunk
Rise into plantarflexion	Push up onto your toes so that you feel your calf muscles activate
Move your knee into flexion	Bend your knee
Your ATP-PC energy system has become more efficient	You are coping better with the session intensity
Thermoregulation and hydration levels will impair your body system functions during the race.	It's going to be hot weather, so you need to wear light clothing and drink plenty of water.

## **Credible Sources of Information**

Throughout your career as a fitness instructor, you will need to maintain, update and surely expand your knowledge of anatomy and physiology concepts.

It will be very beneficial for you to understand where to go to continue to learn and research these concepts as you progress in your experience and career.

Credible sources of information will constantly be updated because science is always making new discoveries about the human body and how it works. There is actually much that we don't know yet about how the body works!

Let's be realistic, there is so much to learn about the human body that you will likely not remember everything you learn during this course. You will need to continue to refer back to credible online resources to remind you of the concepts and to continue on your learning journey once you have started practicing as a trainer.

We will suggest a few credible sources of information that you can use for your assessments in this module and to refer back to in the future as you progress in your knowledge and career.

Be sure to gain your information from websites that are backed by scientific evidence or peer review articles and research reports or studies.

When deciding whether to trust a source you can apply the CRAAP test to it.

The University of South Australia states: 'The CRAAP test assesses the currency, relevance, authority, accuracy and purpose of a source...and should be applied to every source before we decide to [trust] it.'

This means that we should ask whether the source is current information, is relevant to the subject you are researching, is a trusted authority (is produced by universities and/or subject experts) is accurate and purposeful.

Accuracy can be checked by cross referencing with a number of similar credible sources to ensure the information on a certain subject is agreed upon by most subject matter experts.

We will provide links to resources in Get Body Smart, Khan Academy and Ken Hub for you to use as references throughout your course and some of them will help you with your assessment answers.

You will notice that there are many other resources in the areas that the links take you to. It is recommended that you research each topic as much as possible so that you fully understand the anatomy and physiology of each area. You do not need to just watch or read the articles that we recommend, they are provided as a minimum for what you need to complete your assessments effectively.

You can use other credible sources that you find on topics to back up your assessment answers wherever necessary.

You are required to demonstrate that you can identify credible sources of information about anatomy and physiology for this unit and interpret its relevance to fitness instruction.

You will be able to display these skills by sourcing many of your answers for the assessment's questions from the following and other online sources and providing references to the sources that you use.

### **Get Body Smart**

<https://www.getbodysmart.com/>

This website is an excellent resource that provides detailed information about the various body systems, anatomy and physiology of each system, as well as quizzes that you can do to help learn and remember the content.

You can also use the search icon in the top right of the home page to find certain topics.

## Khan Academy

<https://www.khanacademy.org/login>

You will need to create an account to use Khan Academy, there is no cost involved.

Once you have created an account, select the courses that are biology related for human anatomy and physiology information. You can select as many as you like and can change your selections at any time.

Khan Academy will then recommend “courses” that you can do to gain knowledge. Some of the courses may not be relevant or interest you but it’s better to have more options than not enough.

The “Middle and High School Biology” courses are the ones that are the most relevant to this unit.

You can also use the search bar in the top left side of the home page to search for terms of interest.

We will provide links to resources in Khan Academy for you to use as a reference throughout your course and some of them will help you with your assessments.

## Kenhub

<https://www.kenhub.com/en/register>

You will need to register an account with Kenhub to access the information. There is no cost involved.

A premium membership will allow you to use the videos and interactives quizzes to learn more extensively, but it is not necessary to have this level of membership for this unit.

The search bar is in the centre of the dashboard area, use this to search for key terms to research.

We will provide links to resources in Kenhub for you to use as a reference throughout your course and some of them will help you with your assessments.

## Additional resources available

There is wide variety of additional sources of information that you can access here also but you are not limited to these resources only.

<https://www.getbodysmart.com/a-p-resources>

## Referencing

When resources are used to gain knowledge or to answer assessment questions you are required to provide the source of the information as a reference at the end of your answer. We must respectfully acknowledge where the information we have presented and learnt from was gained to avoid plagiarism.

You can do this by copying and pasting the URL of the credible source and indicating which page (if possible) the information is taken from. Be sure that sources of information are peer reviewed articles and published by a subject matter expert or are well researched and referenced.

When referencing a scholarly article or report from a study it is important to include the URL, the name of the article and the cite reference.

### For example:

**Article name:** Practicing Sport in Cold Environments: Practical Recommendations to Improve Sport Performance and Reduce Negative Health Outcomes

**URL:** <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8471173/>

**Cite:** Gatterer, H., Dünwald, T., Turner, R., Csapo, R., Schobersberger, W., Burtscher, M., Faulhaber, M., & Kennedy, M. D. (2021). Practicing Sport in Cold Environments: Practical Recommendations to Improve Sport Performance and Reduce Negative Health Outcomes. International journal of environmental research and public health, 18(18), 9700. <https://doi.org/10.3390/ijerph18189700>

All of the articles and sites that we provide links for throughout this learner guide are not affiliated with our training organisation and are also compiled in the “reference” heading at the end of the guide.

## **Structural Organisation of the Body**

There are six levels of structural organisation in the body starting at the chemical makeup of a cell and working up in layers to the organism or the human body as a whole.

For more details about the structural organisation of the body:

<https://www.khanacademy.org/science/ms-biology/x0c5bb03129646fd6:cells-and-organisms/x0c5bb03129646fd6:organization-in-the-human-body/v/ms-organization-in-the-human-body?modal=1>

### **Level 1 – Chemical makeup of a cell**

### **Level 2 – Cells and organelles**

<https://www.khanacademy.org/science/ms-biology/x0c5bb03129646fd6:cells-and-organisms>

<https://www.kenhub.com/en/library/anatomy/types-of-cells-in-the-human-body>

<https://www.kenhub.com/en/library/anatomy/introduction-to-histology>

### **Level 3 – Tissues**

<https://www.kenhub.com/en/library/anatomy/introduction-to-tissues-epithelial-connective-muscle-and-nervous-tissue>

### **Level 4 – Organs**

<https://www.kenhub.com/en/library/anatomy/review-of-all-the-human-body-organs>

### **Level 5 – Organ systems**

<https://www.khanacademy.org/science/biology/principles-of-physiology/body-structure-and-homeostasis/a/tissuesorgans-organ-systems>

<https://www.kenhub.com/en/library/anatomy/introduction-to-histology>

### **Level 6 – Organism or the body as a whole**



## **Body Systems**

Organs are grouped into organ systems.

The body is made up of 11 organ systems that work together to achieve many functions.

The body systems are:

- Cardiovascular/Circulatory
- Lymphatic
- Digestive
- Endocrine
- Integumentary
- Muscular
- Nervous
- Reproductive
- Respiratory
- Skeletal
- Urinary or renal

<https://www.khanacademy.org/science/biology/principles-of-physiology/body-structure-and-homeostasis/a/tissuesorgans-organ-systems>

**Each system is explained in detail here:**

<https://www.kenhub.com/en/library/anatomy/introduction-to-histology>

### **Cardiovascular/Circulatory System**

#### **Structure and Function**

The cardiovascular (CV) system is made up of the heart, the arteries and blood vessels and the blood itself.

Its main function is to carry oxygen, nutrients and other substances to the cells and then take wastes, carbon dioxide and other substances away from the cells. It also plays a role in stabilizing body temperature and pH levels.

<https://www.getbodysmart.com/circulatory-system>

<https://www.kenhub.com/en/library/anatomy/introduction-to-histology>

<https://www.khanacademy.org/science/high-school-biology/hs-human-body-systems/hs-the-circulatory-and-respiratorysystems/v/meet-the-heart>

<https://www.kenhub.com/en/library/learning-strategies/master-blood-vessels-with-diagrams-and-arteries-and-veinsquizzes>

#### **The role of the blood and circulation**

We need the circulatory system to carry blood around the body to all of the different cell types. Blood vessels form an extensive network around the body to allow the blood to reach every cell. Blood goes from the heart out into the body to deliver oxygen to the cells, plus it carries other substances like nutrients and hormones to the cells also.

Other blood vessels, called veins return the blood from these tissues with deoxygenated or low oxygen blood ready to get reoxygenated by the lungs. The blood also brings back carbon dioxide and waste to expel via the lungs, liver, kidneys and the intestines. Blood can also absorb or give off heat which can help the body maintain its temperature.

For more detail about the role of the blood and circulation:

<https://www.ncbi.nlm.nih.gov/books/NBK279392/>

<https://www.khanacademy.org/science/biology/human-biology#circulatory-pulmonary>

<https://www.getbodysmart.com/circulatory-system/transport-oxygen-blood>



## Respiratory System

### Structure and Function

The main structures that make up the respiratory are the nose, the pharynx and larynx, the trachea, the bronchi and lungs and the breathing muscles which include the diaphragm and intercostals or muscles around the ribs.

The respiratory system works closely with the cardiovascular system. Its main role is to oxygenate the blood which supplies the whole body with oxygen and also removes carbon dioxide upon exhalation. The respiratory system also filters, humidifies and warms the air that comes into the lungs, and it plays an integral part in maintaining the bloods pH level.

For more detail on the structure of the respiratory system and the lungs:

<https://www.getbodysmart.com/respiratory-system>

<https://www.kenhub.com/en/library/anatomy/the-respiratory-system>

<https://www.khanacademy.org/science/high-school-biology/hs-human-body-systems/hs-the-circulatory-and-respiratorysystems/v/meet-the-lungs>

### Mechanics of breathing

As the structures of the respiratory system work together, they perform the act of breathing. Breathing is caused by the muscles contracting and relaxing around and below the rib cage to change the amount of space available for the lungs to occupy.

During the inspiration phase of the breathing cycle the lungs can be expanded in two ways.

1. The diaphragm contracts and pulls the lower surface of the lungs downwards this creates more space in the lungs by lengthening them.
2. The ribs are lifted slightly by the external intercostal muscles which allows the lungs to expand anteriorly and posteriorly or, in simple terms, to widen.

Through the combination of widening and lengthening the space available for the lungs to occupy, more space becomes available inside the lungs for air to occupy. As the air pressure drops in the lungs when they become larger, the air from outside naturally filters in to fill the space. Expiration occurs when the diaphragm and intercostals relax, reducing the space in the thoracic cavity (lung space) and as there is reduced space, some of the air is pushed out.

For more details on the mechanics of breathing:

<https://www.khanacademy.org/science/in-in-class-11-biology-india/x9d1157914247c627:breathing-and-exchange-of-gases>

<https://www.kenhub.com/en/library/anatomy/anatomy-of-breathing>

<https://www.khanacademy.org/science/in-in-class-10-biology/in-in-life-processes#in-in-respiration-in-human-beings>

### Lung Capacity

Our Tidal volume is the amount of air that we breathe in and out during the day when we are not focused on breathing. This is an autonomous action so that we continue to breathe regularly.

We can also purposefully use muscle activations to breathe in deeper and breathe out more air to allow for increased air flow back into the lungs.

There are official names for all of the amounts of air we can breathe in purposefully and the reserves of oxygen left in our lungs after purposeful inhalations and exhalation.

These are measured when a person has a condition that affects the lungs or to see how the lungs adapt to certain types of fitness training and conditioning.

For more detail on lung capacity:

<https://www.getbodysmart.com/spirometry/lung-volumes-capacities>

## Nervous System

### Structure and Function

The nervous system comprises of the brain and the spinal cord plus the peripheral nerves.

The nervous system is an elaborate network of nerve cells called neurons that generate, transmit and interpret signals around the body and back to the spine or brain so that the body systems can communicate with each other. It uses electrical and chemical methods to send and receive messages.

There are two main parts of the nervous system:

Central nervous system (CNS): this is the brain and spinal parts, and its role is to interpret, process and instigate messages.

Peripheral nervous system (PNS): this is the conduit between the CNS and the body. The PNS is made up of the neurons that extend out into all parts of the body. There are two types of neurons, efferent neurons that send messages from the CNS out to the tissues and afferent neurons that conduct pulses from the tissues back to the CNS.

The peripheral system is further broken down into another two parts:

- **Somatic nervous system** – includes the sensory fibres from the skin and skeletal muscles and controls voluntary actions of the skeletal muscles by stimulating motor units.
- **Autonomic nervous system** – Controls all involuntary actions of the organs and other bodily functions

The nervous system has a role in actions such as:

- Sensations (touch, hearing, taste etc)
- Perception – processing sensory information
- Brain growth and development
- Thoughts and emotions, learning and memory
- Movement, balance and coordination
- Sleep
- Healing of the body
- Stress and the body's response to various stresses
- Ageing process
- Breathing and heartbeat
- Body temperature
- Hunger, thirst and digestion
- Puberty, reproduction and fertility



For more detail about the nervous system:

<https://www.khanacademy.org/science/high-school-biology/hs-humanbody-systems#hs-the-nervous-and-endocrine-systems>

<https://www.kenhub.com/en/library/anatomy/the-nervous-system>

<https://www.khanacademy.org/science/high-school-biology/hs-humanbody-systems/hs-the-nervous-and-endocrine-systems/v/structure-of-the-nervous-system?modal=1>

## Nerves and nerve impulses

Neurons, or nerve cells, are the main functional units of the nervous system.

The nerve cell body contains organelles, just like other cells in the body, this is where the impulses or “action potentials” are generated.

Two significant parts of a nerve cell are the axons and the dendrites.

**Axons:** Are long in shape and conduct impulses from the neuronal body.

**Dendrites:** Are short and receive the impulses from other neurons. They conduct the messages toward the nerve cell body.

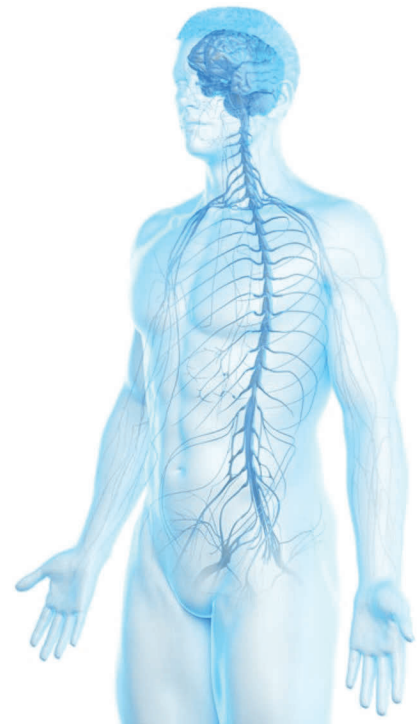
Each nerve cell has one axon and more than one dendrite depending on the structure and type of the function the neuron has to perform.

For more details about neurons:

<https://www.khanacademy.org/science/high-school-biology/hs-human-body-systems/hs-the-nervous-and-endocrinesystems/v/anatomy-of-a-neuron?modal=1>

<https://www.getbodysmart.com/nerve-cells>

<https://www.kenhub.com/en/library/anatomy/histology-of-neurons>



## Muscular System

### Role/function

The muscular system is made up of over 600 muscles that provide movement and stability in the body. Often linked with the skeletal system because the musculoskeletal system work closely together.

Skeletal muscle also plays an important role in storing much of the body's energy in the form of glycogen.

More detail on the role of the muscular system can be found here:

<https://www.getbodysmart.com/muscular-system>

<https://www.kenhub.com/en/library/anatomy/the-musculoskeletal-system>

<https://www.khanacademy.org/science/high-school-biology/hs-human-body-systems#hs-the-musculoskeletal-system>

### Types of muscle tissue

There are three types of muscle tissue in the body:

Cardiac muscle – this type of muscle is only found in the heart and pushes the blood into various chambers around the heart, into the lungs and out of the heart into the arteries for circulation.

Smooth muscle – this type of muscle makes up the walls of blood vessels and organs such as the intestines, liver and pancreas.

Skeletal muscle – this type of muscle attaches to the bones and provides voluntary movement.

The skeletal muscles are the only ones that we can control on purpose with our thoughts, as they are innervated by the somatic part of the nervous system. In contrast to this, the cardiac and smooth muscles are innervated by the autonomic nervous system, thus being controlled involuntarily by the autonomic centres in our brain. We will mainly focus on skeletal muscle as it contributes to exercise the most.

There are also various types of skeletal muscles including:

- Circular
- Convergent
- Parallel – strap, fusiform and fan-shaped
- Pennate – unipennate, bipennate and multipennate

For more detail on muscles types and classifications:

<https://www.kenhub.com/en/library/anatomy/muscles>

## Main muscle groups

The skeletal muscle system is broken up into main areas of the body. Each area contains many small muscles that work together to create a wide variety of movement patterns.

As a fitness professional it is important to be familiar with the primary muscle names in each major muscle group and the types of actions that they create when they contract.

When researching the muscles and where they are, be sure to cover the following main muscle groups and muscle names:

Upper Body:	Lower Body:
<b>Back:</b> <ul style="list-style-type: none"><li>• Latissimus dorsi</li><li>• Trapezius</li><li>• Rhomboids</li><li>• Erector spinae group (three muscles)</li></ul> <b>Shoulders:</b> <ul style="list-style-type: none"><li>• Anterior deltoids</li><li>• Lateral deltoids</li><li>• Posterior deltoids</li><li>• Rotator cuff group (four muscles)</li></ul> <b>Chest:</b> <ul style="list-style-type: none"><li>• Pectoral group (two muscles)</li><li>• External and internal intercostals</li></ul> <b>Abdominals:</b> <ul style="list-style-type: none"><li>• Rectus abdominus</li><li>• Transversus abdominis</li><li>• Internal and external obliques</li></ul>	<b>Hips:</b> <ul style="list-style-type: none"><li>• Iliopsoas</li><li>• Gluteal group (three muscles)</li></ul> <b>Thighs:</b> <ul style="list-style-type: none"><li>• Quadriceps (four muscles)</li><li>• Hamstrings (three muscles)</li><li>• Adductor group (five muscles)</li></ul> <b>Calves:</b> <ul style="list-style-type: none"><li>• Gastrocnemius</li><li>• Soleus</li></ul>

For more detail on the muscles in each group:

<https://www.getbodysmart.com/muscular-system>

<https://www.kenhub.com/en/library/anatomy/the-musculoskeletal-system>

## Muscle fibre anatomy

Muscles are made up of many parts that all work together to create contractions. When a muscle contracts it is shortening in length. Most muscles originate and attach at two or more different bony landmarks, as they shorten, they pull the bones closer together. This occurs all over the body and in many different directions and this leads to movement patterns.

For more detail on muscle anatomy:

<https://www.getbodysmart.com/muscle-fiber/skeletal-muscle-fiber-location-arrangement>

<https://www.khanacademy.org/science/biology/human-biology#muscles>

## Muscle fibre types

There are different types of muscle fibres that make up various types of muscles.

Muscles are made of different fibre types that use different energy systems and have different features:

- Type 1: Slow oxidative (SO) fibres contract relatively slowly and use aerobic respiration (oxygen and glucose) to produce Adenosine Triphosphate (ATP). They produce low power contractions over long periods and are slow to fatigue.
- Type 2 A: Fast oxidative (FO) fibres have fast contractions and primarily use aerobic respiration, but because they may switch to anaerobic respiration (glycolysis), can fatigue more quickly than SO fibres.
- Type 2 B: Fast glycolytic (FG) fibres have fast contractions and primarily use anaerobic glycolysis or the Adenosine Triphosphate-Phosphate Creatine(ATP-PC) energy system. The FG fibres fatigue more quickly than the others.

### Type 1 (SO)

These fibres have a rich capillary blood supply, numerous aerobic respiratory enzymes, and a high concentration of myoglobin. Myoglobin is a red pigment, similar to the haemoglobin in red blood cells that improves the delivery of oxygen to the slow-twitch fibres. Because of their high myoglobin content, slow-twitch fibres are also called red fibres.

Type 1 fibres can function for long periods without fatiguing making them useful in maintaining posture, producing isometric contractions, stabilizing bones and joints, and making small movements that happen often but do not require large amounts of energy. They do not produce high tension, and thus they are not used for powerful, fast movements that require high amounts of energy.

### Type 2A (FO)

Type 2A (FO) fibres are sometimes called intermediate fibres because they possess characteristics that are between fast fibres and slow fibres. They produce ATP relatively quickly, more quickly than SO fibres, and thus can produce relatively high amounts of tension. They are oxidative because they produce ATP aerobically, and do not fatigue quickly. However, FO fibres do not possess significant myoglobin, giving them a lighter colour than the red SO fibres.

Type 2A fibres are used primarily for movements, such as walking, which require more energy than postural control but less energy than an explosive movement, such as sprinting. FO fibres are useful for this type of movement because they produce more tension than SO fibres, but they are more fatigue-resistant than FG fibres.

### Type 2B (FG)

Type 2B (FG) fibres primarily use anaerobic glycolysis as their ATP source. They have a large diameter and possess high amounts of glycogen, which is used in glycolysis to generate ATP quickly to produce high levels of tension. Because they do not primarily use aerobic metabolism, they do not possess substantial numbers of mitochondria or significant amounts of myoglobin and therefore have a white colour. FG fibres are used to produce rapid, forceful contractions to make quick, powerful movements. These fibres fatigue quickly, permitting them to only be used for short periods of time because they use the energy stored immediately in their mitochondria as their fast energy source.

For more detail on muscle fibre types:

<https://www.khanacademy.org/test-prep/mcat/organ-systems/muscular-system/v/type-1-and-2-muscle-fibers>

<https://www.teachpe.com/anatomy-physiology/muscle-fibre-types>

## Muscle physiology

Skeletal muscles are stimulated to contract by chemicals released from a motor neuron. The motor neuron enters a muscle and branches off to attach to multiple muscle fibres.

The cluster of muscle fibres that are stimulated by a single motor neuron is called a motor unit. Whole muscles are then made up of many different motor units based on how large the muscles itself is.

A neuromuscular junction is where the expanded axon tips and the membrane of the muscle fibre meets.

For more detail on the neuromuscular junction and how muscles fibres are activated:

<https://www.getbodysmart.com/muscle-fiber-nerve-supply/motor-units>

<https://www.kenhub.com/en/library/anatomy/the-neuromuscular-junction-structure-and-function>

When a message from the central nervous system (CNS) is sent to activate a motor unit in a muscle, the message travels to the neuromuscular junction and the muscle is stimulated to contract. For a large muscle contraction (like a whole bicep contraction) many thousands of motor units are fired at once.

There are proteins in the muscle fibres called actin and myosin and they move toward and apart from each other to shorten or lengthen the muscle. This theory of movement is called the Sliding Filament Theory.

For more detail on how muscles contract:

<https://www.khanacademy.org/science/biology/human-biology>

<https://www.getbodysmart.com/muscle-physiology>

<https://www.getbodysmart.com/muscle-contraction/contraction-physiology>

<https://www.getbodysmart.com/muscle-fiber-nerve-supply/neuromuscular-junction-structure>

## Muscle Proprioceptors

Proprioception, also known as kinaesthesia, is the sense of knowing your body's relative position in space.

Often referred to as our sixth sense, proprioception allows us to move and navigate environments as we inherently "know" where our limbs, weight, and centre of gravity are at any moment in time.

Muscle proprioceptors are like tiny little sensors that are located on the nerve endings of the inner ear, muscles, skin, joints, tendons, and other tissues and are connected to the CNS. They are sensitive to many environmental changes such as stretching in the muscles, pressure, and other things. They can help us know where our muscles are in space based on how contracted or relaxed the muscles are. They relay information about our body's spatial position and movements to the brain.

More specialised receptors are responsible for detecting temperature and pain as there may be a faster response required if either extremes are experienced.

The proprioceptors of the body are found primarily in the muscles, tendons, and skin.

Among them are the following:

**Muscle spindles** – Also known as stretch receptors, are sensitive to changes in muscle length. These allow you to know when and how far to stretch your legs while walking or your arms when reaching. They respond to reduce the risk of injury when muscles are stretched beyond their normal resting length.

**Golgi tendon organs** – Found in tendons, are sensitive to changes in muscle tension. They sense how much tension a muscle is exerting and what is needed to affect a movement with the appropriate amount of energy.

**Pacinian corpuscles** – Situated in the skin and are responsible for detecting changes in pressure, which the body reads as texture, temperature, and other sensations.



Proprioception also relies upon a coordinated response between the muscles and the inner ear, which is central to balance, motion, and orientation. The inner ear contains structures that perceive whether you are speeding up, rotating, and where you are orientated.

Proprioception can become impaired or reduced for many reasons, either temporarily or permanently. Some causes of impaired proprioception, such as aging, are unavoidable, although improvements can be made.

Illnesses and disease conditions that are neurological, muscular, degenerative, or sensory can also limit proprioception.

For more detail on muscle proprioception and pain receptors:

<https://www.khanacademy.org/test-prep/mcat/processing-the-environment/somatosensation/v/proprioceptionkinesthesia>

<https://www.khanacademy.org/test-prep/mcat/processing-the-environment/somatosensation/v/pain-and-temperature-1>

## **Skeletal System**

### **Structure and Role/Function**

The bones primarily give support to the appendages and protect the fragile organs of the body such as the brain, spinal cord, heart, and lungs.

They also store calcium and phosphorus in the hard bone matrix, which can be released when needed elsewhere.

The bumps, ridges, and grooves on the surface of bones are called bony landmarks and provide attachment sites for the skeletal muscles.

Additionally, many bones contain a soft tissue called marrow that produces new blood cells and stores fat.

### **Bones**

The structures of the skeletal system comprise of the bones, cartilage and joints. There are approximately 206 bones in the human body divided into two sections.

### **Axial skeleton**

The core of the skeleton. This area consists of 80 bones.

- Skull – cranium and facial bones
- Spine – vertebrae bones – cervical, thoracic, lumbar, sternum and coccyx
- Chest – ribs, sternum, clavicle

### **Appendicular skeleton**

This part of the skeleton is attached to the axial skeleton consisting of 126 bones.

- The pectoral girdle – clavicle and scapula
- Arms – humerus, radius and ulna
- Wrists and hands – carpals, metacarpals and phalanges
- Pelvic girdle – Ilium, ischium, pubis
- Legs – Femur, tibia, fibula, patella
- Ankles and feet – tarsals, metatarsals, phalanges

For more details on where the bones are:

<https://www.getbodysmart.com/skeletal-system>

<https://www.khanacademy.org/test-prep/mcat/organ-systems#the-skeletal-system>

<https://study.com/academy/topic/the-skeletal-system.html>

## There are five types of bones:

1. Flat bones – e.g., the skull and sternum
2. Long bones – e.g., femur and humerus
3. Short bones - e.g., carpal and tarsal bones
4. Irregular bones - e.g., vertebrae
5. Sesamoid bones – e.g., patella

For more detail on types of bones:

<https://www.kenhub.com/en/study/bones-skeletal-system>

<https://www.kenhub.com/en/library/anatomy/bones>

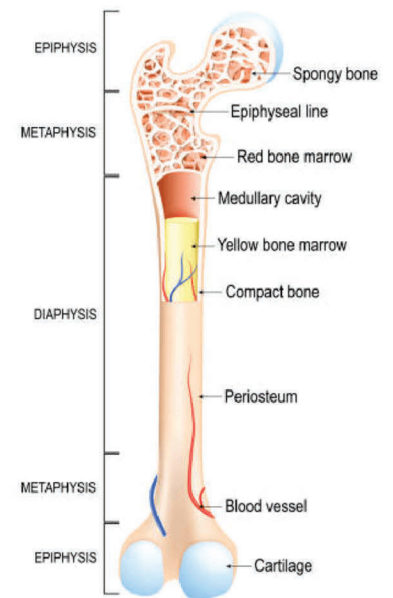
Bones are made up of various materials in layers. The inner layer forms a soft framework around the centre where the bone marrow is produced, and blood vessels and nerves are protected. Then there is an outer layer made up of calcium and phosphate. This is hard and in a honeycomb like structure which makes our bones strong and break resistant under force. (<https://www.medicalnewstoday.com/articles/320444>)

For more detail on the structure of bones:

<https://www.khanacademy.org/science/high-school-biology/hs-human-body-systems/hs-the-musculoskeletal-system/v/skeletal-structure-and-function>

<https://www.khanacademy.org/test-prep/mcat/organ-systems/the-skeletal-system/v/cellular-structure-of-bone>

<https://www.kenhub.com/en/library/anatomy/bones>



## Bony landmarks

Bony landmarks are specific descriptions of places on the bones where muscles attach and can also be pathways for blood vessels and nerves to go through.

They are important to remember to understand the shape of the main bones and where the muscles, ligaments, nerves and other structures affect the bones.

There are many types of bony landmarks used to describe various types of places on bones such as tubercle, tuberosity, process, condyle, crest, head, trochanter, epiphysis, diaphysis, foramen, ridge, facet and more.

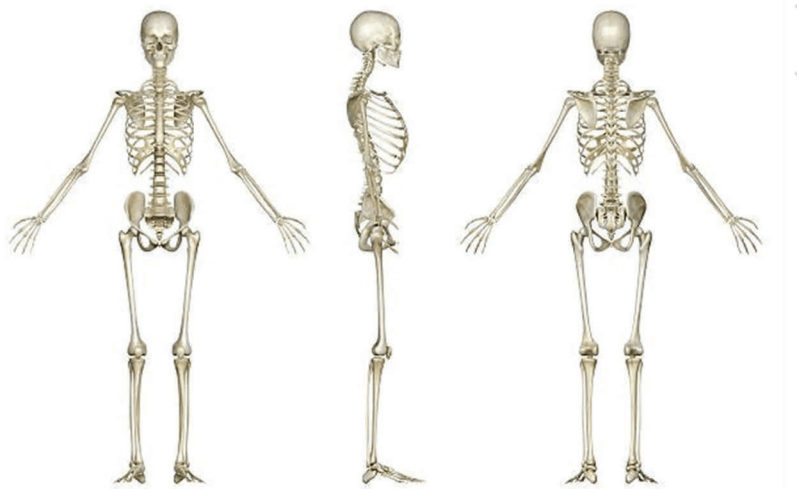
When muscles contract, they pull on the bone from the landmark place they are attached to, which moves the bone from that point, closer to the muscle that is contracting.

For more details on bony landmarks:

<https://www.kenhub.com/en/library/anatomy/complete-list-of-bone-markings>

<https://www.getbodysmart.com/skeletal-system>

[https://human.biodigital.com/view?id=production/maleAdult/bony\\_landmarks\\_complete\\_anatomy&lang=en](https://human.biodigital.com/view?id=production/maleAdult/bony_landmarks_complete_anatomy&lang=en)



## Joints

Joints hold the skeletal system together. They are placed between two or more bones that meet together or articulate into one joint.

Different joints allow different types and ranges of movement and can be classified into several categories based on their structure or function.

There are three main types of joints:

- Synovial – Moveable (knee, hip joints)
- Fibrous – Immoveable fixed joint (skull joints)
- Cartilaginous – Slightly moveable (vertebral joints)

More detail on the joints in the body:

<https://www.kenhub.com/en/study/main-joints-of-the-human-body>

<https://www.khanacademy.org/science/high-school-biology/hs-human-body-systems/hs-the-musculoskeletal-system/v/ligaments-tendons-and-joints>

<https://www.kenhub.com/en/study/types-of-synovial-joints>

<https://www.kenhub.com/en/library/anatomy/intervertebral-joints>

## Movement Terminology

Movement terminology refers to the professional language used to describe various movement types and actions in the body. This is important for fitness instructors to learn so that they can communicate with allied health professionals effectively. It is also essential when programming exercises that require the client to move into certain movement patterns and body positions.

When selecting exercises for clients, the movements that the client performs on a regular basis need to be simulated during the exercise session for specific strength, proprioception and skill development.

Clients may want improvements for ease of everyday activities, ease of work-related movements, postural strength to reduce joint and muscle pain or sports specific requirements.

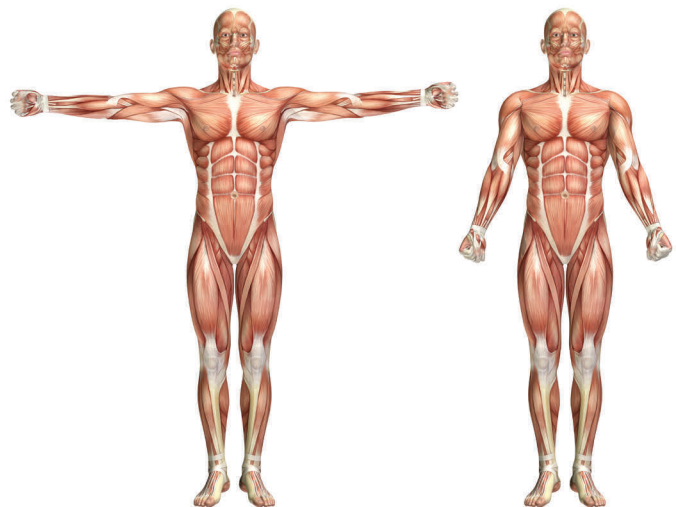
Whatever the client needs the improvements for, the specific movements must be performed, and the fitness professional must know how to select exercises that achieve this, and also which muscles are used during certain exercises or movements.

## Anatomical planes of movement

A plane is a flat surface on which a straight line joining two points would lie.

The body is divided up into imaginary planes that intersect the body. The anatomical planes of movement refer to the various types of movement patterns the body can move into. There are three anatomical planes of movement.

Movement occurs in each plane of movement and also in combinations of planes. All movement and body positions are referenced from the anatomical position.



See the table below for detail on each of the planes.

Plane	Description	Movements along the plane	Exercise example in plane
Anatomical position	Standing straight with arms by side, palms facing forward and feet parallel and pointing forward	All movement is described from this starting point	Nil
Sagittal/ median	Left and right parts	Forward and back: Flexion and extension	Walking, squats and lunges, step ups, bicep curls, knee extension
Frontal/ lateral/ coronal	Front and back parts	Side to side: Abduction and adduction	Star jumps, lateral raises, side bends, upright row
Transverse or horizontal	Upper and lower parts	Rotation: Lateral and medial Internal and external rotation Horizontal flexion and horizontal extension	Russian twist, sumo squats, cable rotation, chest or reverse fly

## Directional Terms

Directional terms are how we described the positions of various body parts in relation to each other or other structures. Anatomical structures are described in relation to each other.

For example: we would describe the elbow as “distal” to the shoulder, and yet the elbow is more ‘proximal’ to the shoulder than the wrist.

### Here is a list of the most common directional terms described:

**Anterior** – in front of or to the front

**Posterior** – at the back of or to the rear

**Distal** – further away from the trunk or the point of origin of a body part or muscle

**Proximal** – closer toward the trunk or the point of origin of a body part or muscle

**Medial** – towards the midline of the body

**Lateral** – away from the midline of the body

**Superior** – toward the top of the body or toward the head

**Inferior** - away from the top or toward the feet

**Superficial** – Nearer to the surface

**Deep** – Farther away from the surface

For more details on the planes of movement and directional terms:

<https://www.kenhub.com/en/library/anatomy/anatomical-terminology>

## Types of movements

The types of movements are referring to the types of angle changes that occur at the major joints. Each major angle change has a movement description and is caused by common groups of muscles at each joint.

When describing joint movements, two factors are included:

- The axis or fulcrum around which the specific part moves.
- The plane of movement it occurs in.

### Here are the most common movements terms and a general description of each one:

- Flexion – decreasing the angle between two structures.
- Extension – increasing the angle between two structures.
- Abduction – moving away from the midline.
- Adduction – moving toward the midline.
- Pronation – medial rotation of the radius bone (from the anatomical position) resulting in the palm of the hand facing posteriorly or downwards if the elbow is flexed.
- Supination – lateral rotation of the radius (from the anatomical position), resulting in the palm facing anteriorly or facing up if the elbow is flexed.
- Dorsiflexion – flexion of the top part of the foot (dorsum) or pulling the toes into a superior position to the heel.
- Plantarflexion – flexion of the underside of the foot (or the plantar) or pointing the toes downwards inferior to the heel.
- Circumduction – combination of movements that results in the circular pathway of the arm or leg. Movements in order are flexion, abduction, extension and ending in adduction back to the anatomical position.
- Inversion – the plantar side of the foot or sole of the foot moving towards the medial plane or rolling to face inwards.
- Eversion – the sole or plantar of the foot rolling to face laterally or outwards.

For more detail on movement types:

<https://www.kenhub.com/en/study/body-movements>

<https://www.kenhub.com/en/library/anatomy/types-of-movements-in-the-human-body>

<https://teachmeanatomy.info/the-basics/anatomical-terminology/terms-of-movement/>

## Lever systems

Lever systems have three parts, the effort or force applied to the lever, the fulcrum and the load itself.

There are also three classes of lever – 1st class, 2nd class, and 3rd class. They each have the effort, fulcrum and load in different places. The efficiency of a lever relies on the ratio of the effort arm to the load arm. The greater the ratio of the effort arm to the load arm, the more efficient the lever system is or the easier it is to move the load.

Our bodies are composed of a variety of synovial joints that function as lever systems. So, by understanding the concept of levers systems, we can see that if the distance between a muscle's insertion site and the joint is greater than the distance between the load and the joint, your muscle is at an advantage to move the load, due to the lever involved.

The reason it's easier to perform a weighted calf raise than a bicep curl with the same weight is because the lever system involved in a bicep curl is mechanically less efficient than the lever system involved in a calf raise.

For more details on levers in the human body:

<https://www.khanacademy.org/test-prep/mcat/physical-sciences-practice/physical-sciences-practice-tut/e/the-forearm-as-an-example-of-a-third-class-lever>

<https://www.visiblebody.com/blog/biomechanics-lever-systems-in-the-body>

## Forces that act on the body during exercise

Force is identified as a scientific strength or energy that can cause an object to move or accelerate. Gravity is one of the most common forces that applies to the body during exercise.

Gravity and applied load, tension or torque are generally applied to the body during exercise, leading to the human body activating certain muscles or groups of muscles to overcome or resist the applied pressure.

Gravitational and ground resistance force (or the reaction we have to impact with the ground) also have a significant impact on our bone strength.

During exercise (and any other time for that matter) we are always being pulled toward the floor, along with all of the equipment we use. Different types of materials have a different weight when we measure how hard it is to keep it away from the floor with our personal muscle strength.

Exercise is based around developing strength so that we can move objects of various weights, away or along the ground, at different speeds while counteracting the force of gravity on our bodies and on the object. This is how we gain strength and functionality. This is also how we increase in power, speed and agility. The variables of speed, load and distance from the ground are adjusted to achieve a certain outcome.

Free weights are the most challenging to our muscle groups when it comes to strength training, as they are being pulled straight down no matter which position your body is in or where they are, so changing the position of your body and the free weight will cause different muscles to activate to resist the consistent downward pull of gravity. This is also the most functional way to train (along with body weight loaded positions) as most objects we need to pick up and carry in daily life are affected by the same gravitational pull direction.

Another powerful way to exercise is to incorporate movements where our bodies are moved against gravity. When we work against gravity (by pushing or pulling our bodies up and away from the ground) our demands for energy are higher. These movements can be progressed to have load and/or speed added during the movement away from the ground.

Power bands and cables type machines can provide an alternative to common downward gravitational resistance when purposefully positioned. They can cause the load to need to be moved from a lateral direction or from an overhead position when attached above our bodies.

For more detail on how the body manipulates and overcomes force:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3037021/>

Cite: Kohrt, W. M., Barry, D. W., & Schwartz, R. S. (2009). Muscle forces or gravity: what predominates mechanical loading on bone? *Medicine and science in sports and exercise*, 41(11), 2050–2055.

<https://doi.org/10.1249/MSS.0b013e3181a8c717>

<https://pdhpe.net/the-body-in-motion/how-do-biomechanical-principles-influence-movement/force/how-the-bodyapplies-force/>





## **Energy systems**

Energy systems refer to specific mechanisms in which energy is produced and used by our body and muscles. Different types of movements, duration and intensity of movement use different energy systems in our body.

The human body generates energy using three different systems:

### **1. Phosphagen system (ATP-PC)**

ATP stands for Adenosine Triphosphate and is the molecule that provides energy for all movement. PC stands for Phosphate Creatine. The phosphagen energy system harnesses the ATP, stored in our cells for highly intensive activities that last between 10 and 30 seconds.

This energy system does not need oxygen to access the energy, so it is called an anaerobic system. (Meaning: "in the absence of oxygen")

Since our body stores a limited amount of ATP at one time, activities that last longer than 30 seconds must tap into energy that is generated by the glycolytic system after the immediate ATP stores are used.

Activities that use the phosphagen system are short sprints, plyometrics or explosive movements like box jumps or shot-put throw.

### **2. Glycolytic system**

The glycolytic system uses carbohydrate to produce ATP quickly. Glycolysis means the breakdown of glucose for energy. The glycolytic system is also referred to as an anaerobic system, but the energy comes a bit slower than the phosphagen system as the ATP has to be synthesized through a series of chemical reactions rather than being there already.

When this energy system is activated, hydrogen ions are released into the muscle cell. Without oxygen these cannot be removed and as a result the muscles cell becomes increasingly acidic. It is this acidity that we feel as the burning sensation when we work at this intensity as a result of the accumulation of the hydrogen ions.

When the muscle cell becomes too acidic the muscle stops functioning because the enzymes that control the glycolysis process struggle to function in an acidic environment.

As this build up happens, we need to either stop exercising or reduce the intensity.

Activities that are between 30 seconds and 3 minutes primarily use this energy system with some cross over to the aerobic system depending on the person's ability to remove the build-up of lactate in the muscle from the process.

### **3. Oxidative system**

The oxidative system is aerobic, which means that it uses oxygen to help with energy production. This energy system uses carbohydrates as well as protein and fats to produce ATP stores of energy. This system takes more time and energy to produce ATP and is the system that produces energy for longer training sessions that are low to moderate intensity. This system is the one that most of our core stabilising muscles use to continue to activate, maintaining posture and holding our bones in the right positions.

The oxidative system can continue to create ATP consistently without rest as long as there is adequate fuel in the form of carbohydrates, protein and fat to convert and oxygen present.

For more detail on energy systems:

<https://canada.humankinetics.com/blogs/excerpt/energy-systems>

<https://www.brianmac.co.uk/energy.htm>

## Thermoregulation

The human body regulates temperature by maintaining a balance between heat gain and heat loss. Humans regulate heat and cold to maintain an internal body temperature or core temperature between 36.5 and 37.5 °Celsius (°C). Core temperature is regulated by the hypothalamus (in the brain), which is often called the body's thermostat. The hypothalamus responds to various temperature receptors located throughout the body and makes physiological adjustments to maintain a constant core temperature.

The body's metabolism is constantly producing heat and then dispersing it through various processes.

When our internal temperature changes, sensors in the central nervous system (CNS) send messages to the hypothalamus. In response, it sends signals to various organs and systems in our body. They respond with a variety of mechanisms to control the temperature and maintain homeostasis.

To cool down the body uses the following methods:

**Sweating:** Your sweat glands release sweat, which cools your skin as it evaporates. This helps lower your internal temperature.

**Vasodilatation:** The blood vessels under your skin get wider. This increases blood flow to your skin where it is cooler — away from your warm inner body. This lets your body release heat through heat radiation.

If your body needs to heat up, it will use the following methods:

**Vasoconstriction:** The blood vessels under your skin become narrower. This decreases blood flow to your skin, retaining heat near the warm inner body.

**Thermogenesis:** Your body's muscles, organs, and brain produce heat in a variety of ways. For example, muscles can produce heat by shivering.

**Hormonal thermogenesis:** Your thyroid gland releases hormones to increase your metabolism. This increases the energy your body creates and the amount of heat it produces.

Environmental conditions will affect the temperature of the human body and it will need to employ warming up or cooling down methods accordingly to maintain the normal body temperature.

For more details on thermoregulation:

<https://www.khanacademy.org/science/ap-biology/ecology-ap/energy-flow-through-ecosystems/a/animal-temperatureregulation-strategies>

## **Cold temperatures**

Exercising in cold temperatures may allow our bodies to work at a higher intensity level before overheating due to the environmental conditions contributing to the cooling process. And yet, if the temperature is too cold, the blood vessels will vasoconstrict to keep the bodies heat more central, which will cause a competition for blood flow to muscles in the limbs. This can lead to a lack of performance, higher risk of injury and possible muscles cramps.

For more details on body response to exercising in cold temperatures:

<https://link.springer.com/article/10.2165/00007256-199111060-00003>

## **Warm temperatures**

Exercising in warm temperatures also instigates a competition for blood flow from the working muscles to the skin for effective heat dissipation to avoid overheating. The metabolic demands of the active muscle may be met but the consequence is that the regulation of body temperature will suffer. The limiting factor for continuing exercise in the heat at low intensity is not compromised muscle blood flow, nor reduced blood pressure, but mainly the elevation in central temperature. The body will prioritise the muscles need for blood flow over controlling the bodies central temperature which can lead to overheating and reduced performance.

Sweating also occurs to attempt to cool the body through evaporation, which may lead to dehydration and excessive nutrient loss if not replaced effectively.

For more details on body responses to exercising in the hot temperatures:

<https://physoc.onlinelibrary.wiley.com/doi/full/10.1113/jphysiol.2007.142158>

## Dehydration

During exercise, the main way the body maintains optimal body temperature is by sweating. Heat is removed from the body when beads of sweat on the skin evaporate, resulting in a loss of body fluid. Sweat production, and therefore fluid loss, increases with a rise in ambient temperature and humidity, as well as with an increase in exercise intensity.

Dehydration also results in an increase of heart rate and body temperature due to the above factors and other strains it puts on the body systems.

Drinking fluid during exercise is necessary to replace fluids lost in sweat. A good way to work out how much fluid is lost during a training session is to weigh the client before the session and then straight after. For every gram of body weight 125-150% of fluid should be replaced. This is to allow for the extra fluid that is lost through “residual sweating” after the session and urine loss.

Plain water is an effective drink for fluid replacement, especially in low intensity and short duration sports. However, if carbohydrate and electrolytes are added to water, as in a sports drink, performance may be enhanced, especially in high intensity and endurance sports.

The detrimental effects of dehydration on performance may include loss of coordination, impaired ability to make a decision, increased rate of perceived exertion and increased risk of heat stress.

<https://www.sportsdietitians.com.au/wp-content/uploads/2015/04/Fluids-in-sport.pdf>



## **Body system demands during exercise**

Now that we have knowledge of the body systems, their anatomical structures and roles in the body, we can learn how each body system contributes to, is affected by and adapts to various types of exercise.

### **Cardiorespiratory System**

During exercise, the main role of the cardiorespiratory system is to deliver oxygen to the working muscles, via blood circulation and to remove carbon dioxide from the body via the lungs.

As exercise intensity increases the requirement of oxygen to working muscles increases and therefore our breathing rate increases to take in more oxygen to supply the increased blood flow.

Gas exchange occurs which means that carbon dioxide also needs to be removed from the body. As the muscles work more anaerobically, producing more lactic acid, more carbon dioxide is produced and must be removed during expiration.

So, during exercise our inspiration and expiration rates become deeper to achieve these two purposes:

1. Increased oxygen intake
2. Increased carbon dioxide output

Blood also delivers nutrients like glycogen, lipids (or fats) and micronutrients to the cells during exercise to optimise energy and performance.

When the blood vessels and arteries are not healthy, as in, they have a build-up of plaque in them, this system does not deliver optimal blood during exercise which will limit performance.

Regular exercise has a major effect on the cardiorespiratory system health and studies have shown that regular exercise stimulates the growth of more blood vessels to improve blood flow and reduce artery ageing by stimulating nitric oxide production. Nitric oxide can keep the artery lining smooth and relaxed which reduces the chance of blood clots and artery blockages.

For more details on the cardiorespiratory actions during exercise:

<https://www.kenhub.com/en/library/anatomy/the-blood>

<https://www.khanacademy.org/test-prep/mcat/organ-systems/the-respiratory-system/v/oxygen-movement-from-alveolito-capillaries>

<https://www.khanacademy.org/test-prep/mcat/organ-systems#the-respiratory-system>

<https://www.visiblebody.com/learn/circulatory/circulatory-blood-vessels>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7764033/>

### **Blood pressure**

Blood pressure is a measure of the pressure of the blood on the walls of our blood vessels as the heart pumps. When the heart pushes the blood into the arteries, the pressure is higher than when the heart relaxes as the blood flows into it.

When the heart contracts the pressure is called the systolic pressure and when the heart is relaxing is called the diastolic pressure (which is lower).

Blood pressure increases when the arteries and blood vessels become rigid from a lack of exercise and a condition called atherosclerosis or a build-up of plaque in the artery walls. As there is less space for the blood to flow through the blood vessels, the pressure is higher.

Performing exercise, naturally increases the blood pressure temporarily, as there is more blood being pumped around the body and therefore the increased blood flow puts pressure on the artery walls.

One of the long-term adaptations of regular cardiovascular exercise is that the blood vessels become more flexible and less rigid and often the plaque in the blood vessels can be reduced with regular exercises and dietary changes. This leads to more space in the blood vessels and lower blood pressure overall.

It is essential that fitness professionals are aware of the risk of allowing a person with existing high blood pressure to train at a moderate to high intensity as the risk of the blood pressure increasing even further and blood flow becoming blocked when more demand is required could be high. Fitness instructors should always gain clearance from a medical practitioner if a client reveals that they have high blood pressure.

For more details on exercise and blood pressure:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4914008/>

<https://www.acsm.org/blog-detail/acsm-certified-blog/2019/02/27/exercise-hypertension-prevention-treatment>

<https://www.ahajournals.org/doi/10.1161/hypertensionaha.112.197780>

## Heart rate

When the heart beats, the amount of blood that is pumped out of the left ventricle of the heart during each contraction is called the stroke volume. Cardiac output is the blood volume that the heart pumps through the body over a period of time.

Cardiac output is greatly increased during exercise due to the additional oxygen demands of the cells and carbon dioxide disposal needs. This is the short term effect on the heart.

When a person has a low level of fitness the stroke volume will be lower as the heart lacks the strength to pump a higher stroke volume each pump. This leads to the heart needing to beat more often to pump a certain volume of blood around the body.

When we exercise regularly, particularly with cardiovascular intensity, the heart muscles grow stronger which leads to improved heart function and a stronger stroke volume per beat. This causes more blood to be pumped each time the heart contracts which lowers the exercising and resting heart rate because more blood is pumped using less contractions. This is how the body adapts, we become more efficient at coping with certain levels of exercise and therefore it feels easier, and we are fitter for the activity.

For more details on cardiac adaptation and exercise:

<https://www.livestrong.com/article/314364-the-effect-of-exercise-on-blood-pressure-pulse/>

<https://www.khanacademy.org/science/in-in-class-11-biology-india/x9d1157914247c627:body-fluids-and-circulation#x9d1157914247c627:circulatory-pathways>

## Breathing rate

The amount of air we can breathe in and out on one respiratory cycle is called our tidal volume. When a person breathes in, oxygen (O<sub>2</sub>) enters the lungs and diffuses across the alveolar-capillary interface to reach the blood and oxygenate it. At the same time carbon dioxide is expelled to prevent it from accumulating in the body. Carbon dioxide (CO<sub>2</sub>) is breathed in and is also a by product of energy metabolism in our bodies.

So, the volume of inspired and expired air that helps keep oxygen and carbon dioxide levels stable in the blood is referred to as our tidal volume.

Tidal volume relies on coordination between the respiratory control centre in the brain and the muscles that assist in respiration.

Our nervous system determines the rate and depth at which breathing occurs. In response to changes in blood oxygen and carbon dioxide levels, central and peripheral receptors send information to the brainstem to modulate breathing rate and pattern. The diaphragm, and other inspiratory muscles, respond by altering tidal volume and respiratory rate.



Tidal volume can be increased during exercise and at rest by strengthening the muscles that assist in respiration. Deep breathing exercises can encourage the muscles around the chest cavity and the diaphragm to contract with more strength each breath, which can lead to lower breathing rates during exercise and at rest due to greater lung area capacity.

For more detail on breathing rate:

<https://www.ncbi.nlm.nih.gov/books/NBK482502/#:~:text=Tidal%20volume%20is%20the%20amount,proper%20ventilation%20to%20take%20place.>

<https://www.khanacademy.org/science/in-in-class-11-biology-india/x9d1157914247c627:breathing-and-exchange-of-gases#x9d1157914247c627:the-respiratory-system>

## Nervous system

Neural adaptations are happening constantly during exercise, whether it be strength training, power, speed and agility or endurance. The brain sends signals along the motor pathways to tell muscles when to activate, how quickly and how powerfully they need to contract to produce the right amount of force.

When we are training for a certain movement outcome, our brain sends signals to the correct muscle fibres to tell them to contract. Strength comes from a number of muscle fibres contracting in one area of a muscle.

Sometimes we may not have very strong neural pathways to certain muscle fibres, especially if we have not used them for some time and the brain needs to create a stronger neural pathway to a muscles to achieve activation. This can often be done by thinking carefully about which muscles we want to fire and concentrating on performing the exercise with good technique so that the correct muscles have to fire to keep the body in the right positions for certain muscles to activate.

The more we practice types of movements, at certain speeds and in certain planes of movement, the more the nervous system can adapt to become more efficient at those particular movement patterns.

This is how the nervous system adapts and how proprioception is improved.

During strength training, initial strength gains are often achieved as the nervous system recruits (or turns on) more muscle fibres to overcome a load. It's likely that the muscle fibres were not being used previously, but now that a load or stimulus is being applied, the nervous system will step up the activations to become better at the activity or moving the heavy load.

Therefore, it is important to apply enough load or stimulus to our muscles and nervous system each time we train, so that we are challenged, and adaptation occurs to better cope with the activity when it is next performed.

The somatic and the autonomic nervous systems are engaged during exercises for various adjustments to allow for the demands and the sympathetic system is where we perform our high demand exercises.

The nervous system is designed to protect the body from injury. Which means if our muscles are not strong or are deconditioned, the nervous system inhibits movement to avoid the muscles moving into a position that could injure them. One of the most significant adaptations to the nervous system when training the muscles is disinhibition of these inhibitory mechanisms. Allowing us to feel less "tight" and more capable to move and function.

At the end of a training session, cool down activities can stimulate the autonomic nervous system to calm down and enter into the parasympathetic state so that we can nourish and recover our body systems.

The nervous system also adapts in other ways. The timing of muscle contractions can become more coordinated and faster to meet greater force, load or stimulus requirements. More motor units are activated in muscle fibres for more force, power or speed to become possible.

The central nervous system can become fatigued from prolonged periods of excessive activation from exercise and challenging activities and needs adequate rest to recover and adapt. Eating a nutritious diet, reducing stress and getting good quality sleep are all very effective ways to allow our nervous systems to recover.

For more detail on how the nervous system respond to exercise:

<https://simplifaster.com/articles/central-nervous-system-fatigue-effects-speed-power-athletes/>

<https://jps.biomedcentral.com/articles/10.1007/s12576-019-00669-6>

<https://www.kenhub.com/en/library/anatomy/the-nervous-system>



## Skeletal

The skeletal system is affected and benefits in various ways from exercise.

Bone density increases with high impact and weight bearing exercise or when strain is put on the muscles and bones. The body produces cells called osteoblasts that reinforce and build the bones up and therefore they become more dense and stronger.

Joints are also benefitted from increased synovial fluid production to keep them lubricated which increases mobility and nourishes them. A steady flow of synovial fluid is produced when we move and are active.

Over time, the tendons that hold our muscles together will strengthen from regular exercise, which creates more stability in the joints and lower risk of bone misalignment or posture issues.

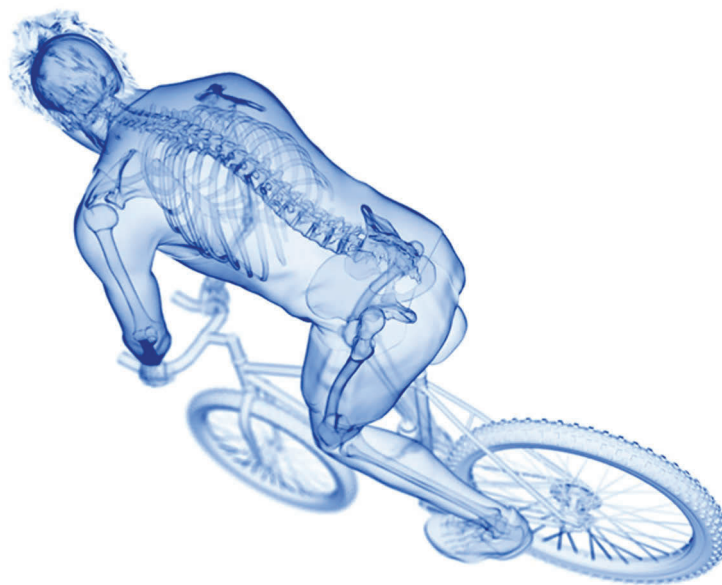
Stability and balance exercises can also benefit the bones. As the muscles become stronger and coordination improves, the risk of falls decreases which places the bones at a lower risk of breaking if a fall were to occur.

Overuse of bones and movement can lead to premature bone degeneration, stress fractures and joint, tendon and ligament damage. It is important to be moderate in exercise habits and progress slowly so that the body can improve and adapt at a safe rate.

For more details on how the skeletal system responds to exercise:

<https://healthybonesaustralia.org.au/your-bone-health/exercise-bone-health/>

<https://physioworks.com.au/pain-injury/overuse-injuries/>



## Muscular System

### Strength training

The physiological adaptations experienced as a result of strength training have been split into two categories.

1. Muscle fibre response
2. Neuromuscular adaptations

### Muscle fibre response

When we train specifically for strength and hypertrophy the main adaptations occur to the muscle fibre size, and the neuromuscular activation of the individual muscle fibres.

The increase in muscle size from resistance training is referred to as hypertrophy.

The 'pump' you might feel from a single exercise bout is referred to as transient hypertrophy. This short-term effect is the effect of fluid accumulation in the intracellular and extracellular areas of the muscle. The intracellular fluid (ICF) compartment is the system that includes all fluid enclosed in the cells by their plasma membranes. Extracellular fluid (ECF) surrounds all cells in the body. Extracellular fluid has two primary constituents: the fluid component of the blood (called plasma) and the interstitial fluid (IF) that surrounds all cells not in the blood.

Hypertrophy refers to the increase in muscle size associated with long-term strength training. Increases in the cross-sectional area of muscle fibres range from 20% to 45% in most training studies. It is generally believed that the number of muscle fibres you have is established by birth and remains fixed throughout your life.

Therefore, the hypertrophy adaptations we experience with resistance training are a result of subcellular changes within the muscle which include more and thicker actin and myosin protein filaments, more myofibrils (which embody the actin and myosin filaments), more sarcoplasm (the fluid in the muscle cell), and plausible increases in the connective tissue surrounding the muscle fibres.

The effect of exercise on muscle fibre types depends on the type and duration of exercise engaged in.

Different muscles have a different ratio of muscle fibre types based on the role that they play in the body. Aerobic exercises rely mainly on Type I (slow-twitch muscles) which sustain maximal contraction for extensive periods of time. This use of slow-twitch muscles, and the availability of oxygen, prevents the build-up of lactic acid, and typically does not result in substantial muscle fatigue in the short-term.

Anaerobic energy systems activate at the start of high intensity and heavy resistance training. This prioritizes the use of Type II (fast-twitch) muscles fibres for short, high-intensity contractions. Muscles prioritize the use of readily available ATP, glucose and glycogen for these contractions, which results in a build-up of lactic acid.

Long-term adaptations of the muscle fibre types are that the type becomes more predominant in the muscle and more efficient at achieving the load intensity placed on it.

## Neuromuscular adaptations

Neuromuscular adaptations are another way the body adapts to become stronger and promote muscle size increases. The components of intramuscular coordination due to increase neuromuscular activity are as follows:

- Synchronization - the capacity to contract motor units simultaneously or with a minimum latency (that is, with a delay less than five milliseconds)
- Recruitment - the capacity to recruit motor units simultaneously
- Rate coding - the capacity to increase firing rate (or to recruit more motor units to activate) in order to express more strength

The maximum voluntary recruitment of motor units developed through maximum strength training can be transferred to a sport-specific exercise skill as long as the athlete knows its technique. The objective of maximum strength training is to improve motor unit recruitment of the prime movers, whereas power training works mainly on rate coding. These two aspects of intramuscular coordination - recruitment and rate coding - play strong roles in muscular force production.

Over time, strength training for intermuscular coordination reduces the motor unit activation necessary to lift the same load, thus leaving more motor units available for higher loads.

This means that to continue to improve strength capacity we need to keep increasing the load in our training sessions so that the muscles are constantly challenged to adapt and grow.

As the muscles grow stronger over time, percentages of strength increase can be harder to achieve, but there is always some improvement possible with various types of strength training and by adding more load and movement patterns to your programs.

## Endurance Training

Endurance training leads to adaptations in both the cardiovascular and musculoskeletal system that supports an overall increase in exercise capacity and performance. Increased mitochondrial biogenesis (growth of mitochondrial number and size) and capillary density, aid in the body's ability to transport and use oxygen to generate energy and therefore delay the onset of muscle fatigue during prolonged aerobic performance.

## Flexibility training

When stretching a muscle, the muscle spindle receptors will activate the stretch reflex. This tells the nervous system that it needs to contract the muscles to protect it from overstretching and becoming injured. When muscles are short and tight, this reflex activates often, and we feel like we can't move very far because of the risk of injury.

Flexibility training or stretching can help the muscles naturally rest at a longer length so that the stretch reflex is activated at a greater range of motion. This is healthier for the muscles and reduces the risk of injury because the muscles are able to move into a greater range of motion safely.

For more detail on muscular system responses to exercise:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5983157/>

Hughes, D. C., Ellefsen, S., & Baar, K. (2018). Adaptations to Endurance and Strength Training. Cold Spring Harbor perspectives in medicine, 8(6), a029769. <https://doi.org/10.1101/cshperspect.a029769>

<https://www.nature.com/articles/s42255-020-0251-4>

<https://www.sciencedirect.com/topics/immunology-and-microbiology/mitochondrial-biogenesis>

<https://medium.com/in-fitness-and-in-health/what-happens-when-you-stretch-9be500af5498>

<https://www.coreprinciples.com.au/online-personal-trainer2/item/the-science-behind-stretching.html>



## **Changes to muscular skeletal systems through the lifespan**

Both muscle mass and bone mass are able to be manipulated through the lifespan and are affected by the environmental changes we impose on them.

Muscle and bone tissue develops significantly from birth right through adolescence and reaches a peak density between the ages of 20-30 years of age.

Gross and fine motor skills are developed during youth and muscles and bones become stronger, more functional and denser. The rate that this occurs is directly related to the amount of stimulus applied in the way of learning new skills and exposing the muscles and bones to various types and intensities of movement patterns. This is why it is so important that children engage in structured activities to learn the basic functional skills and play sports to encourage hand eye coordination and learn to enjoy physical activity.

Once a person reaches the age of 40 years, there is a progressive decline in muscle mass, strength and functionality. This is called the process of sarcopenia.

Research has shown that the rate of decline can be genetic and also strongly influenced by the peak of strength reached in both bone and muscle tissues earlier in life. Some lifestyle factors play an active role when it comes to maintaining musculoskeletal health during adulthood and minimizing musculoskeletal decline. The rate of decline can be reduced by implementing strategies promoting muscle and bone health.

After the age of 60, a progressive decline in bone mineral density (BMD) of nearly 1–1.5%/year is common. By the age of 70, bone mass can be reduced by nearly 30–40%.

In women, the most important risk factor for bone loss is menopause, since after that the normal bone turnover cycle is impaired by estrogen deficiency, which explains why there is more pronounced bone loss in the females compared to males. Nearly half of the overall bone loss in women is experienced during the first 10 years after menopause.

For more details on musculoskeletal changes across the lifespan:

<https://www.frontiersin.org/articles/10.3389/fmed.2021.697954/full>

<https://www.betterhealth.vic.gov.au/health/conditionsandtreatments/ageing-muscles-bones-and-joints>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5389428/>

### **Long-term and short-term adaptations**

Each body system will have acute responses to exercises, (also known as immediate responses) that occur as we engage in the activity and also long-term adaptations that occur over time when the activity is engaged in repeatedly.

See the tables over for indications of various body systems, exercise types and the long- and short-term adaptations that can be expected.



## Short-term and long-term adaptations summary

Body System	Single bout (short term) response	Long term adaptation
<b>Cardiovascular system/Blood Pressure</b>	<p>Heartrate increases to 70-90% maximal rate</p> <p>Increased blood flow to delivery oxygen to working muscles</p> <p>Wastes are transported in the blood for removal to organs</p> <p>Blood pressure increases due to higher heart rate and blood flow through the blood vessels</p> <p>Redistribution of blood flow from organs to working muscles</p>	<p>Heart grows stronger and stroke volume increases</p> <p>Resting heartrate decreases</p> <p>Blood vessels become more flexible and less rigid</p> <p>Blood pressure decreases</p> <p>Capillarisation increases to the cells</p>
<b>Respiratory system</b>	<p>Breathing frequency increases</p> <p>More oxygen is inhaled</p> <p>More blood is oxygenated</p> <p>More carbon dioxide is expelled via the lungs</p>	<p>Increased strength in muscles used to increase tidal volume</p> <p>Alveoli efficiency to absorb O<sub>2</sub> and expel Co<sub>2</sub> improves</p>
<b>Muscular system</b>	<p>Activation of fast twitch muscle fibres</p> <p>Increase in temperature of the muscles</p> <p>Increase in elasticity</p> <p>Glycogen depletion and muscle fatigue</p>	<p>Ability to engage in the same level of intensity with less effort</p> <p>Increased lactate threshold and recovery rate improves</p> <p>Ability to sustain level of effort for longer</p> <p>Mitochondrial biogenesis</p>
<b>Skeletal system</b>	<p>Joints lubricated - Synovial fluid increases</p> <p>The start of bone remodelling and strengthening.</p> <p>Bones are put under stress by activated muscles pulling on them</p>	<p>Moderate increase in bone strength</p> <p>Ligament strength improved</p>
<b>Nervous System</b>	<p>Anaerobic energy system used predominantly</p> <p>Increased CNS output to activate muscles</p> <p>Neurotransmitters are activated</p> <p>Neural pathways activated and information retention develops</p> <p>Sympathetic nervous system activated</p> <p>Regulates breathing rate and blood flow</p>	<p>Muscle growth stimulation</p> <p>Stimulates efficiency adaptation in all body systems</p> <p>Lowered sympathetic nervous system activation when not training</p> <p>Promotes parasympathetic activity upon rest</p> <p>Synchronisation improves</p>

## Aerobic Cardiovascular Exercise (low-moderate intensity)

Body System	Single bout (short term) response	Long term adaptation
<b>Cardiovascular system/Blood Pressure</b>	<p>Faster heart contractions. (50-70% maximal rate)</p> <p>Increased blood flow to delivery oxygen to working muscles</p> <p>Wastes are transported in the blood for removal to organs</p> <p>Blood pressure increases due to higher heart rate and blood flow in the blood vessels</p>	<p>Heart become stronger and more efficient</p> <p>Heart pumps more blood into the blood vessels each contraction, leading to lower resting heart rate</p> <p>Circulatory system becomes more elastic and less rigid, leading to lower resting blood pressure</p> <p>Capillarisation increases to the cells</p>
<b>Respiratory system</b>	<p>Breathing rate increases to meet the increased demand of oxygenation of the blood</p> <p>Tidal volume increases to take in more oxygen and expel more carbon dioxide</p>	<p>Improved ability to draw in deeper and longer breaths and take fewer breaths</p> <p>Improved elasticity and strength in muscle that assist breathing leading to ability to breath in more air into the thoracic cavity each breath</p> <p>Alveoli efficiency to absorb O<sub>2</sub> and expel Co<sub>2</sub> improves</p>
<b>Muscular system</b>	<p>Activation of slow twitch muscles fibres</p> <p>Increase in temperature of the muscles</p> <p>Increase in lactic acid from repetitive muscle action</p> <p>Glycogen and fat stores are used as energy</p>	<p>Increase in the size and number of type 1 muscle fibres, which improves endurance performance.</p> <p>Aerobic workouts trigger important metabolic changes in muscle tissue, including mitochondrial biogenesis and increase in protein myoglobin.</p> <p>This can also promote a better ability to burn fat</p>
<b>Skeletal system</b>	<p>Joints lubricated - Synovial fluid increases</p> <p>The start of bone remodelling and strengthening</p> <p>Bones are put under stress by activated muscles pulling on them</p>	<p>Bone strength and density increase</p> <p>Circulation of blood and synovial fluid improves.</p> <p>Range of motion increases based on the type of exercise</p>
<b>Nervous System</b>	<p>Aerobic energy system used predominantly</p> <p>Increased CNS output to activate muscles</p> <p>Neurotransmitters are activated</p> <p>Neural pathways activated and information retention develops</p> <p>Sympathetic nervous system activated</p> <p>Regulates breathing rate and blood flow</p>	<p>Increased neuron growth and activity</p> <p>Improved stress resilience</p> <p>Improved structural and functional improvements in the brain and pathways associated with control and memory</p> <p>Improved ability to convert fat into energy while exercising</p> <p>Slow twitch muscle fibre innervation strengthens and becomes more efficient</p>



## Hypertrophy and Strength

Body System	Single bout (short term) response	Long term adaptation
<b>Cardiovascular system/Blood Pressure</b>	<p>Heart rate increases to 60-80% maximal rate</p> <p>Increased blood flow to deliver oxygen to working muscles</p> <p>Wastes are transported in the blood for removal to organs</p> <p>Blood pressure increases due to higher heart rate and blood flow through the blood vessels</p> <p>Redistribution of blood flow from organs to working muscles</p>	<p>Resting heart rate may decrease</p> <p>Blood vessels may become more flexible and less rigid</p> <p>Resting blood pressure may increase or decrease depending on muscle size and intensity of training</p> <p>Capillarisation increases to the cells</p>
<b>Respiratory system</b>	<p>Breathing rate increases to meet the increased demand of oxygenation of the blood</p> <p>Tidal volume increases to take in more oxygen and expel more carbon dioxide</p>	<p>Improved ability to draw in deeper and longer breaths and take fewer breaths if training intensity is high</p> <p>Improved elasticity and strength in muscle that assist breathing leading to ability to breathe in more air into the thoracic cavity each breath</p> <p>Alveoli efficiency to absorb O<sub>2</sub> and expel CO<sub>2</sub> improves</p>
<b>Muscular system</b>	<p>Activation of slow and fast twitch muscle fibres depending on the demands of the session</p> <p>Increase in temperature of the muscles</p> <p>Increase in lactic acid from repetitive muscle action and duration of sets</p> <p>Glycogen and fat stores are used as energy</p> <p>Muscle fibres are damaged during eccentric phase of the exercises</p> <p>Metabolic stress of the muscles occurs leading to inflammation and need for recovery</p>	<p>Muscle growth including protein synthesis</p> <p>Muscle repair</p> <p>Increased strength of tendons and ligaments</p> <p>Increased</p>
<b>Skeletal system</b>	<p>Joints lubricated - Synovial fluid increases</p> <p>Bones are put under stress by activated muscles pulling on them</p>	<p>Moderate increase in bone strength</p> <p>Ligament strength improved</p>
<b>Nervous System</b>	<p>Anaerobic and aerobic energy systems used</p> <p>Increased CNS output to activate muscles</p> <p>Neurotransmitters are activated to fire muscle</p> <p>Neural pathways activated and information retention develops</p> <p>Sympathetic nervous system activated</p> <p>Regulates breathing rate and blood flow</p> <p>Rate coding and recruitment increases</p>	<p>Muscle growth stimulation – protein synthesis is activated through growth hormone release</p> <p>Promotes parasympathetic activity upon rest</p> <p>Synchronisation and coordination improve in everyday activities</p> <p>Muscles are activated more often outside of training sessions</p> <p>Rate coding and recruitment continues to develop and improve</p>

## High Impact Exercise (running and jumping)

Body System	Single bout (short term) response	Long term adaptation
<b>Cardiovascular system/Blood Pressure</b>	<p>Heart rate increases to 70-90% maximal rate</p> <p>Increased blood flow to deliver oxygen to working muscles</p> <p>Wastes are transported in the blood for removal to organs</p> <p>Blood pressure increases due to higher heart rate and blood flow through the blood vessels</p> <p>Redistribution of blood flow from organs to working muscles</p>	<p>Heart becomes stronger and more efficient</p> <p>Heart pumps more blood into the blood vessels each contraction, leading to lower resting heart rate</p> <p>Circulatory system becomes more elastic and less rigid, leading to lower resting blood pressure</p> <p>Capillarisation increases to the cells</p> <p>Improved recovery when intervals are performed</p>
<b>Respiratory system</b>	<p>Breathing rate increases to meet the increased demand of oxygenation of the blood</p> <p>Tidal volume increases to take in more oxygen and expel more carbon dioxide</p>	<p>Improved ability to draw in deeper and longer breaths and take fewer breaths if training intensity is high</p> <p>Improved elasticity and strength in muscle that assist breathing leading to ability to breathe in more air into the thoracic cavity each breath</p> <p>Alveoli efficiency to absorb O<sub>2</sub> and expel CO<sub>2</sub> improves</p>
<b>Muscular system</b>	<p>Activation of fast twitch muscle fibres</p> <p>Increase in temperature of the muscles</p> <p>Increase in elasticity</p> <p>Glycogen depletion and muscle fatigue</p>	<p>Ability to engage in the same level of intensity with less effort</p> <p>More muscle fibres become active and hypertrophy for strength and power</p> <p>Improved elasticity</p> <p>Increases elastic energy and firing rate and power of muscle fibres</p>
<b>Skeletal system</b>	<p>Bones are placed under stress by impact and activated muscles pulling on them</p>	<p>Significant increase in bone strength and density</p> <p>Ligament strength improved</p>
<b>Nervous System</b>	<p>Anaerobic energy system used predominantly</p> <p>Increased CNS output to activate muscles</p> <p>Stretch reflex response activated to increase force output</p> <p>Neural pathways activated and information retention develops</p> <p>Sympathetic nervous system activated</p> <p>Rate coding and recruitment increases</p>	<p>Muscle growth stimulation</p> <p>Adaptation to speed of stretch to contract rate quickens</p> <p>Synchronisation and coordination improve</p> <p>Rate coding and recruitment develops and improves</p> <p>More muscle fibres become activated</p>

## Endurance Exercise

Body System	Single bout (short term) response	Long term adaptation
<b>Cardiovascular system/Blood Pressure</b>	<p>Faster heart contractions. (50-70% maximal rate)</p> <p>Increased blood flow to delivery oxygen to working muscles</p> <p>Wastes are transported in the blood for removal to organs</p> <p>Blood pressure increases due to higher heart rate and blood flow in the blood vessels</p>	<p>Heart become stronger and more efficient.</p> <p>Heart pumps more blood into the blood vessels each contraction, leading to lower resting heart rate</p> <p>Circulatory system becomes more elastic and less rigid, leading to lower resting blood pressure</p> <p>Capillarisation increases to the cells</p>
<b>Respiratory system</b>	<p>Breathing rate increases to meet the increased demand of oxygenation of the blood</p> <p>Tidal volume increases to take in more oxygen and expel more carbon dioxide</p>	<p>Improved ability to draw in deeper and longer breaths and take fewer breaths</p> <p>Improved elasticity and strength in muscle that assist breathing leading to ability to breath in more air into the thoracic cavity each breath</p> <p>Alveoli efficiency to absorb O<sub>2</sub> and expel Co<sub>2</sub> improves</p>
<b>Muscular system</b>	<p>Activation of slow twitch muscles fibres</p> <p>Increase in temperature of the muscles</p> <p>Increase in lactic acid from repetitive muscle action</p> <p>Glycogen and fat stores are used as energy</p>	<p>Increase in the size and number of type 1 muscle fibres, which improves endurance performance</p> <p>Aerobic workouts trigger important metabolic changes in muscle tissue, including mitochondrial biogenesis and increase in protein myoglobin, this can also promote a better ability to burn fat</p>
<b>Skeletal system</b>	<p>Joints lubricated - Synovial fluid increases</p> <p>Bones are put under stress by activated muscles pulling on them</p>	<p>Moderate increase in bone strength</p> <p>Ligament strength improved</p>
<b>Nervous System</b>	<p>Aerobic energy system used predominantly</p> <p>Increased CNS output to activate muscles</p> <p>Neurotransmitters are activated</p> <p>Neural pathways activated and information retention develops</p> <p>Sympathetic nervous system activated</p> <p>Regulates breathing rate and blood flow</p>	<p>Increased neuron growth and activity</p> <p>Improved stress resilience</p> <p>Improved structural and functional improvements in the brain and pathways associated with control and memory</p> <p>Slow twitch muscle fibre innervation strengthens and becomes more efficient</p> <p>Improved ability to convert fat into energy while exercising</p>

## Flexibility and Mobility Exercise

Body System	Single bout (short term) response	Long term adaptation
<b>Cardiovascular system/Blood Pressure</b>	Improvement in circulation by relaxing blood vessels Increased heart rate and blood flow Blood pressure reduction	May reduce blood pressure May improve blood vessel function and promote circulation
<b>Respiratory system</b>	Minimal change Increase in breathing rate based on blood flow oxygenation requirements	Minimal change
<b>Muscular system</b>	Static stretching can reduce force output in targeted muscles	Improved flexibility in muscles and tendons targeted Reduction in resting length of muscle fibres Possible reduction in force production with increased muscle compliance Reduced feeling of tension and pain in muscles
<b>Skeletal system</b>	Improved resting position of bones and joints	Improved joint range of motion Reduced joint pain Improved posture and bone positions
<b>Nervous System</b>	Activates parasympathetic nervous system	May promote stress relief Reduced feelings of tension and pain

## Selecting exercises for clients

When training clients, fitness instructors need to be able to select appropriate and beneficial exercises for various client types.

The types of exercises that are appropriate for a client are based on the answers to the following questions:

### 1. What does the client want to achieve?

This should be categorised into fitness components. The client may have health related or skill related fitness goals or both. The exercises we select for them must be specific so that the outcomes they desire are achieved.

### 2. What sorts of movements does the client need improvement and strength in?

Does the client need sports specific fitness improvements? Or are they looking to be more efficient and stronger in movements that they perform during their daily duties? The exercises you program should mimic the movement patterns that they want to become more efficient in.

### 3. What is their current level of fitness?

Knowing how advanced the client is in regard to movement efficiency, technique efficiency and strength levels will help you decide what progression of exercise is appropriate for that client.

### 4. Are there any types of exercises that are not appropriate for this client?

A client may have certain conditions due to an existing illness, injury, joint pains or lack of strength that make some types of exercises an inappropriate selection. Exercises that are too intense or too advanced will only put the client at risk of losing confidence in you as the trainer, in their own bodies and increasing the risk of an injury.

There are often many more questions that you will ask during a health screening interview, but the ones mentioned above can help you select basic and safe exercises for various types of clients that will have them achieving their goals without injury.

Client programs should also include the most common movements patterns, trained with even numbers of exercises so that their muscle groups are balanced for postural improvements.

#### The big basic movement patterns essential for all clients are:

- Upper body push – Shoulder press, chest press, triceps pushdown
- Upper body pull – Rowing, pull up or pull down, bicep curl
- Lower body push – Lunge, squat, machine leg press, step up, knee extension
- Lower body pull – Deadlifts, hamstring curl, glute bridge
- Torso rotation, flexion and extension – Russian twist, crunches, back extension
- Core stability and bracing – Plank, paloff press, dead bug

Each of the movement patterns have a wide variety of types of exercises that are considered to be a version of that movement pattern. The next step is to choose a progression of the exercise that suits the client's fitness level and ability to perform the exercise safely and correctly.

## Phases of an exercise

Each exercise has a concentric and an eccentric phase plus the time between each of these phases.

### Concentric phase

This is the push or pull phase or action of a movement. Muscles are loading while flexing, shortening or contracting during this phase.

### End of concentric phase

This is the pause or hold that may or may not have time allocated to it after the concentric phase is completed. Muscles may or may not be loaded during this time, depending on the exercise.

### Eccentric phase

This is the opposite phase to the concentric phase, usually where muscles are controlling a lowering of the load or moving back into position to start the concentric phase again. Muscles are often loaded while extending or lengthening during this phase.

### End of eccentric phase

This is the pause or hold that may or may not have time allocated to it after the eccentric phase is completed. Sometimes the muscles will continue to be loaded during this time or they may be unloaded depending on the exercise.

## Functions and actions of major muscles during movement and exercises

During a movement pattern muscles take on various roles at different times.

**Agonist role** – this is the muscle or group of muscles that are primarily contracting to cause a movement during the concentric phase of an exercise (i.e., the chest muscle during a bench press)

**Antagonist role** – this is the muscle or group of muscles that are on the opposite side of the main joint moving that are relaxing (or allowed to lengthen) while the agonist (or prime mover) contracts. (i.e., the latissimus dorsi during a bench press)

**Synergist role** – these are the muscles that assist with the movement pattern to perform it correctly or to move or stabilise secondary joints moving during an exercise. (i.e., triceps and anterior deltoids during a bench press)

**Fixator role** – These are the smaller muscles that stabilise the origin or the agonists so that can achieve maximum and effective contraction. The fixator muscles increase in tension but do not allow any movement to take place. (i.e., the rotator cuff muscles that stabilise and decrease the forward movement of the shoulder joint during a bench press)

When the fixator muscles are not recruited to keep joints in the correct positions during movements or exercises the joints are pulled into positions that they should not be loaded in and this can lead to injuries.

Insisting on correct technique being achieved and observing that joints are remaining in correct positions when loaded will encourage synergists and fixators to activate to perform their role and prevent incorrect movement, poor posture and injuries.

In the below table you will be able to connect the major movement patterns of the body, with the muscle groups, joints involved, joint movement names during the concentric phase of the movement and some exercise suggestions that are versions of each type of movement.



<b>Movement terminology (joint action)</b>	<b>Joints involved</b>	<b>Agonist Muscles</b>	<b>Synergist muscles</b>	<b>Exercise examples</b>
<ul style="list-style-type: none"> <li>Shoulder horizontal flexion</li> <li>Elbow extension</li> <li>Upper body push horizontal</li> </ul>	<ul style="list-style-type: none"> <li>Shoulder (glenohumeral)</li> <li>Elbow</li> </ul>	<ul style="list-style-type: none"> <li>Pectoral group</li> </ul>	<ul style="list-style-type: none"> <li>Anterior Deltoids</li> <li>Triceps Brachii</li> </ul>	<ul style="list-style-type: none"> <li>Push up</li> <li>Bench Press</li> <li>Seated chest press</li> <li>Dumbbell bench press</li> </ul>
<ul style="list-style-type: none"> <li>Shoulder abduction</li> <li>Elbow extension</li> <li>Upper body push vertical</li> </ul>	<ul style="list-style-type: none"> <li>Shoulder (glenohumeral)</li> <li>Elbow</li> </ul>	<ul style="list-style-type: none"> <li>Deltoid group</li> </ul>	<ul style="list-style-type: none"> <li>Triceps brachii</li> </ul>	<ul style="list-style-type: none"> <li>Handstand push up</li> <li>Seated shoulder press</li> <li>Dumbbell or barbell shoulder press</li> </ul>
<ul style="list-style-type: none"> <li>Shoulder horizontal extension</li> <li>Elbow flexion</li> <li>Upper body pull horizontal</li> </ul>	<ul style="list-style-type: none"> <li>Shoulder (glenohumeral)</li> <li>Elbow</li> </ul>	<ul style="list-style-type: none"> <li>Trapezius</li> <li>Rhomboids</li> </ul>	<ul style="list-style-type: none"> <li>Biceps brachii</li> <li>Teres major/minor</li> </ul>	<ul style="list-style-type: none"> <li>Bent over row</li> <li>Pendlay row</li> <li>Seated row</li> <li>Under bar pull up</li> </ul>
<ul style="list-style-type: none"> <li>Shoulder adduction</li> <li>Elbow flexion</li> <li>Upper body pull vertical</li> </ul>	<ul style="list-style-type: none"> <li>Shoulder (glenohumeral)</li> <li>Elbow</li> </ul>	<ul style="list-style-type: none"> <li>Latissimus dorsi</li> </ul>	<ul style="list-style-type: none"> <li>Biceps brachii</li> <li>Teres major/minor</li> <li>Trapezius</li> </ul>	<ul style="list-style-type: none"> <li>Pull up</li> <li>Chin up</li> <li>Lateral Pull down</li> </ul>
<ul style="list-style-type: none"> <li>Hip extension</li> <li>Knee extension</li> <li>Lower body push horizontal</li> </ul>	<ul style="list-style-type: none"> <li>Hip</li> <li>Knee</li> </ul>	<ul style="list-style-type: none"> <li>Quadriceps</li> <li>Glutes</li> </ul>	<ul style="list-style-type: none"> <li>Hamstrings</li> <li>Calves</li> </ul>	<ul style="list-style-type: none"> <li>Horizontal leg press</li> </ul>
<ul style="list-style-type: none"> <li>Hip extension</li> <li>Knee extension</li> <li>Lower body push vertical</li> </ul>	<ul style="list-style-type: none"> <li>Hip</li> <li>Knee</li> </ul>	<ul style="list-style-type: none"> <li>Quadriceps</li> <li>Glutes</li> <li>Calves (calf raise)</li> </ul>	<ul style="list-style-type: none"> <li>Hamstrings</li> <li>Calves</li> <li>Core</li> </ul>	<ul style="list-style-type: none"> <li>Squats</li> <li>Split squats</li> <li>Lunges</li> <li>Calf raises</li> <li>Step up</li> </ul>
<ul style="list-style-type: none"> <li>Knee flexion</li> <li>Lower body pull horizontal</li> </ul>	<ul style="list-style-type: none"> <li>Knee</li> </ul>	<ul style="list-style-type: none"> <li>Hamstrings</li> </ul>	<ul style="list-style-type: none"> <li>Calves</li> </ul>	<ul style="list-style-type: none"> <li>Lying hamstring curl</li> <li>Swiss ball curls</li> </ul>

<b>Movement terminology (joint action)</b>	<b>Joints involved</b>	<b>Agonist Muscles</b>	<b>Synergist muscles</b>	<b>Exercise examples</b>
<ul style="list-style-type: none"> <li>• Hip extension</li> <li>• Lower body pull vertical</li> </ul>	<ul style="list-style-type: none"> <li>• Hip</li> </ul>	<ul style="list-style-type: none"> <li>• Glutes</li> <li>• Hamstrings</li> </ul>	<ul style="list-style-type: none"> <li>• Core</li> <li>• Hip stabilisers</li> </ul>	<ul style="list-style-type: none"> <li>• Deadlift</li> <li>• Single leg deadlift</li> </ul>
<ul style="list-style-type: none"> <li>• Torso rotation</li> </ul>	<ul style="list-style-type: none"> <li>• Vertebral column</li> </ul>	<ul style="list-style-type: none"> <li>• Obliques</li> </ul>	<ul style="list-style-type: none"> <li>• Rectus abdominus</li> <li>• Erector spinae group</li> </ul>	<ul style="list-style-type: none"> <li>• Russian twist</li> <li>• Woodchops</li> <li>• Cable rotation</li> </ul>
<ul style="list-style-type: none"> <li>• Hip extension</li> <li>• Hip hinges</li> </ul>	<ul style="list-style-type: none"> <li>• Hips</li> <li>• Vertebral column</li> </ul>	<ul style="list-style-type: none"> <li>• Glutes</li> <li>• Hip flexors</li> </ul>	<ul style="list-style-type: none"> <li>• Erector spine group</li> <li>• Hamstrings</li> <li>• Abdominals</li> </ul>	<ul style="list-style-type: none"> <li>• Good morning</li> <li>• Back extension</li> <li>• Leg raises/drops</li> </ul>
<ul style="list-style-type: none"> <li>• Torsoflexion</li> </ul>	<ul style="list-style-type: none"> <li>• Vertebral column</li> </ul>	<ul style="list-style-type: none"> <li>• Rectus abdominus</li> </ul>	<ul style="list-style-type: none"> <li>• Hip flexors</li> </ul>	<ul style="list-style-type: none"> <li>• Sit-ups</li> <li>• Crunches</li> <li>• Knee raises/ curls</li> </ul>
<ul style="list-style-type: none"> <li>• Torso extension</li> </ul>	<ul style="list-style-type: none"> <li>• Vertebral column</li> </ul>	<ul style="list-style-type: none"> <li>• Lower back</li> <li>• Erector Spinae</li> </ul>	<ul style="list-style-type: none"> <li>• Gluteal group</li> <li>• Transverse abdominus</li> </ul>	<ul style="list-style-type: none"> <li>• Back extension</li> <li>• Superman</li> </ul>
<ul style="list-style-type: none"> <li>• Core brace</li> </ul>	<ul style="list-style-type: none"> <li>• Vertebra column</li> </ul>	<ul style="list-style-type: none"> <li>• Transverse abdominus</li> <li>• Obliques</li> <li>• Erector spinae (isometric hold)</li> </ul>	<ul style="list-style-type: none"> <li>• Deep core muscles</li> <li>• Gluteal group</li> </ul>	<ul style="list-style-type: none"> <li>• Plank</li> <li>• Side plank</li> <li>• Dead bugs</li> <li>• Paloff Press</li> <li>• Hollow hold</li> </ul>

## Progressing and regressing exercises

When selecting an exercise, we may need to progress or regress it to suit a client or a client group.

The following progressions and regressions apply to all exercise types.

When choosing an exercise, consider if it would be best to progress or regress it for the clients needs.

### **Important:**

It is best to choose a progression level that the client will be able to perform and make it more challenging once you can see that they can achieve that level safely and effectively. It is much safer to increase an exercises intensity than to program something too difficult and risk an injury occurring.

### **Ways to REGRESS an exercise or program:**

- Make the exercise or program less complicated
- Reduce the load/weight
- Slow the movement down
- Reduce the lever length
- Reduce the range of motion
- Increase the rest periods
- Change the order of the exercises to alternate muscle groups
- Train less often

### **Ways to PROGRESS an exercise or program:**

- Make the exercise or program more complicated
- Increase the load/weight
- Speed up the movement down
- Increase the lever length
- Increase the range of motion
- Decrease the rest periods
- Change the order of the exercises to overload similar muscle groups
- Train more often



## **Basic client types**

There are a few basic client types that most clients can be categorised into. Then their unique personal preferences and needs must be considered, but we will go deeper on this subject when we reach the programming units. Let's look at the basic client types first and the types of exercises that would likely suit them best based on fundamental and common needs of these groups. The fitness needs mentioned below are common to these groups only. Not all people that fit into a group will necessarily have these as goals.

### **Female adults**

Female adults range from the ages of 18 - 55 years. Younger than 18, and they are classified as adolescents or children and older than 55, they are classified as senior populations.

#### **Female fitness needs:**

- Maintain healthy BMI to reduce the risk of lifestyle disease
- Maintain healthy waist to hip ratio
- Increase muscle strength for ease of daily life
- Improve cardiovascular fitness for cardiovascular health
- Increase metabolic rate to reduce the risk of excessive fat gain
- Improve posture and core strength

Females are able to healthily carry more body fat than males due to their ability to grow a baby and the bodies needs for such a process. According to the American Journal of Clinical Nutrition, the normal body fat range for a female is 21% - 32%. Females also tend to carry body fat in areas such as the lower body and limbs, which is a healthier place to carry it than in the abdominal region.

### **Male adults**

#### **Male fitness needs:**

- Maintain healthy BMI to reduce the risk of lifestyle disease
- Maintain healthy waist to hip ratio
- Increase muscle strength for ease of daily life
- Improve cardiovascular fitness for cardiovascular health
- Increase metabolic rate to reduce the risk of excessive fat gain
- Improve posture and core strength

Males are required to maintain a lower body fat range for health purposes. According to the American Journal of Clinical Nutrition, men should have 10% to 20% body fat to reduce the risk of lifestyle disease.

Men tend to carry body fat in the abdominal region more prevalently than women, due to hormonal variances, and therefore a focus on healthy waist to hip ratio is essential for male clients. Male clients will commonly be naturally stronger than female clients, due to the fact that men maintain muscle mass more easily than women and may be able to perform more advanced progressions of exercises in less training time. (For example: many females will need to start performing push ups on their knees and may take some time to progress to their toes, whereas quite a few male clients will be able to complete push ups on their toes even if they have not been strength training regularly.)

## Clients over 55 years

### Senior client fitness needs:

- Maintain healthy BMI to reduce the risk of lifestyle disease
- Maintain healthy waist to hip ratio
- Increase muscle strength for ease of daily life and to reduce the rate of sarcopenia
- Maintain cardiovascular fitness with low impact exercise
- Improve posture and core muscle strength
- Improve balance and stability for falls prevention
- Low to moderate physical activity daily

The fitness level of a senior client will be dependant on how much physical activity they have performed prior, during the rest of their life. If the senior client is just starting a fitness training program, then progress should be taken slow, and abilities confirmed before progression occurs. Regular low to moderate exercise is more beneficial than irregular high intensity exercise, as this may increase the risk of injury. The main focus in a fitness program for senior clients is to maintain cardiovascular health and increase full body muscle strength for ease of everyday activities. Another important consideration in senior clients is balance and stability development to reduce the risk of falls.

## Sedentary clients

A sedentary lifestyle describes clients that have not been engaging in physical activity before or within the last 12 months. These clients will also, likely, fall into one of the other categories (male, female or senior) and sedentary will describe their current activity levels.

(For example, they may be a senior and have a sedentary lifestyle or a male adult that has been sedentary) Sedentary clients may have been to their GP who told them they need to start exercising for health reasons or be realising that living a non-active lifestyle isn't healthy and be coming to you for guidance to start structured exercise.

### Sedentary client fitness considerations:

- May have a diagnosed health condition
- May have a low level of cardiovascular fitness
- May have postural weakness and joint pain from sitting positions
- May be overweight or obese
- May have low muscle strength

Sedentary clients should start at a low level of progression and feel personally confident to progress to a new level. The focus should be on regularity of movement, healthy body composition attainment and building of active habits into their daily lives for health and reduction of the risk of lifestyle diseases. It's important to identify their personal barriers to exercise and help them implement strategies to minimise or overcome these to incorporate physical activity into their lives permanently.

## Active clients

Active clients are those that have been engaging in physical activity recently. This might include regular moderate intensity cardiovascular or strength training that is structured and they have made progressions in.

They are the opposite to sedentary clients who engage in minimal or no structured exercise.

### Active client fitness considerations:

- May have a moderate level of fitness already
- Will not necessarily have progressed optimally (may have strong legs and a weak core for example)
- May not have progressed evenly in strength (may still have posture muscle imbalance)
- May have an injury or joint pain from recent activities
- May still require technique correction
- May expect to start training at a moderate level rather than starting slow
- May have fitness goals that are skill-related
- Should still ensure health related components are being trained to reduce the risk of lifestyle disease

Active clients may be able to perform progressed versions of exercises. The focus should be on finding out where their strength level is in all muscle groups, ensuring posture is ideal and that progressing doesn't put the body at risk of injury. Their personal goals also need to be programmed for that may be sports specific or strength or hypertrophy based.

### When selecting exercises that are appropriate for each client consider the following:

1. Which population groups do they identify with?
2. What are the best exercise types for those population groups health needs?
3. What is the current client's fitness level?
4. What are their goals?
5. Do they have any limitations that would increase their risk of injury when performing certain exercise types or intensities.

Once these things have been considered, safe and beneficial exercises should be selected to match their needs, preferences and goals.

## Common injuries and causes

There are a variety of types of injuries that can affect clients and it is important that fitness instructors are aware of what can happen and how these injuries commonly occur so that they can program exercises that are safe and reduce the risk of an injury occurring.

### Primary injury

This is immediate damage incurred at the time that the injury happens. These may be caused by a direct blow or an indirect cause. Including skin lacerations or abrasions, fractures, dislocations, sprains and strains, tissue tears and internal or external haemorrhage.

### Secondary injury

Secondary injuries are ones that evolve after the initial injury event. As an example – a leg bone may break which is the primary injury and the secondary injury may be nervous system damage leading to leg pain, or structural damage that occurs to the tissues surrounding the primary injury site. Inflammation, swelling, bruising, reduced blood flow or nervous system damage can cause or lead to secondary injuries.



## Direct injury

Direct injuries are caused by a direct force from a person or thing that is external to the body. This would most often happen during an event where the client is hit by an object like a ball or has a collision with a person. Direct injury often causes instant (or primary) tissue trauma like sprains, strains, bruising, fractures, dislocations and internal bleeding.

## Indirect injury

Indirect injuries are caused by either an internal force within the body or excessive force (not a person or thing) from outside the body. They are caused by over-stretching, poor technique or movement patterns, fatigue or lack of strength or fitness for the specific activity.

These type of injuries can also occur when a client has imbalances in their muscles, perform sudden movements outside of their normal range of joint motion or from weakness in a particular muscle.

## Acute injury

An acute injury is a sudden and overwhelming injury that is a result of some sort of physical activity. They often occur from a movement or impact during activity that the body was not prepared for or couldn't activate fast enough to protect the body from injury. The tissues affected can be bone, muscle, tendon and ligament, nerve, brain and skin.

The most common types of acute injuries are fractures, sprains, strains, tears, dislocations and more.

These generally occur when the body has not been warmed up or prepared adequately for a type of activity.

They can also occur from direct or indirect causes.

## Overuse injury

Overuse injuries occur from repetitive activity that is stressful and where not enough recovery is allowed between sessions. Exercise, in itself, is a trauma on the body. We traumatise it just enough so that when it recovers it is stronger and better prepared for that level of trauma next time.

If we continue to apply the trauma, without enough recovery, or add too much stimulus, then an overuse injury is likely. Overuse injuries may also occur without excessive activity but if the activity that is performed is not done with correct technique, which adds excessive stress on a certain joint, bone or muscle over time.

Common overuse injuries include tendinitis, stress fractures, joint or tissue inflammation, shin splints etc.

For more detail on common injuries:

<https://www.niams.nih.gov/health-topics/sports-injuries>

<https://www.mayoclinic.org/healthy-lifestyle/fitness/in-depth/overuse-injury/art-20045875>

[https://www.physio-pedia.com/Sport\\_Injury\\_Classification](https://www.physio-pedia.com/Sport_Injury_Classification)



## **Ways to prevent injuries**

When training clients there are some important precautions to take to reduce the risk of them sustaining an injury. Be sure to include all of these precautionary measures with all clients to give them the best chance of exercising safely, effectively and not sustaining an injury.

### **1. Perform an adequate and appropriate warm up before physical activity.**

Warmups should include:

- Adequate blood flow stimulation to bring oxygen and nutrients to the muscles that are going to be working.
- Movement into ranges of motion that you expect to move into during the physical activity to ensure the muscles are familiar with this range of motion in a controlled environment.
- Activation of any muscles that are typically underactive to confirm they are “Switching on” during the training sessions.

### **2. Do not progress the exercises or sessions too quickly.**

Exercise progression should not exceed 5% above the previous level and should only be introduced when the client can confidently perform the previous level of intensity effectively.

### **3. Do not allow clients to continue to perform exercise with incorrect technique.**

Allowing this reinforces incorrect movement patterns and muscle imbalances. It will also neglect to encourage the body to create habits of firing the most effective muscles for certain movement patterns. If the client cannot perform the exercise correctly when cued in the correct technique or positions, regress the exercise to a level they can achieve. This builds their confidence to perform well and reduces the risk of an adverse incident.

### **4. Include adequate stretching to improve joint ranges of motion during cool downs and between activity sessions.**





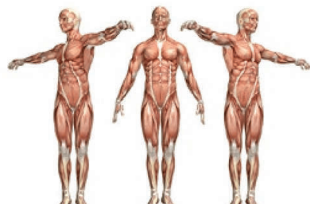

### **5. Ensure adequate recovery is achieved between sessions with strategies to decrease stress, fuel the body with proper nutrition and achieve high quality rest and sleep.**

## **Correct exercise technique**

There are many versions of the exercises that require clients to move into the main movement patterns. It will be beneficial for you to start researching different exercises and how to correct the technique for each one when training clients. Here are some ways to explain common movement patterns and exercise to clients to help them perform them correctly.

Try this:

Remember to use visual demonstrations and point to muscles and joints that you are referring to when explaining and instructing exercises to clients. You can also practice performing the correct technique of certain exercises in front of a mirror and talk yourself through the movement sequence so that you become familiar with the types of terms clients may respond to when helping them correct their movement patterns, move their bodies into correct positions and activate the right muscles to do the primary movements.

Movement	
<p><b>Pull</b> (bent over row)</p> <p>Hold a bar or rod like object with both hands, shoulder width apart. Move your body into a 90-degree bent over angle with a straight back and slightly bent knees.</p> <p>Row the bar from your knees, up your legs and into the crease of your hips toward your belly. Perform 2-3 reps maintaining the bent over position with a straight back.</p>	
<p><b>Push</b> (push-up)</p> <p>Start in the straight arm plank position with core engaged and spine in neutral or straight position.</p> <p>Hands are slightly wider than shoulder width.</p> <p>Lower body down toward the ground while maintaining the neutral spine position. Push back up to straight arm starting position.</p> <p>Perform 3-4 perfect push ups with correct technique.</p>	
<p><b>Squat</b></p> <p>Place feet slightly wider than hip width apart with feet turned out slightly.</p> <p>Push your hips back behind you and keep the weight of your body primarily in the heels of your feet as you lower your hips toward the ground. Rise back up to the straight leg starting position.</p> <p>Perform 5-6 repetitions with knees tracking in line with the toes.</p>	
<p><b>Lunge</b> (or split squat)</p> <p>Start with legs in a split stance – body weight primarily in the front foot and back toe with light weight through it.</p> <p>Engage core to remain balanced. Lower down until the back knee is within 5cm of the ground. Front knee should be behind the toes still and torso straight.</p> <p>Repeat the lunge 4-5 times with each leg forward.</p>	
<p><b>Rotate</b></p> <p>Stand with arms wide and hips facing forward. Hold the hips facing forward and rotate the arms and head 90 degrees to the left and then 90 degrees to the right.</p> <p>Repeat twice on each side.</p>	
<p><b>Overhead press:</b> (no weight required)</p> <p>This is best performed with a light rod or no weight at all until technique is perfect.</p> <p>Stand with hands wider than shoulder holding onto a light rod placed across collar bone.</p> <p>Maintain tall body with neutral spine and press the bar overhead until the bar is directly above your head and elbows by your ears.</p> <p>Extend arms to straight. Lower back to starting position and repeat 3 times.</p>	

# HEALTHY EATING

## What is Nutrition?

### **nutrition**

*noun*

The process of taking in food and using it for growth, metabolism, and repair.

A healthy diet provides the body with the nutrients it needs to perform, maintain wellness, and fight disease.

According to the World Health Organisation (2022) (WHO):

Nutrition is a critical part of health and development. Better nutrition is related to improved infant, child and maternal health, stronger immune systems, safer pregnancy and childbirth, lower risk of non-communicable diseases (such as diabetes and cardiovascular disease), and longevity.

Malnutrition is a significant threat to the world's public health.

Adults and children with adequate nutrition are more productive and can seek opportunities to break common patterns of poverty and hunger.

**'Today the world faces a double burden of malnutrition that includes both undernutrition and overweight' (WHO 2022)**



## Why is nutrition important?

Diet is one of the most important behavioural risk factor that can impact our health.

The quality and quantity of foods and drinks we consume have a significant impact on our health and wellbeing, society and the environment.

Better nutrition has huge potential to improve individual and public health and decrease healthcare costs.

Optimal nutrition is essential for the normal growth and physical and cognitive development of infants and children. In all Australians, nutrition contributes significantly to healthy weight, quality of life and wellbeing, resistance to infection, and protection against chronic disease and premature death.

A healthy diet helps the body work effectively at a cellular level. It is at a cellular level that the body fights deficiencies, excesses and provides immune responses to counteract environmental factors.

The food and drinks we consume, and digest, contain macro and micronutrients that our body uses to generate energy, repair and rebuild our cells and tissues and fight disease.

Many of these nutrients we can only get from dietary sources and if we are not consuming a good variety of food types, we can miss out on essential nutrients that are important for our body to have to remain healthy.

Overconsumption of most macro and micronutrients is also not healthy for us and can lead to health issues just like under consumption can.

## **Benefits of Healthy Eating**

Evidence of the health benefits of a dietary pattern consisting of a variety of nutritious foods in appropriate amounts has strengthened over the past decade. The evidence suggests that high diet quality is associated with a reduced risk of chronic disease and improved health outcomes.

Benefits of a healthy diet include:

- Reduced morbidity (state of having a specific illness or condition)
- Reduced mortality (death from a specific illness or condition)
- Reduced risk of various chronic disease (long lasting conditions with persistent symptoms)
- Improved health outcomes
- Reduced risk of cardiovascular disease
- Reduced risk of some cancers
- Reduced risk of obesity
- Reduced risk of Type 2 diabetes
- Improved immune function
- Improved energy and performance

## **Relationship to physical well being**

Recent reviews of the evidence on food and health confirm that healthy dietary patterns are positively associated with increased health and wellbeing.

Two systematic reviews conducted when updating the Australian Dietary Guidelines found that higher dietary quality was consistently associated with a 10–20% reduction in morbidity. When a wide range of eating patterns was assessed for compliance with different guidelines using a variety of qualitative tools, the assessment suggested an association between adherence to national dietary guidelines and recommendations, and reduced morbidity and mortality (Grade B; Evidence Report, Section 20.1).

More recent evidence from western societies confirms that dietary patterns consistent with guidelines recommending relatively high amounts of vegetables, fruit, whole grains, poultry, fish, and reduced fat milk, yoghurt and cheese products may be associated with superior nutritional status, quality of life and survival in older adults. Modelling of dietary patterns in accordance with dietary guidelines has demonstrated achievable reductions in predicted cardiovascular and cancer disease mortality in the population, particularly with increased consumption of fruit and vegetables (Australian Dietary Guidelines 2013 p. 1 & 2).

## **Effects of an unbalanced diet**

If clients don't understand the need to have a balanced diet and take steps to develop healthy eating habits, the impact on their health can be very serious.

Malnutrition results from an unbalanced diet in which certain nutrients are lacking, in excess (too high an intake), or in the wrong proportions.

It can cause nutritional disorders, depending on which nutrients are under or over-abundant in the diet.

Malnutrition increases the risk of:

- Infection and infectious disease
- Onset of chronic disease (i.e., cardiovascular disease, type 2 diabetes, some cancers, dementia)
- Lack of energy and performance
- Lifestyle diseases
- Poor mental health
- Poor sleep quality
- Premature death

## Where to go for credible nutrition knowledge

There are many people on the internet claiming to have the latest nutritional advice but the question we need to ask is whether their claims have been evaluated and clear evidence gained that their advice improves health and longevity in the majority of people that follow it.

Following dietary patterns, which are consistent with the Australian Dietary Guidelines and the Eat for Health Educator's Guide is recommended for Australians. These have been evaluated extensively and clinical results gained on the effect they can have on human wellness, disease prevention and morbidity rates.

When people model their dietary patterns in accordance with dietary guidelines, they will have optimum chance of reducing the risk of lifestyle related diseases.

The Australian Dietary Guidelines form part of a suite of resources on nutrition and dietary guidance. Other documents in the suite include the following:

- Nutrient Reference Values for Australia and New Zealand (NRV Document) – This details quantitative nutrient reference values (NRVs) for different ages and genders. The NRVs detail the recommended amounts of macronutrients and micronutrients required to avoid deficiency, toxicity and chronic disease. As an example, the NRV Document would be the reference for finding out how much iron is needed by women aged between 19 and 30 years.
- A modelling system to inform the revision of the Australian Guide to Healthy Eating (Food Modelling System) – This describes a range of computer-generated diets that translate the NRVs into dietary patterns to describe some types, combinations and amounts of foods that can deliver nutrient requirements for each age and gender group of different height and activity levels in the Australian population. A range of models including omnivore, lacto-ovo vegetarian, pasta and rice-based dietary patterns were developed, and primarily omnivorous dietary patterns were used to inform the Australian Guide to Healthy Eating and companion resources.
- A review of the evidence to address targeted questions to inform the revision of the Australian Dietary Guidelines (Evidence Report) – This is a systematic approach to literature review relevant to targeted questions published in the peer-reviewed nutrition literature from 2002–2009. As an example, the Evidence Report would be the reference for looking at the evidence for a particular evidence statement included in these Guidelines.
- Infant Feeding Guidelines – This document aims to support optimum infant nutrition by providing health workers with a review of the evidence, and clear evidence-based recommendations on infant feeding. It is relevant to healthy, term infants of normal birth weight.
- Australian Guide to Healthy Eating – This is the food selection tool which reflects dietary patterns divided into portions from the five food groups – fruit, vegetables, grains, milk, yoghurt and cheese products and lean meats (or alternatives), representing the proportion of these food groups required each day.
- Companion resources – These include an interactive website, summary booklets, brochures and posters for health professionals and consumers. (Australian Dietary Guidelines 2013 P 3)

If you would like more information on the subjects discussed in this Learner Guide, and to access studies evidencing the health claims linked to the healthy eating patterns recommended by the Australian Dietary Guidelines please consult these documents available on the internet at [www.eatforhealth.gov.au](http://www.eatforhealth.gov.au)

Much of the information in this Learner Guide is sourced from the Australian Dietary Guidelines 2013 pdf: Available online at <https://www.health.gov.au/sites/default/files/australian-dietary-guidelines.pdf>



## **Dietary Impact on Fitness Goals and Health Outcomes**

When a client comes to a fitness representative for assistance to achieve a certain health or fitness goal, their diet habits must be considered as they can impact on a client's ability to achieve a certain goal and also the time it may take to achieve such a goal if diet changes are not implemented.

When encouraging a client to consider improving their eating habits, explaining the relationship that healthy eating has on physical wellbeing and how their eating habits can impact on their health and fitness goals can be a good way to communicate how essential our diet really is. When the client becomes educated and understands why you are suggesting diet improvements, it may motivate them to want to change their eating habits more and be more invested in making the adjustments they need to make to their eating for optimal performance.

### **Consider the following ways diet can impact on a client's health and fitness outcomes:**

#### **Reduced energy to train consistently**

If a client is not taking in adequate macro and micro-nutrients, they will lack the energy they need to be consistent in their training sessions each week. This can lead to feeling too exhausted to train and missing sessions which will impact their overall goals.

#### **Reduced performance**

When a client is training in their session, progress will often come from training at a relatively high intensity. Poor dietary habits can lead to lack of energy and output during a training session and less adaptation than expected if they were able to perform optimally.

#### **Mental health**

Poor dietary habits can affect mental health and motivation to be consistent in a training program or to train optimally during a training session. Mental and emotional stress is also demanding on the body, leaving it exhausted and can result in less output during sessions.

#### **Impaired recovery**

Inadequate nutrition can affect recovery after training sessions, leading to lower levels of adaptation and higher risk of overtraining symptoms. Sleep quality is also affected by our diet and when sleep quality is not optimal the muscles and nervous system will not recover adequately.

#### **Immune system function**

A high-quality diet will support immune function and reduce the risk of contracting communicable diseases. When a client is well, they will be able to train more consistently and with more effort. Sickness will lead to setbacks in a training regime and affect a client's goal achievement.

#### **Higher risk of injury**

Adequate macro and micro-nutrients are required to repair the body after training. A highly nutritious diet is necessary to avoid physical injuries in the body and promote progression of load and exercise type due to optimal soft tissue recovery and growth.

When consulting with and providing recommendations to a client about their fitness and health goals, dietary considerations are an essential part of the equation and must be reviewed and often adjusted if a client is going to have the best chance of achieving their goals effectively, safely and in an ideal timeframe.

## Lifestyle Diseases and Dietary Factors

Lifestyle diseases are conditions that are often triggered or developed earlier than usual because of unhealthy habits.

We will eventually have health issues as the ageing process occurs, but we can avoid the early onset of these diseases by making healthy choices during our life.

Our nutrition choices are a large part of the lifestyle choices that we can adjust to help prevent lifestyle diseases.

We will consider some of the most common lifestyle diseases and identify key lifestyle and nutritional factors that are related so that you can communicate the risks to clients and suggest lifestyle strategies they can implement and dietary habits they can adopt to reduce the risk of these diseases.

### Obesity

Obesity is generally caused by eating too much and moving too little. If we consume high amounts of energy, particularly fat and sugars in our diet, but do not burn off the energy through exercise and physical activity, much of the surplus energy will be stored by the body as fat.

Obesity isn't just a cosmetic concern. It's a medical problem that increases the risk of other diseases and health problems.

People with obesity are more likely to develop a number of potentially serious health problems, including:

- **Heart disease and strokes.** Obesity makes you more likely to have high blood pressure and abnormal cholesterol levels, which are risk factors for heart disease and strokes.
- **Type 2 diabetes.** Obesity can affect the way the body uses insulin to control blood sugar levels. This raises the risk of insulin resistance and diabetes.
- **Certain cancers.** Obesity may increase the risk of cancer of the uterus, cervix, endometrium, ovary, breast, colon, rectum, oesophagus, liver, gallbladder, pancreas, kidney and prostate.
- **Digestive problems.** Obesity increases the likelihood of developing heartburn, gallbladder disease and liver problems.
- **Sleep apnoea.** People with obesity are more likely to have sleep apnoea, a potentially serious disorder in which breathing repeatedly stops and starts during sleep.
- **Osteoarthritis.** Obesity increases the stress placed on weight-bearing joints, in addition to promoting inflammation within the body. These factors may lead to complications such as osteoarthritis.
- **Severe COVID-19 symptoms.** Obesity increases the risk of developing severe symptoms if you become infected with the virus that causes coronavirus disease 2019 (COVID-19). People who have severe cases of COVID-19 may require treatment in intensive care units or even mechanical assistance to breathe.

Obesity is defined as having excess body weight, often diagnosed using BMI as a measure. To calculate your BMI, divide weight in kilograms by height in meters squared.

**Example** – Female: 61 kg and 164 cm = 22.67 BMI

**Here is how to calculate this persons BMI:**

To square the height in metres:  $1.64 \times 1.64 = 2.69$  Weight divided by height squared =  $61 / 2.69 = 22.67$

BMI	Weight status
Below 18.5	Underweight
18.5–24.9	Normal
25.0–29.9	Overweight
30.0 and higher	Obesity

For most people, BMI provides a reasonable estimate of body fat. However, BMI doesn't directly measure body fat, so some people, such as muscular athletes, may have a BMI in the obesity category even though they don't have excess body fat.

Many doctors also measure a person's waist circumference to help guide treatment decisions. Weight-related health problems are more common in men with a waist circumference over 40 inches (102 centimetres) and in women with a waist measurement over 35 inches (89 centimetres).

## Obesity Prevention

Many of these obesity prevention tips are the same for losing or maintaining a healthy weight. The bottom line is that eating a healthy diet and getting more physical activity can help prevent obesity.

### Strategies to prevent obesity:

- Consume less saturated fat
- Consume less processed and sugary foods
- Eat more serves of fruits and vegetables
- Eat plenty of fibre in your diet
- Focus on more wholegrain foods
- Engage in regular aerobic activities
- Incorporate strength training in activity schedule
- Enjoy activity with family and friends regularly
- Reduce daily stress
- Eat smaller portions of food



## Cardiovascular Disease and Stroke

Heart disease and stroke are responsible for 16% of the world's total deaths. Heart disease is the number one cause of death in Australia – in 2018, 11% of all deaths were as a result of heart disease. Although there is not one single cause, an unhealthy diet can be one of the contributing risk factors for heart disease.

Since 2000, the largest increase in deaths has been for this disease, rising by more than two million to 8.9 million deaths in 2019.

Ischemic heart disease is caused by a decrease in blood flow through one or more of the blood vessels that carry oxygen to your heart (coronary arteries).

Fatty deposits (or plaque) gradually build up on the inside of the artery walls, narrowing the space in which blood can flow to heart. This process is called Atherosclerosis and can start when you are young, so by the time you reach middle age, it can be quite advanced.

Plaque build-up can be considered as stable or unstable. If there is too much build-up of stable plaque, it narrows the arteries, causing pain and discomfort due to not enough blood reaching the heart – this is called angina and can be treated to reduce the symptoms but can worsen and eventually cause cardiac arrest if too little blood is able to reach the heart.

Unstable plaque is inflamed and has a thin cap which can develop a crack, allowing the blood to come in contact with the fatty contents of the plaque. The blood will clot to try to seal the gap but in doing so, the blood clot blocks the artery. This prevents the flow of blood to the heart, cuts off its oxygen supply and damages or kills the heart cells. This is when a heart attack happens.

Plaque in the arteries is largely made from calcium, cholesterol and fat.

- Atherosclerosis happens when the endothelium becomes damaged, due to factors such as smoking, high blood pressure, or elevated levels of glucose, fat, and cholesterol in the blood.
- This damage allows a collection of substances, known as plaque, to build up in the artery wall.
- The symptoms of atherosclerosis depend on which arteries are affected.

### 1. Carotid arteries provide blood to the brain.

Restricted blood supply can lead to a stroke.

### 2. Coronary arteries provide blood to the heart.

When the blood supply to the heart falls, it can cause angina or heart attack.

### 3. Renal arteries supply blood to the kidneys.

If the blood supply becomes limited, kidney disease may develop.

There are many factors that can increase our risk of heart disease. Some factors cannot be changed, but many can. It is essential that we as fitness professionals help our clients learn how to and adjust lifestyle factors that can reduce their risk of heart disease and possible early death.

Risk factors that can't be changed	Risk factors that we can control
<ul style="list-style-type: none"><li>• Age</li><li>• Gender</li><li>• Ethnicity</li><li>• Family history of heart disease</li></ul>	<ul style="list-style-type: none"><li>• Smoking status</li><li>• Diet</li><li>• Cholesterol levels</li><li>• Blood pressure</li><li>• Body weight and composition</li><li>• Diabetes management</li><li>• Physical activity levels</li><li>• Mental health treatment</li></ul>

One of the best things you can do to reduce your risk of heart disease is to have a healthy diet and maintain a healthy weight!

Key diet related lifestyle actions to reduce the risk of the early onset of heart disease:

- Maintain a healthy body weight (see “Obesity”)
- Keep cholesterol levels controlled (see “High cholesterol”)
- Control blood sugar levels by controlling carbohydrate intake (see “Diabetes”)
- Reduce saturated fat, foods high in sodium and added sugars
- Consume plenty of whole, plant-based foods
- Consume alcohol moderately

## High Cholesterol

Cholesterol is a waxy, fatty substance produced naturally by your liver and found in your blood. Cholesterol is used for many different things in your body, but it can become a problem when there is too much of it in your blood.

### The two main types of cholesterol are:

- Low-density lipoprotein (LDL) – also known as ‘bad’ cholesterol because it can add to the build-up of plaque (fatty deposits) in your arteries and increase your risk of coronary heart disease.
- High-density lipoprotein (HDL) – also known as ‘good’ cholesterol because it can help to protect you against coronary heart disease.

High levels of LDL cholesterol in your blood are mainly caused by eating foods that aren’t part of a healthy eating pattern.

Diseases that have been linked to high cholesterol include coronary heart disease, stroke, peripheral arterial disease, type 2 diabetes and high blood pressure.

### Some causes of high cholesterol include:

- High intake of foods containing unhealthy fats (saturated fats and trans fats) – such as fatty meats and deli-style meats, butter, cream, ice cream, coconut oil, palm oil and most deep-fried takeaway foods and commercially baked products (such as pies, biscuits, buns and pastries).
- Low intake of foods containing healthy fats – healthy fats tend to increase the good (HDL) cholesterol. Foods containing healthy fats include avocado, nuts, seeds, olives, cooking oils made from plants or seeds, and fish.
- Low intake of foods containing fibre – foods that are high in dietary fibre, particularly soluble fibre, can reduce the amount of bad (LDL) cholesterol in your blood. Include fibre-containing foods in your diet by choosing vegetables, fruits, wholegrains, legumes, nuts and seeds every day.
- Low levels of physical activity and exercise.
- Being overweight or obese and having too much abdominal fat.
- Smoking
- Genetics – your family history may affect your cholesterol level. In some families, several people might be diagnosed with high cholesterol or heart disease at a relatively young age (men below age 55 years and women below 65 years). This type of pattern can be caused by genetics, including a genetic condition called familial hypercholesterolaemia.
- Drinking too much alcohol
- Some medical conditions can cause high cholesterol levels including kidney and liver disease and underactive thyroid gland (hypothyroidism).
- People with type 2 diabetes and high blood pressure often have high cholesterol.

What we eat has an impact on our cholesterol levels and can help reduce our risk of disease. The Heart Foundation recommends following a heart-healthy eating pattern, which means eating a wide variety of fresh and unprocessed foods and limiting highly processed foods including take away, baked goods, chocolate, chips, lollies and sugary drinks. Not only does this help to maintain a healthy and interesting diet, but it provides essential nutrients to the body.

<https://www.heartfoundation.org.au/heart-health-education/healthy-eating>

### Key diet inclusions to reduce the risk of high cholesterol

- Plenty of vegetables, fruit and wholegrains
- A variety of healthy protein-rich foods (especially fish and seafood), legumes (such as beans and lentils), nuts and seeds. Small amounts of eggs and lean poultry can also be included in a heart-healthy eating pattern. If choosing red meat, make sure it is lean and limit to one to three times a week
- Unflavoured milk, yoghurt and cheese. People with high cholesterol should choose reduced fat varieties
- Healthy fats and oils. Choose nuts, seeds, avocados, olives and their oils for cooking
- Herbs and spices to flavour foods, instead of adding salt.

This way of eating is also naturally high in fibre, which is ideal because a high intake of dietary fibre can also reduce levels of LDL cholesterol in the blood.

## High Blood Pressure (Hypertension)

Blood pressure is a measure of the pressure of the blood on the walls of our blood vessels as the heart pumps. When the heart pushes the blood into the arteries, the pressure is higher than when the heart relaxes as the blood flows into it.

When the heart contracts the pressure is called the systolic pressure and when the heart is relaxing it is called the diastolic pressure (which is lower).

Blood pressure is usually written as 120/80 – with the systolic number first and the diastolic number second.

High blood pressure is considered to be any measure over 140/90 for a person that does not have a chronic illness.

Blood pressure is important because if it is too high, it affects the blood flow to our organs. Over the years, this increases the chances of developing heart disease, stroke, chronic kidney disease, eye disease, erectile dysfunction and other conditions.

Various risk factors can make high blood pressure more likely. Many of these factors can be controlled by changing our lifestyle habits and/or are linked with other diseases discussed.

See the other diseases for specific dietary factors that can affect blood pressure levels.

#### **Known risk factors include:**

- Leading a sedentary lifestyle (with little or no exercise)
- Smoking
- Being overweight
- A diet with a high salt intake
- High blood cholesterol
- A family history of high blood pressure
- High alcohol consumption
- Diabetes

## **Diabetes**

Approx 1 in 20 people in Australia have diabetes type 1 or 2 and about 500 000 have undiagnosed type 2 diabetes!

- Type 1 Diabetes is an autoimmune disease that usually occurs in childhood or early adulthood
- Type 2 Diabetes occurs in adulthood and is largely preventable
- Gestational Diabetes occurs during pregnancy

When someone has diabetes, their body can't maintain healthy levels of glucose in the blood. Glucose is a form of sugar which is the main source of energy for our bodies. Unhealthy levels of glucose in the blood can lead to long-term and short-term health complications.

For our bodies to work properly we need to convert sugars from food into energy. Sugars from food are converted into glucose. A hormone called insulin is essential for the conversion of glucose into energy. In people with diabetes, insulin is no longer produced or not produced in sufficient amounts by the body. When people with diabetes eat foods that contain sugars or starches, such as breads, cereals, fruit and starchy vegetables and sweets, it can't be converted into energy and the level of glucose in their blood rises and is harmful to them.

Instead of being turned into energy the glucose stays in the blood resulting in high blood glucose levels. Your blood glucose level is called glycaemia.

Our cells absorb the glucose from the blood stream and converts it into energy with the help of insulin, which is made by the pancreas.

Beta cells in the pancreas make the insulin and release it into the blood stream.

If these beta cells do not produce enough insulin, glucose will build up in the bloodstream leading to hyperglycemia (or high blood sugar levels).

#### **All types of diabetes are increasing in prevalence:**

- Type 1 diabetes accounts for 10% of all diabetes and is increasing
- Type 2 diabetes accounts for 85% of all diabetes and is increasing
- Gestational diabetes in pregnancy is increasing

Type 2 diabetes is increasing at the fastest rate. There are large numbers of people with silent, undiagnosed type 2 diabetes which may be damaging their bodies.



Type 2 diabetes is one of the major consequences of being obese.

Our diets and the food that is available to us, combined with reduced physical activity levels because of more sedentary work and less activity, means most populations are seeing more type 2 diabetes.

Genes also play a part with higher risk of type 2 diabetes in Chinese, South Asian, Indian, Pacific Islander, Aboriginal and Torres Strait Islander populations.

#### **Risk factors:**

- Being overweight or obese – especially with abdominal fat
- Not getting enough physical activity daily
- Family history and ethnicity (Asian and Pacific Islanders are more prone)
- Risk increases after the age of 45 years
- Untreated pre-diabetes or high blood sugar levels
- Overeating carbohydrates at each meal
- Consuming foods and drinks with high sugar content

#### **Key diet related lifestyle actions to reduce the risk of the early onset of diabetes:**

- Optimize vitamin D levels with short bursts of sun exposure and diet inclusions
- Maintain a healthy body weight and moderate body fat percentage
- Eat plenty of fruits, vegetables and grains
- Control carbohydrate intake to avoid overloading the beta cells at any one meal
- Avoid added sugars as this is a simple carbohydrate that can spike blood sugar levels quickly
- Drink plenty of water daily
- Reduce portion sizes and eat high fibre foods

## **Cancer**

Cancer is a leading cause of death in the world accounting for about 17% of all deaths in 2019. The most common types of cancers are breast, lung, colon, rectal (or bowel) and prostate cancers.

Cancer is caused by cells that have a gene mutation. This causes it to rapidly divide and multiply and then the new cells have the same mutation causing abnormal growths and can damage surrounding tissues or organs.

Gene mutations occur for a few reasons:

- Some are inherited from our parents – but this is not common
- Smoke inhalation and smoking
- Radiation
- Viruses
- Cancer causing chemicals (carcinogens)
- Obesity
- Hormones
- Chronic inflammation
- Lack of exercise

Studies have evidence that some types of cancers can be prevented with diet modifications.

## **Dietary fibre**

Foods containing dietary fibre, such as vegetables, fruits, pulses (legumes) and cereals, are identified by the 2007 World Cancer Research Fund (WCRF) and American Institute for Cancer Research (AICR) report and continues to update as having convincing evidence for a protective effect against colorectal cancer, with limited suggestive evidence for oesophageal cancer.

## Plant-based foods

Data from large studies indicated a modest association between increased intake of total fruits and vegetables, notably intake of vegetables, and reduced overall cancer risk.

## Red meat and processed meats

The WCRF and AICR report and updates identified convincing evidence that increased consumption of red meat and processed meat increased the risk of colorectal cancer, and limited evidence suggests increased risk of oesophageal, lung, pancreatic and stomach cancers. Dose response meta-analyses have indicated a 17% increase in colorectal cancer risk for each 100 g increase per day in red meat, and an 18% increase in colorectal cancer risk for each 50 g increase per day in processed meat. The WCRF and AICR report recommends limiting consumption of red meat to less than 500 g per week, very little if any to be processed meat.

## Salt intake

The WCRF and AICR report identified evidence that salt (from salty foods, processed foods, and added salt) is a probable cause of stomach cancer. As processed foods are a major source of salt, the WCRF and AICR report recommends that individuals limit consumption of processed foods with added salt to ensure an intake of less than 6 g of salt per day. (Equivalent to approximately 2,300 mg sodium).

### Key diet related lifestyle actions to reduce the risk of the early onset of cancer growth:

- Eat a diet rich in fruits and vegetables
- Ensure adequate fibre intake, including soluble and insoluble types
- Consume red meat only 3-4 times weekly and white meats as other meat alternatives
- Consume moderate levels of salt
- Avoid processed meats and foods in general
- Maintain a healthy body weight
- Drink alcohol in moderation

## Effects of Cultural and Social Influences on Food Choices

The key driver for eating is of course hunger but what we choose to eat is not determined solely by physiological or nutritional needs.

### Some of the other factors that influence food choice include:

- Biological determinants such as hunger, appetite, and taste
- Economic determinants such as cost, income, availability
- Physical determinants such as access, education, skills (e.g., cooking) and time
- Social determinants such as culture, family, peers and meal patterns
- Psychological determinants such as mood, stress and guilt
- Attitudes, beliefs and knowledge about food
- Age and life stage

Population studies show there are clear differences in social classes with regard to food and nutrient intakes. Poor diets can result in under-nutrition (micronutrients deficiency) and over-nutrition (energy over consumption resulting in overweight and obesity); problems that face different sectors of society. Therefore, food choices are often affected by socio-economic factors.

In some urban centres, people in lower socioeconomic groups have less access to supermarkets and greater access to fast food outlets than more advantaged groups. Supermarkets generally offer a wider variety of food products, as well as fresh raw food. In Australia, the cost of a nutritious diet has been estimated to account for about 40% of the disposable income of welfare-dependent families, compared to only 20% of

an average family's disposable income. Fitness and health professionals should be aware of the budget challenges healthy food habits may pose for people who are welfare dependent and should note that checking and comparing the price of food products can reduce the weekly food cost and make healthy eating more affordable.

The decreased availability of nutritious foods (such as fresh fruit and vegetables, wholegrain bread and low-fat milk products) in remote and regional areas in Australia has been documented frequently. The cost of nutritious foods in these areas can be over 30% higher than in major cities and may impact on food security and food affordability.

Social influences on food intake refer to the impact that one or more persons have on the eating behaviour of others, either direct (buying food/marketing) or indirect (learn from peer's behaviour), either conscious (transfer of beliefs) or subconscious. Even when eating alone, food choice is influenced by social factors because attitudes and habits develop through the interaction with others. However, quantifying the social influences on food intake is difficult because the influences that people have on the eating behaviour of others are not limited to one type and people are not necessarily aware of the social influences that are exerted on their eating behaviour.

Social support can have a beneficial effect on food choices and healthy diet changes. Social support from within our household or from co-workers has been shown to have positively influence improvements in fruit and vegetable consumption, and with the preparative stage of improving eating habits. Social support can encourage health promotion through fostering a sense of group belonging and helping people to be more competent in their personal food choices.

The economic, social and cultural factors that influence health inequities also influence the ability of an individual to choose nutritious foods consistent with dietary guidelines. The ability of parents and carers to make nutritious food choices is likely to affect their family's nutrition status too.

## Cultural

Cultural influences lead to the difference in the habitual consumption of certain foods and in traditions of preparation, and in certain cases can lead to restrictions such as exclusion of meat and milk from the diet. Cultural influences are however amenable to change: when moving to a new country individuals may often adopt particular food habits of the local culture.

They may also tend to continue to eat foods common to their mother culture due to familiarity, taste preference and cooking styles known to them. This affects the types of food they consume regularly and can be an explanation for macro-nutrient balance in some cultures.

For example: Some cultures eat a dominantly vegetarian diet and therefore they may be prone to consume more carbohydrate rich food than protein rich food.

Cultural differences should be considered and accommodated whenever possible when providing healthy eating advice and if the clients diet requires them to omit certain food groups, they should be referred to a dietitian for more specific assistance with their diet.

## **Dietary Advice and Scope of Practice**

Fitness Instructors must clearly recognise the role they can play when providing nutrition and weight management advice to clients or potential clients.

Clients may commonly expect you to give them nutrition advice, as it goes hand in hand with the goals they often want to achieve, and they may not have thought of going to see a dietitian before.

It is our role to identify which clients and situations are within our scope of practice to provide dietary advice to, the types of advice we can provide and when we need to refer the clients to an Allied Health Professional to seek more detailed or specific advice for their safety to achieve their health and fitness goals.

AUSactive (previously Fitness Australia) is the nationally recognised Health and Exercise Industry Association and they have introduced guidelines for Fitness Professionals to follow when giving nutrition advice to clients, through the release of a Nutrition Advice within Scope of Practice document.

It is designed to help fitness professionals find the balance between providing the appropriate level of nutritional advice to the client, without providing information beyond their professional Scope of Practice.

Please find this resource on the internet:

[https://ausactive.org.au/wp-content/uploads/2021/11/Nutrition\\_Advice\\_within\\_SoP\\_for\\_AusREPs\\_F.pdf](https://ausactive.org.au/wp-content/uploads/2021/11/Nutrition_Advice_within_SoP_for_AusREPs_F.pdf)

The document gives fitness professionals clear guidelines as to what services they can (and can't) provide, and when it's most appropriate to refer clients on to an Allied Health Professional for more specific advice.

The guide is developed and endorsed by AUSactive, Dietitians Association of Australia and Sports Dietitians Australia.

Please familiarise yourself with this document and you may use it as an additional resource to help you complete your assessments for this Study Block.

### **Advice that is not within scope of practice for a fitness representative:**

- To advise a client to avoid a specific food group altogether
- To suggest or give advice that a client use nutritional supplements
- To provide specific nutritional advice relating to a medical condition
- To recommend, provide or design a one-day or seven-day meal plan for a client that is inconsistent with the recommendations outlined in the Eat for Health Program guidelines
- To provide specific nutritional advice that cannot be found evidenced in the National Dietary Guidelines and Eat for Health Educators Guide.

### **Risks to clients of providing nutrition-related advice out of scope of practice**

If fitness instructors provide nutrition-related advice outside of their scope of practice there is the potential of professional and legal consequences, depending on the outcome of the situation.

Fitness instructors must be aware of the risks to their business, reputation and the health of their clients if they give advice outside of their scope of practice and an incident occurs.

### **Risks of giving advice outside of scope of practice may include:**

- Nutrient deficiencies and imbalances
- Exposure to low energy availability (LEA) and overview of LEA impacts
- Negative impact on existing health conditions
- Food intolerance and allergy adverse reactions
- Negative food-drug interactions
- Nutrition confusion
- Financial burden of product recommendations

## Nutrient deficiencies and imbalances

Nutrients referred to here are macro and micronutrients found in various types of foods. Deficiency or imbalances can occur when the client is eating the wrong types of foods and in the wrong quantities for their lifestyle of health-related needs.

Fitness representatives do not have confirmed depth of knowledge or training to assess an individual's diet effectively and safely beyond a comparison of the client's eating patterns to the Eat for Health Program guidelines.

A complete and detailed assessment of nutrient needs and/or adequacy can only be completed by an Accredited Practising Dietitian (APD). This is because the assessment of an individual's intake to this level of detail requires specific training to ensure that the assessment is based on an accurate data, otherwise incorrect and potentially harmful recommendations could result, leading to nutrient deficiencies and imbalances.

### Out of scope example:

Calculation of the number of grams of macronutrients (carbohydrate, protein, fat) required or estimation of micronutrient intake (e.g., iron, calcium, etc) to determine adequacy.

### In scope example:

Help the client align their eating to include the five-food group serves each day. Show them how to read food labels and control their serving sizes and avoid discretionary food items.

## Exposure to low energy availability (LEA) and overview of LEA impacts

Clients that want to lose weight or body fat may regularly seek a fitness instructor for help with this goal. When providing nutrition-related advice we need to be careful that they don't experience too large an energy deficiency which can have serious health implications.

Low energy availability (LEA) describes a situation where the body does not have enough energy left to support body system functions that are essential to maintain optimal health.

Fitness representatives do not have the confirmed knowledge or training to recommend calorie restricted eating for weight loss.

### The symptoms related to LEA can include:

- Disturbance of metabolic homeostasis – metabolic conservation of energy
- Disruption to hormones necessary for growth, reproduction and control of inflammation
- Thyroid suppression
- Changes in blood substrate levels
- Reduced bone mass density
- Impaired immunity and increased infection rate
- Increased cortisol levels
- Decreased training results
- Impaired concentration, coordination and judgement
- Reduced energy

The reasons LEA may be present with a client are varied and complicated and can include disordered eating patterns and body image issue amongst other causes. This condition can have serious implications for the client's health, so when a client wants to lose body weight or fat specifically, they should be referred to a trained Allied Health Professional for help with the dietary requirements associated with such a goal.

### **Out of scope example:**

"If you reduce the number of calories you are eating, you will use up your body fat for energy. The more calories you reduce, the faster the weight will come off."

### **In scope example:**

"I see that one of your goals is to lose weight? When you align your eating with the five-food groups and serving sizes each day, reduce the number of discretionary foods you eat and increase your physical activity we should see your weight start to decrease. For more specific results I will refer you to an Accredited Practising Dietitian that can write you a program to help you reduce your calories and maintain your energy for healthy weight loss."

## **Negative impact on existing health conditions**

Some clients may have existing health conditions that require a certain type of diet or food types to reduce symptoms or prevent the condition worsening. Fitness representatives do not have the knowledge or training to give diet-related advice to any person with a pre-existing medical condition as the advice given, even if in alignment with the Eat for Health Educator Guide, may not be specific enough for their condition and could potentially cause it to worsen or impair improvement.

Given the complex interactions of diet and medical conditions and potential to cause harm if incorrect advice is provided, it is beyond scope to provide information relating to the treatment or prevention of a medical condition and ideal not to give specific advice to any person with a confirmed chronic medical condition.

### **Out of scope example:**

Providing nutritional information that you have heard will help decrease high blood pressure, manage high cholesterol or that has helped someone else fight against cancer effectively etc.

### **In scope example:**

Refer all people with chronic medical conditions to an Allied Health Professional for a diet/treatment plan to suit their condition.

## **Food intolerance and allergy adverse reactions**

Some clients may have food allergies or intolerances that they are or even are not aware of. Giving specific advice on foods and food types could cause an allergic or anaphylactic reaction to a food which can be life threatening. When giving general advice about food groups and encouraging a wide variety in each food group, the risk of triggering an allergy or intolerance is much lower. Clients that are aware of specific needs related to known intolerances or allergies should always gain advice from an Allied Health Professional to ensure nutritional adequacy is achieved while omitting certain foods.

If you are consulting with a client and suspect there may be food allergies or intolerances that they are not aware of or have not been confirmed, they need to be referred to an Allied Health Professional for investigative treatment.

### **Out of scope example:**

"I see that you have been diagnosed with a gluten intolerance. Perhaps you can try eating rye or spelt bread instead of white bread, I don't think it has any gluten in it and it is higher in nutritional value."

### **In scope example:**

"There are grains that you can consume in the cereals and grains food group that are gluten free. I am going to refer you to an Accredited Practising Dietician who can give you specific advice on what you can and can't include in your diet from this food group."



## Negative food-drug/medication interactions

Often medications interact in various ways with different foods and food types. Nutrients can affect the absorption, breakdown or excretion of a medication which may enhance or oppose the intended effect of the medication. It is therefore beyond the scope of fitness representatives to give nutrition information which may interfere or compromise the effect of medications.

### Out of scope example:

"Your dairy serves are too high each day for someone of your age and gender. Cut out the glass of milk that you are having at bedtime with your evening medication to reduce the dairy serves."

### In scope example:

Avoid talking about foods and medications together and ensure they are aware of any food interactions that their GP has mentioned could affect their medication.

## Nutrition confusion

There are many sources aiming to educate people on what is and isn't healthy these days and it can be very confusing. If a fitness representative goes too deep when explaining the subject of nutrition to a client, it can become overwhelming for them, and they may feel like giving up altogether on their healthy eating journey.

We don't want to promote "nutrition confusion" as there is already so much confusing advice on the internet. By helping clients make basic and small changes, one at a time to align more closely with the Australian Dietary Guidelines we can avoid adding more confusion. Just remember to help them take small steps from where they are, any improvement is beneficial for them. Also make sure that your advice stays within the parameters of the guidelines and doesn't get more specific as this can also promote confusion.

### Out of scope example:

You need to add more fruit serves to your daily eating. Bananas are high in sugar and so are tropical fruits like pineapple and mango so avoid those, berries have the lowest GI and citrus fruits are high in vitamin C, so they are the best options to go with to add more fruit into your day. Also, don't eat fruit on an empty stomach as it digests quickly so should be eaten first before any protein in your meals.

### In scope example:

It would be ideal to increase your fruit serves to two pieces a day for your age and gender. Any fruit you enjoy is good and a serving size is about the size of your fist.

## Financial burden of product recommendations

Recommending nutritional supplements for a performance goal or medical situation is beyond the scope of practice for fitness representatives. This is because supplements need to be integrated within an individual's detailed nutrition plan and, if used incorrectly, can have detrimental or harmful effects on an individual's health and well-being or performance.

Supplements should not be recommended without extensive testing to ensure the client is depleted in the nutrients being supplemented. Making recommendations based on supposition or unconfirmed suspicions of the client's nutritional needs can be a waste of money for the client, especially if they don't need the extra supplementation for their health or could affect their health adversely if the supplementation overloads their system with nutrients they don't need more of.

### Out of scope example:

Recommending that a client who is feeling fatigued starts taking an iron supplement in case their iron levels are low or advising a client to start using creatine to help them 'bulk up'.

### **In scope example:**

"You've mentioned that you have been particularly tired lately. I suggest you go and see your General Practitioner to get a blood test and see if you are deficient in any particular nutrients."

### **Consequences of providing advice out of scope of practice**

The consequences of providing advice out of scope of practice can be serious and potentially life changing for you and/or the client if an adverse incident occurs and you are found to have contributed or caused the incident based on advice that you provided that you are not qualified to give.

- Litigation for cause of harm
- Considerable financial costs of associated legal proceedings if an accusation is made
- Potential complaint to AUSactive and loss of professional registration
- Loss of professional reputation and standing
- Business and financial loss

These consequences may occur because of how Australian law operates when a person gives advice that is outside their scope of practice, or inconsistent with generally prevailing standards of professional competency. It should not be overlooked that a client can take you to court and win if you have failed to comply with reasonable and acceptable industry standards (Fitness Australia – Nutrition advice within SoP for AusREPs P17).

If you are found to have been negligent to your duty of care as a fitness representative and given advice outside of your scope of practice you may have to pay large sums of compensation to the client, your insurance will likely not cover this advice that you have given and your reputation can be tarnished, ruining your career as a fitness representative for many years, if not indefinitely.

There can also be implications of your actions for a fitness centre that you were practicing within who may seek compensation for loss from you as you may have breached an employment or contractor contract or agreement.

### **Communicating your Role Limitations to Clients**

Once you have achieved your vocational qualification in this unit you will be qualified to provide a measure of advice to people regarding their eating habits.

The nutrition-based content that you can use to provide this advice is found in the Australian Dietary Guidelines and Eat for Health Educator Guide. These must be your references for all advice provided.

Initially when consulting with a client about healthy eating patterns you should clearly outline to the client what your scope of practice is and how that will affect the advice they can access from you.

You could say something like:

"As a qualified fitness instructor, I am able to provide advice to you that is in alignment with the Australian Dietary Guidelines and the Eat for Health Educators Guide. I can certainly compare your current eating patterns to the Guidelines and give you strategies to improve the quality of your diet."

You can then go on to communicate some of the benefits they may experience from eating a more healthful diet and how it relates to them achieving their health and fitness goals.

There are more scenarios that you may encounter with clients and specific responses provided that you can use in the "Nutrition Advice within SoP for AusREPs" from pages 18-20. You can use these to give answers to clients wanting more specific information, while remaining within Scope of Practice.

## **Opportunities to Promote and Support Healthy Eating**

Although it may seem like you have many limitations with what you can say and do within your scope of practice, there are many opportunities that you can take to promote healthy eating within your business and with individual clients.

- Be a good example with your own diet and healthy eating habits
- Inspire and motivate clients through social media to move their eating closer to the national dietary guidelines
- Educate clients on where they can go for credible evidence based nutritional information
- Review clients basic eating habits and provide general advice to help them improve their nutrition
- Explain which foods are in the discretionary group and how to reduce these in their diet
- Help to reduce nutrition confusion by providing basic advice in alignment with the guidelines
- Assist clients with strategies to adhere to an eating plan that has been provided by a nutritional expert
- Refer clients to an allied health professional when they need more specific nutritional advice
- Explain the benefits of healthy eating to a client's health, wellness and performance
- Explain the risks if a client continues to eat an unhealthy diet

These things are all within your scope of practice and will help many clients improve their diets and reduce their risk of disease. Many people are not even meeting the minimum requirements of the five-food group serves in their diets daily. Many people also consume far too many discretionary items each day that are causing bad affects to their health.

Try to focus on what you can do to help clients achieve their health and fitness goals and at the same time be careful not to overstep your scope of practice by providing too much information or making it too specific.

## **Referring Clients to Allied Health Professionals (AHP)**

Fitness instructors have a unique opportunity to promote and support healthy eating habits with clients and will sometimes need to refer clients to an Allied Health Professional for more specific advice or that have diet related needs that are outside of the scope of practice to provide advice about.

Appropriate allied health professionals that clients can be referred to about diet or health related matters related to diet are:

- Accredited Practicing Dietitian (APD)
- Accredited Sports Dietitian (ASD)
- General Practitioners (GP)

### **Accredited Practicing Dietitians (APD's)**

#### **Definition of a dietitian**

A professional who applies the science of food and nutrition to promote health, prevent and treat disease to optimise the health of individuals, groups, communities and populations.

(Definition of Dietitian-Nutritionist, ICDA By-Law – September 2016)

Dietitians provide expert nutrition and diet advice for people of all ages. They understand how nutrition affects the body and will provide advice so that a client's diet will promote optimal wellness and performance based on their specific needs.

### The specific role of ADPs include the following:

- Assess individual nutritional needs
- Develop personalised eating plans
- Develop medical nutrition therapy plans
- Deliver group nutrition education sessions
- Sort out nutrition fact from fiction
- Undertake nutrition and food research
- Train health care professionals
- Develop nutrition communications, programs and policies

### Difference between a dietitian and a nutritionist

All dietitians are nutritionists, but nutritionists without a dietetics qualification can't call themselves a dietitian. They will both be able to provide a client with nutrition education and knowledge to some degree, but the amount of knowledge or experience a Nutritionist has may not be the same in all persons that call themselves a Nutritionist.

While the definition of a dietitian and nutritionist are similar, there are differences in qualifications and regulation.

Dietitians with the Accredited Practising Dietitian (APD) credential commit to ongoing training and education throughout their careers. They adhere to a code of conduct and their practice is audited to ensure they are in alignment with the code to remain accredited.

Most dietitians in Australia have completed an approved dietetics degree, from an approved Australian University. This confirms that Dietitians have the knowledge and skills found in the National Competency Standards for Dietitians.

Accredited Dietitians are also eligible to join the APD Program. When a person with a chronic health condition receives a care plan referral from their GP, they can often claim part or all of the fee from Medicare when they see a professional that is approved as an APD provider. For more information on the APD Program: <https://dietitiansaustralia.org.au/working-dietetics/credentialing-dietitians>

Practicing Nutritionists are not confirmed to have completed a nutrition degree, as they can practice unregistered and are not governed by an accreditation procedure. Therefore, there is no guarantee that their qualifications have been issued by a credible course provider or that their advice is consistent with the most recent scientific evidence-informed dietary advice.

They will also not likely be able to join the APD program.

It's important to check the credentials of a healthcare provider before referring a client to see them. Both Nutritionists and Dietitians are limited in the advice they can give related to exercise programming.

Their position allows the provision of scientific evidence-informed advice on levels of physical activity (which support nutritional related outcomes), based on government activity guidelines.

If a client wants more specific advice on fitness or exercise programming, a Dietitian may refer them to a Personal Trainer or Exercise Physiologist as it is outside of their scope of practice to give specific advice in this area.

### Accredited Sports Dietitian (ASD)

An Accredited Sports Dietitian is an APD that has undertaken further training in sports nutrition and has extensive practical experience helping fit and active people achieve their goals. They provide strategies to maximise wellbeing and performance by using a combination of wholefoods, sports products, and supplements tailored to an individual's unique needs. (Sports Dietitians Australia 2022)

A Sports Dietitian provides individual and group/team nutrition counselling and education to enhance the performance of competitive and recreational athletes, on-site and during travel.

### Primary responsibilities of an ASD include:

- Counselling individuals and groups on daily nutrition for performance and health
- Translating the latest scientific evidence into practical sports nutrition recommendations
- Tracking and documenting outcomes of nutrition services
- Serving as a food and nutrition resource for coaches, trainers, and parents
- Providing sports nutrition education for health/wellness programs, athletic teams, and community groups
- Maintaining professional competency and skills required for professional practice.
- Ultimately the aim of the ASD is to maximize performance.
- To achieve this, the main specific areas that a Sports dietitian can have influence are the following:
  - General health and immunity
  - Energy levels
  - Concentration
  - Growth and body composition

An athlete's dietary plan is essential and can make a huge difference to their health and feelings of wellness. If they continue to eat the wrong foods and in the wrong amounts, they can do irreversible damage to their health and their performance can be severely affected.

Sports dietitians and regular dietitians are not able to provide specific fitness advice or exercise programming and cannot diagnose medical conditions.

### General Practitioners (GP's)

The provision of basic nutrition advice is acknowledged to be part of the role of GPs and practice nurses, as they are the first point of contact for patients, allowing them to raise nutrition awareness.

Doctors who specialise in general practice typically have a:

- Strong understanding of physical, psychological and cultural health problems
- Wide knowledge of local networks and specialist services
- Well-rounded knowledge of symptoms and problems, whether they indicate long-standing illnesses, new developments or issues in urgent need of attention

GPs are responsible for recognizing, diagnosing and, where appropriate, providing health care education, treatment or referrals to specialists such as APD's when required.

GPs cannot write meal plans for clients or give them specific diet or nutrition advice to clients with chronic health conditions. They would refer the client to a Dietitian for this service. They also cannot provide clients with exercise programs or specific fitness advice.

## Health conditions requiring referral to an AHP

There are many health conditions that we must be aware of that require specific nutritional needs. We must recognise the dangers of providing inappropriate nutrition advice to clients with these conditions.

These include the following specific population groups and conditions:

- Pregnant or breast-feeding women
- Very underweight, overweight or obese
- Impaired Glucose Tolerance, Impaired Fasting Glucose or strong family history of Type 2 Diabetes
- Type 1 or Type 2 diabetes
- Cardiovascular disease, renal disease or liver disease
- Food allergies and intolerances
- Gastro-intestinal diseases (Crohn's, Ulcerative Colitis, Coeliac, autoimmune diseases etc)
- Diagnosed with, undergoing treatment for, or recovering from cancer
- Frail elderly
- Disordered eating
- High intensity and high-volume exercise or sport

How can we recognise these populations groups and detect that they may require nutrition advice that is out of our scope of practice?





View the table below for more information on common characteristics that may identify various population groups and how their nutritional needs may differ from general population level recommendations in the national dietary guidelines.

Specific population group	Possible characteristics/symptoms	Specific nutritional needs	Who to refer to
Pregnant or breast-feeding women	<ul style="list-style-type: none"> <li>• Fatigue</li> <li>• Nausea</li> <li>• Increased urination</li> <li>• Tender/swollen breasts</li> <li>• Headaches</li> <li>• Possible gestational diabetes</li> </ul>	<ul style="list-style-type: none"> <li>• Additional nutrition required to sustain foetus and infant once breast feeding</li> <li>• Appropriate rate of weight gain during pregnancy and weight loss after birth</li> </ul>	<ul style="list-style-type: none"> <li>• General practitioner</li> <li>• Accredited Practicing Dietitian</li> </ul>
Very underweight	<ul style="list-style-type: none"> <li>• Unhealthy BMI &lt; 18.5</li> <li>• Possible eating disorder</li> <li>• Looks very thin with visible bone structures</li> <li>• May have low energy and be restricting food intake</li> </ul>	<ul style="list-style-type: none"> <li>• Additional nutrition to gain weight</li> <li>• Mental health support if disordered eating is detected</li> </ul>	<ul style="list-style-type: none"> <li>• General practitioner</li> <li>• Accredited Practicing Dietitian</li> </ul>
Obesity class 1, 2 & 3	<ul style="list-style-type: none"> <li>• Unhealthy BMI &gt; 30</li> <li>• Excess fat visible on body</li> <li>• May lack energy</li> <li>• High discretionary food intake</li> <li>• May have other medical conditions or be at high risk of disease associated with obesity</li> <li>• Low activity or sedentary lifestyle</li> </ul>	<ul style="list-style-type: none"> <li>• Reduced calorie intake for healthy fat loss</li> <li>• Increased nutritional content to support weight loss</li> <li>• Mental health support to overcome unhealthy eating habits</li> <li>• Monitoring for LEA</li> </ul>	<ul style="list-style-type: none"> <li>• General practitioner</li> <li>• Accredited Practicing Dietitian</li> </ul>
Impaired Glucose Tolerance, Impaired Fasting Glucose or strong family history of Type 2 Diabetes	<ul style="list-style-type: none"> <li>• Overweight or obese</li> <li>• High waist to hip ratio</li> <li>• Fasting blood sugar test results</li> <li>• Poor diet habits</li> <li>• Family history of type 2 diabetes</li> </ul>	<ul style="list-style-type: none"> <li>• Carbohydrate control in meals</li> <li>• Limit sweet foods and drinks</li> <li>• Increase fibre and low GI foods</li> <li>• Weight loss</li> </ul>	<ul style="list-style-type: none"> <li>• General practitioner</li> <li>• Accredited Practicing Dietitian</li> </ul>
Type 1 or Type 2 diabetes	<ul style="list-style-type: none"> <li>• Diagnosis by a GP</li> <li>• Family history of type 2 diabetes</li> <li>• Commonly over the age of 45 years</li> <li>• Overweight or high waist to hip ratio</li> </ul>	<ul style="list-style-type: none"> <li>• Portion control</li> <li>• Improve dietary nutrition</li> <li>• Carbohydrate control</li> <li>• Restrict refined carbohydrates and sugars</li> <li>• Weight loss</li> </ul>	<ul style="list-style-type: none"> <li>• General practitioner</li> <li>• Accredited Practicing Dietitian</li> </ul>

Specific population group	Possible characteristics/symptoms	Specific nutritional needs	Who to refer to
Cardiovascular disease, renal disease or liver disease	<ul style="list-style-type: none"> <li>• Diagnosis by a GP</li> </ul>	<ul style="list-style-type: none"> <li>• Very specific diets based on individual client needs</li> </ul>	<ul style="list-style-type: none"> <li>• General practitioner</li> <li>• Accredited Practicing Dietitian</li> </ul>
Food allergies and intolerances	<ul style="list-style-type: none"> <li>• Itchy rashes and hive</li> <li>• Swelling of the face and mouth</li> <li>• Shortness of breath and asthma symptoms</li> <li>• Nausea</li> <li>• Stomach pain</li> <li>• Diarrhoea and/or vomiting</li> <li>• Gas, cramps or bloating</li> <li>• Heartburn</li> <li>• Headaches</li> <li>• Anxiety</li> </ul>	<ul style="list-style-type: none"> <li>• Identification of the food that is the culprit</li> <li>• Elimination of food</li> <li>• Replacement of missing nutrients due to food elimination through other food sources</li> <li>• Reintroduction of culprit food if appropriate</li> <li>• Monitoring for symptoms</li> </ul>	<ul style="list-style-type: none"> <li>• General practitioner</li> <li>• Accredited Practicing Dietitian</li> </ul>
Gastro-intestinal diseases (Crohn's, Ulcerative Colitis, Coeliac, autoimmune diseases etc)	<ul style="list-style-type: none"> <li>• Abdominal discomfort</li> <li>• Unintentional weight loss</li> <li>• Vomiting and nausea</li> <li>• Heart burn</li> <li>• Diarrhoea and/or constipation</li> <li>• Fatigue</li> <li>• Loss of appetite</li> </ul>	<ul style="list-style-type: none"> <li>• Professional diagnosis of condition</li> <li>• May need significantly altered eating patterns</li> <li>• Elimination of foods that worsen the condition</li> <li>• May need supplementation or medication</li> </ul>	<ul style="list-style-type: none"> <li>• General practitioner</li> <li>• Accredited Practicing Dietitian</li> <li>• Specialist</li> </ul>
Diagnosed with, undergoing treatment for, or recovering from cancer	<ul style="list-style-type: none"> <li>• Diagnosis confirmed by a Specialist</li> <li>• May have had a recent operation</li> <li>• May be undergoing regular treatment</li> <li>• Nausea and vomiting from treatment</li> <li>• Loss of hair</li> <li>• Fatigue</li> </ul>	<ul style="list-style-type: none"> <li>• May need a specific diet based on treatment or type of cancer</li> <li>• Supplementation likely</li> <li>• Medication interactions to be considered</li> <li>• Malnourishment is common</li> </ul>	<ul style="list-style-type: none"> <li>• General practitioner</li> <li>• Accredited Practicing Dietitian</li> <li>• Specialist</li> </ul>

Specific population group	Possible characteristics/symptoms	Specific nutritional needs	Who to refer to
Frail elderly	<ul style="list-style-type: none"> <li>• Over the age of 65 years</li> <li>• Loss of muscle mass</li> <li>• May look thin and drawn</li> <li>• Skin concerns</li> <li>• Low bone density common</li> <li>• Low interest in food</li> <li>• Unable to prepare nourishing food due to other health conditions</li> </ul>	<ul style="list-style-type: none"> <li>• Supplementation is common</li> <li>• May need a specific diet if there are issues with eating mechanics</li> <li>• Malnourishment is common</li> <li>• Lack of interest in food needs to be considered</li> </ul>	<ul style="list-style-type: none"> <li>• General practitioner</li> <li>• Accredited Practising Dietitian</li> </ul>
Disordered eating	<ul style="list-style-type: none"> <li>• Dieting behaviours (fasting, counting calories etc)</li> <li>• Has fussy food preferences that are not based on a physical requirements (won't eat fatty foods or omits food groups)</li> <li>• Hiding food or eating in private</li> <li>• Evidence of vomiting or laxative use</li> <li>• Excessive or ritualistic exercise patterns</li> </ul>	<ul style="list-style-type: none"> <li>• Counselling required</li> <li>• May need hospitalisation</li> <li>• Food intake monitored</li> <li>• Will often require a food and exercise plan</li> <li>• May need medication or supplementation</li> </ul>	<ul style="list-style-type: none"> <li>• General practitioner</li> <li>• Accredited Practising Dietitian</li> </ul>
High intensity and high-volume exercise or sport	<ul style="list-style-type: none"> <li>• Trains intensely and frequently</li> <li>• Sports competition goals</li> <li>• Overtraining could be an issue</li> <li>• Injuries are common</li> <li>• Fatigue and low energy common</li> </ul>	<ul style="list-style-type: none"> <li>• Food plan to allow for high activity levels</li> <li>• May have specific nutrition needs</li> <li>• Eating times may need to be considered</li> <li>• Diet adjusted for competition phases</li> <li>• Food and drinks effect on performance considered</li> </ul>	<ul style="list-style-type: none"> <li>• Accredited Sports Dietitian</li> </ul>

Based on the above considerations of specific populations, there will be times when you will encounter clients that have specific dietary needs.

When you realise that a client has a condition or requires nutrition advice that is outside of your scope of practice you must:

1. Advise the client about why their nutrition needs are outside scope of your own role
2. Provide them with information about the type of medical or allied health professional with relevant expertise that they can arrange a consultation with to gain safe and effective advice.

# **Key Contents of the Australian Dietary Guidelines**

## **The Five Dietary Guidelines**

### **Guideline 1.**

To achieve and maintain a healthy weight, be physically active and choose amounts of nutritious food and drinks to meet your energy needs.

- Children and adolescents should eat sufficient nutritious foods to grow and develop normally. They should be physically active every day and their growth should be checked regularly.
- Older people should eat nutritious foods and keep physically active to help maintain muscle strength and a healthy weight.

Healthy weight is associated with reduced risk of chronic disease. An unhealthy weight refers to being underweight, overweight or obese.

An optimum dietary pattern for adults to achieve and maintain a healthy weight is one in which nutrient requirements are met and total energy intake does not often exceed total energy expenditure.

Physical activity is an important part of a healthy, active life. Small persistent amounts of excess energy intake will cause excess weight gain in people of all ages.

Weight should be measured regularly in adults and the amount and/or quality of food, drinks and physical activity adjusted accordingly. Children and adolescents need sufficient nutritious foods to grow and develop normally and their growth should be checked regularly to ensure appropriate development is occurring.

Advice on this guideline is aimed at general populations to help with weight management and to discourage inappropriate food restrictions, particularly among high-risk groups.

(Australian Dietary Guidelines 2013 P 11–29)

### **Guideline 2.**

Enjoy a wide variety of nutritious foods from these five food groups every day:

- Plenty of vegetables, including different types and colours, and legumes/beans
- Fruit
- Grain (cereal) foods, mostly wholegrain and/or high cereal fibre varieties, such as breads, cereals, rice, pasta, noodles, polenta, couscous, oats, quinoa and barley
- Lean meats and poultry, fish, eggs, tofu, nuts and seeds, and legumes/beans
- Milk, yoghurt, cheese and/or their alternatives, mostly reduced fat (reduced fat milks are not suitable for children under the age of 2 years)

And drink plenty of water.

Dietary patterns that include a wide variety of nutritious foods are more likely to meet nutrient requirements, promote health and wellbeing and confer health benefits than restricted diets.

A variety of foods should be consumed from each of the five food groups.

There are many different ways that these nutrient-dense foods can be chosen to contribute to nutritious dietary patterns that suit personal preferences. Economic, social and cultural factors can affect the ability of individuals and groups to access nutritious foods, and this must be considered when providing advice.

(Australian Dietary Guidelines 2013 P 31–65)

### Guideline 3.

Limit intake of foods containing saturated fat, added salt, added sugars and alcohol.

- a. Limit intake of foods high in saturated fat such as many biscuits, cakes, pastries, pies, processed meats, commercial burgers, pizza, fried foods, potato chips, crisps and other savoury snacks.
  - Replace high fat foods which contain predominantly saturated fats such as butter, cream, cooking margarine, coconut and palm oil with foods which contain predominantly polyunsaturated and monounsaturated fats such as oils, spreads, nut butters/pastes and avocado.
  - Low fat diets are not suitable for children under the age of 2 years.
- b. Limit intake of foods and drinks containing added salt.
  - Read labels to choose lower sodium options among similar foods.
  - Do not add salt to foods in cooking or at the table.
- c. Limit intake of foods and drinks containing added sugars such as confectionary, sugar-sweetened soft drinks and cordials, fruit drinks, vitamin waters, energy and sports drinks.
- d. If you choose to drink alcohol, limit intake. For women who are pregnant, planning a pregnancy or breastfeeding, not drinking alcohol is the safest option.

This guideline emphasises the importance of limiting intake of foods and drinks high in saturated fat, added salt, added sugars and alcohol based in evidence that these foods are associated with increased risk of obesity and/or chronic diseases.

There is limited capacity for including energy-dense discretionary foods in a nutritious diet. When considering the energy requirements of many Australians, their daily calories need to be used to consume foods with high nutrition levels for health promotion.

Replacing dietary saturated fat with monounsaturated and polyunsaturated fats is associated with improved blood lipid profiles and reduced risk of cardiovascular disease. Fat-rich foods are energy dense which is important to consider when controlling overall energy intake for a certain goal.

Reducing sodium intake decreases blood pressure in adults and the evidence has strengthened that reducing sodium intake may decrease risk of mortality, stroke and heart disease in people with high blood pressure. Salt that is found in processed foods is the main source of sodium in Western diets.

Discretionary foods should only be consumed in small amounts and sometimes. While discretionary foods can contribute to the overall enjoyment of eating and are often part of social activities and family or cultural celebrations, if their intake is not reduced then physical activity levels need to be increased to burn the additional energy from discretionary foods to avoid weight gain or to maintain a healthy weight.

(Australian Dietary Guidelines 2013 P 67–85)

### Guideline 4.

Encourage, support and promote breastfeeding.

The World Health Organization states that 'breastfeeding is an unequalled way of providing ideal food for the health growth and development of infants. ([who.int/health-topics/breastfeeding](http://who.int/health-topics/breastfeeding) 2011)

Breastfeeding provides health benefits to infants including reduced risk of infection, accelerated recovery from childbirth and progress towards a healthy body weight. Breastfeeding is associated with reduced risk of some cancers.

Infants should be exclusively breastfed until around 6 months of age when solid foods are introduced. Breastfeeding should be continued while solid foods are introduced until 12 months of age and beyond, for as long as the mother and child desire.

(Australian Dietary Guidelines 2013 P 87–96)

## Guideline 5.

Care for your food; prepare and store it safely.

More than five million cases of foodborne illness are estimated to occur every year in Australia.

Bacterial and viral food poisoning is a result of pathogenic organisms reaching harmful levels or the production of pathogenic toxins.

Incorrect handling of food and storing food at inappropriate temperatures are major causes of food poisoning. Particular care should be taken when handling food to be consumed by people who have an increased risk of foodborne illness, such as pregnant people, infants, older people and people with certain medical conditions.

(Australian Dietary Guidelines 2013 P 97–100)



# FIVE FOOD GROUPS

No single food – with the exception of breast milk for about the first 6 months of life – can provide all the nutrients in the amounts needed for good health.

Dietary patterns that include a wide variety of nutritious foods and water are more likely than restricted diets to meet nutrient requirements and confer health benefits.

A dietary pattern needs to include a variety of choices from each of the five food groups – vegetables; fruit; grain (cereal) foods; lean meats and poultry, fish, eggs, nuts and seeds and legumes/beans; and milk, yoghurt, cheese and/or alternatives.

Most Australians today eat a wide variety of foods from different cuisines. The available food supply generally meets the nutritional needs of the population, but appropriate choices must be made to ensure that all nutrient requirements are met, so that diet-related chronic disease can be prevented or delayed, and so that optimum health and wellbeing can be achieved.

Australia is also fortunate in having a safe food supply with low levels of contaminants and pollutants.

## The five food groups that should be consumed daily are:

- 1. Vegetables
- 2. Fruit
- 3. Grains
- 4. Meat, nuts and eggs
- 5. Dairy

The Eat for Health Program groups foods primarily on the basis of their type and nutrient contribution.



The model on which the Five Food Groups is based assumes that foods within each grouping are eaten in types not too dissimilar to the average intakes in Australia. The amounts recommended for consumption were determined using the Food Modelling System and are based on the nutrient requirements for each age and gender group of different height and activity levels in the population.

Food group name	Grain (cereal) foods, mostly wholegrain and/ or high cereal fibre varieties	Vegetables and legumes/ beans	Fruit	Milk, yoghurt, cheese and/or alternatives, mostly reduced fat	Lean meat and poultry, fish, eggs, tofu, nuts and seeds, legumes/ beans
Main distinguishing nutrients	<ul style="list-style-type: none"> <li>carbohydrate</li> <li>protein</li> <li>iron</li> <li>dietary fibre</li> <li>thiamine</li> <li>folate</li> <li>iodine</li> </ul>	<ul style="list-style-type: none"> <li>beta-carotene and other carotenoids</li> <li>vitamin C</li> <li>folate</li> <li>dietary fibre</li> </ul>	<ul style="list-style-type: none"> <li>vitamin C</li> <li>dietary fibre</li> </ul>	<ul style="list-style-type: none"> <li>calcium</li> <li>protein</li> <li>riboflavin</li> <li>vitamin B12</li> </ul>	<ul style="list-style-type: none"> <li>protein</li> <li>iron</li> <li>zinc</li> <li>vitamin B12 (animal foods only)</li> <li>long chain omega 3 fatty acids</li> </ul>
Other significant nutrients	<ul style="list-style-type: none"> <li>energy</li> <li>magnesium</li> <li>zinc</li> <li>riboflavin</li> <li>niacin</li> <li>vitamin E</li> </ul>	<ul style="list-style-type: none"> <li>beta-carotene and other carotenoids</li> <li>vitamin C</li> <li>folate</li> <li>dietary fibre</li> </ul>	<ul style="list-style-type: none"> <li>carbohydrate</li> <li>folate</li> <li>beta-carotene</li> <li>potassium</li> </ul>	<ul style="list-style-type: none"> <li>energy</li> <li>fat</li> <li>carbohydrate</li> <li>magnesium</li> <li>zinc</li> <li>potassium</li> </ul>	<ul style="list-style-type: none"> <li>dietary fibre (plant foods only)</li> <li>energy</li> <li>essential fatty acids</li> <li>niacin</li> <li>vitamin E (seeds, nuts)</li> </ul>

## Vegetables

Vegetables come from many different parts of plants, including the leaves, roots, tubers, flowers, stems, seeds and shoots. Some varieties which are not strictly vegetables from the botanical aspect, are included in this group because they are used as vegetables.

For example, tomatoes and pumpkin are the fruit of the plant and sweet corn is a grain/cereal, but these are included in the vegetable group.

Legumes are the seeds of plants from the Leguminosae family. These vegetables are eaten in the immature form as green peas and beans, and the mature form as dried peas, beans, lentils and chickpeas.

Including plenty of vegetables of a variety of different types and colours, and legumes/beans in the diet can provide a range of nutrients that may help reduce the risk of obesity and some chronic diseases including heart disease and some cancers. Because of their low energy density, diets which are high in a variety of vegetables and legumes/beans are especially important in helping to maintain a healthy weight.

Vegetables and legumes/beans are a good source of vitamins, minerals, dietary fibre and legumes/beans and a few vegetables, such as potatoes, sweet potatoes and green peas, also provide carbohydrate. All vegetables provide vitamin C, with capsicum, broccoli, cauliflower, cabbage, Asian greens and tomatoes particularly high in this vitamin. Dark green and orange vegetables like spinach, broccoli, carrots and pumpkin are an especially good source of carotenes with beta-carotene converted in the body to vitamin A. Green vegetables (including some salad vegetables), beetroot, cauliflower, asparagus, dried peas, beans and lentils are good sources of folate. Legumes/beans are also a good source of protein, iron, zinc and carbohydrate.

Over a week, try to include the following sub-groups in a healthy diet:

- dark green or cruciferous vegetables such as bok choy, spinach, broccoli, cauliflower, cabbage, brussels sprouts
- orange vegetables such as sweet potato, pumpkin, carrots
- salad vegetables such as lettuce, tomato, cucumber, capsicum
- starchy vegetables such as potatoes, sweet potato, taro, corn
- legumes such as dried peas, beans, lentils, chickpeas.

### How much from the vegetables, legumes/beans group is needed?

The minimum recommended intake ranges are:

- 2½ serves a day for 2–3-year-olds,
- 4½ serves a day for 4–8yr-olds,
- 5 serves a day for older children and adolescents,
- 5–6 serves for adults including pregnant women,
- and 7½ serves for lactating women.

Additional amounts can be included as desired but extra quantities of starchy vegetables will depend on energy needs (age, activity levels and body size).

### Examples of types of vegetables and legumes/beans

Dark green or cruciferous	Root/tubular/bulb vegetables	Legumes/beans	Other vegetables
<ul style="list-style-type: none"> <li>• Asparagus Basil Broccoli</li> <li>• Brussels sprouts</li> <li>• Bok choy and other Asian greens</li> <li>• Cabbages, all types, including red</li> <li>• Cauliflower</li> <li>• Chicory Chives Kale</li> <li>• Lettuce such as cos, mignonette</li> <li>• Parsley Silver beet</li> <li>• Snow peas Spinach</li> <li>• Water spinach</li> </ul>	<ul style="list-style-type: none"> <li>• Artichoke Bamboo shoots Beetroot</li> <li>• Carrots Cassava Celeriac</li> <li>• Fennel Garlic Ginger</li> <li>• Leeks Onions Parsnip</li> <li>• Potato Radish Shallots</li> <li>• Spring onions Swede</li> <li>• Sweet potato Taro</li> <li>• Turnip</li> </ul>	<ul style="list-style-type: none"> <li>• Black beans Black-eyed beans Borlotti beans Cannellini beans Chickpeas</li> <li>• Fava beans Lentils Lima beans</li> <li>• Lupin beans Pinto beans</li> <li>• Red kidney beans Split peas Soybeans</li> <li>• Tofu</li> </ul>	<ul style="list-style-type: none"> <li>• Avocado Bitter melon Capsicum Celery</li> <li>• Chilli Choko</li> <li>• Cucumber Eggplant</li> <li>• Green beans Green peas Mushrooms</li> <li>• Okra Pumpkin</li> <li>• Sprouts Squash</li> <li>• Sweetcorn Tomato</li> <li>• Zucchini</li> </ul>

### A serve of vegetables is about 75g.

- ½ cup of cooked green or orange vegetables (for example broccoli, spinach, carrots or pumpkin)
- ½ cup cooked, dried or canned beans, peas or lentils (no added salt)
- 1 cup of green leafy or raw salad vegetables
- ½ cup of sweetcorn
- ½ medium potato other starchy vegetables (for example sweet potato, taro or cassava)
- 1 medium tomato

\* with canned varieties, choose those with no added salt

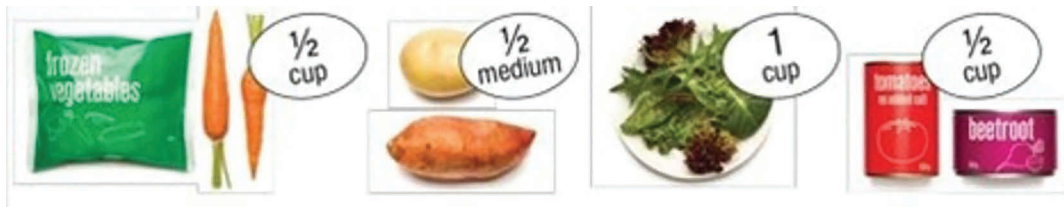


Image credit: NHMRC Eat for Health Educator Guide 2013

## Fruit

A wide variety of fruit is available in Australia.

Most fruit forms from the flower and contains the seeds of the plant.

Some vegetables such as pineapple or rhubarb are included in this group because they are used as fruit. Most fruit is sweet because of its natural sugars. Including fruit in the diet each day may help to reduce the risk of some chronic diseases, including heart disease and some cancers. Because of their low energy density, diets which include relatively higher amounts of fruit may also help to maintain a healthy weight.

Fruit is a good source of vitamins, including vitamin C and folate. Fruit also provides potassium, dietary fibre and carbohydrates in the form of natural sugars.

Edible skins are especially high in dietary fibre, but dietary fibre is also in the fruit flesh.

All fresh, frozen and canned fruits are part of this group but for canned varieties look for varieties that are canned in fruit juice rather than with added sugars or syrup. However, the fruit juice used for canning can be high in naturally occurring sugars.

Fruit juices belong to this group, but most have lost the dietary fibre found in fresh fruit. Fruit juices are also acidic and frequent consumption may increase the risk of dental erosion. Dried fruit can be used but because it has a lower water content, it is more energy dense than fresh fruit. Dried fruit can also stick to the teeth and increase the risk of dental decay.

Eat a wide variety of fruit such as:

- pome fruits such as apples and pears
- citrus fruit such as oranges, mandarins and grapefruit
- stone fruit such as apricots and peaches
- tropical fruit such as bananas, mangoes, pawpaw, and pineapple
- berries
- other fruits such grapes or passionfruit.

Choose fruits in season for better value, quality and availability.

## How much from the fruit group is needed?

The minimum recommended intake ranges are:

- 1 serve a day for 2–3-year-olds
- 1½ serves a day for 4–8-year-olds,
- 2 serves a day for all older children, adolescents and adults, including pregnant and lactating women.  
Additional amounts can be included depending on energy needs (age, activity levels and body size.)

### Examples of fruit

Citrus	Pome	Tropical	Berries	Stone	Other
<ul style="list-style-type: none"> <li>• Grapefruit</li> <li>• Lemon</li> <li>• Lime</li> <li>• Mandarin</li> <li>• Orange</li> <li>• Tangerine</li> </ul>	<ul style="list-style-type: none"> <li>• Apple</li> <li>• Loquat</li> <li>• Pear</li> <li>• Quince</li> </ul>	<ul style="list-style-type: none"> <li>• Banana</li> <li>• Guava</li> <li>• Mango</li> <li>• Melon</li> <li>• Pineapple</li> <li>• Pawpaw</li> <li>• Rambutan</li> </ul>	<ul style="list-style-type: none"> <li>• Blackberry</li> <li>• Blueberry</li> <li>• Loganberry</li> <li>• Raspberry</li> <li>• Strawberry</li> </ul>	<ul style="list-style-type: none"> <li>• Apricot</li> <li>• Cherry</li> <li>• Nectarine</li> <li>• Peach</li> <li>• Plum</li> </ul>	<ul style="list-style-type: none"> <li>• Feijoa</li> <li>• Fig</li> <li>• Grapes</li> <li>• Kiwifruit</li> <li>• Lychee</li> <li>• Melons</li> <li>• Passionfruit</li> <li>• Pomegranate</li> </ul>

### A serve of fruit is about 150g, for example:

- 1 medium apple, banana, orange or pear
- 2 small apricots, kiwi fruits or plums
- 1 cup diced or canned fruit (with no added sugar)
- or occasionally as a substitute for other foods in the group:
- ½ cup (125ml) 100% fruit juice (no added sugar)
- 30g dried fruit (for example 4 dried apricot halves or 1½ tablespoons of sultanas)



Image credit: NHMRC Eat for Health Educator Guide 2013



## Cereals and Grains

Foods in this group come from grains like wheat, oats, rice, rye, barley, millet, quinoa and corn.

The grains can be cooked and eaten whole, rolled, ground into flour to make a variety of cereal foods such as bread, pasta and noodles, or made into breakfast cereals.

Consumption of grain (cereal) foods, mostly wholegrain and/or high cereal fibre, may help reduce the risk of heart disease, type 2 diabetes, excessive weight gain, and some cancers.

The nutrients provided by the foods in this group include carbohydrates, protein, dietary fibre and a wide range of vitamins and minerals including folate, thiamine, riboflavin, niacin, vitamin E and iron. Some foods in this group may have nutrients added during processing. For example, in Australia, food regulations require that vitamin B1 (thiamine) and folic acid be added to wheat flour used for breadmaking.

Salt used in breadmaking must be iodised. Most breakfast cereal manufacturers also voluntarily add some vitamins and minerals to their products.

This group includes both refined and wholegrain varieties of grain (cereal) foods. Wholemeal or wholegrain varieties are preferable because they provide more dietary fibre, vitamins and minerals than refined grain (cereal) foods. Grain (cereal) foods which have relatively large amounts of added fats and sugars and/or salt such as cakes, muffins and biscuits are not included in this group but are classified under discretionary choices.

We should aim for as much variety as possible of grains in our diet rather than sticking to just one or two types as they each have different types of nutrients in them.

### How much from the grains group is needed?

The minimum recommended intake ranges are:

- 4 serves a day for 2–8-year-olds,
- 7 serves a day for older adolescents,
- 3 serves a day for women over the age of 70
- 6 serves a day for women less than 50 years of age,
- 8–9 serves a day for pregnant and breastfeeding women.
- 3 serves a day for men over the age of 70 years
- 6 serves a day for men less than 50 years.

Additional amounts can be included depending on energy needs (age, activity levels and body size).

### Examples of grains (cereal) foods

Breads	Breakfast cereals	Grains	Other products
<ul style="list-style-type: none"><li>• Crispbreads Damper English muffins Focaccia Lavash</li><li>• Naan</li><li>• Pita and other flat breads Rye</li><li>• White Wholegrain Wholemeal</li></ul>	<ul style="list-style-type: none"><li>• Ready to eat:</li><li>• Muesli (untoasted)</li><li>• Oats</li><li>• Porridge</li><li>• Whole wheat biscuits</li><li>• Wholegrain and/or high</li><li>• cereal fibre flaked cereals</li></ul>	<ul style="list-style-type: none"><li>• Barley, pearl barley Buckwheat</li><li>• Bulgur Corn Polenta Cous cous</li><li>• Flours made from grains Millet</li><li>• Quinoa Rice Rye</li><li>• Semolina Sorghum Spelt Triticale Wheat</li><li>• Wheatgerm</li></ul>	<ul style="list-style-type: none"><li>• Crumpets Noodles Pasta</li><li>• Popcorn (plain)</li></ul>



**A serve of grain (cereal) foods is approximately 30-45g which is:**

- 1 slice (40g) bread
  - ½ medium (40g) roll or flat bread
  - ½ cup (75-120g) cooked rice, pasta, noodles, barley, buckwheat, semolina, polenta, bulgur or quinoa
  - ½ cup (120g) cooked porridge
  - ⅔ cup (30g) wheat cereal flakes
  - ¼ cup (30g) muesli
  - 3 (35g) crispbreads
  - 1 (60g) crumpet
  - 1 small (35g) English muffin or scone
- \* Grain (cereal) foods, mostly wholegrain and/or high cereal fibre varieties



Image credit: NHMRC Eat for Health Educator Guide 2013

## **Lean Meat, Poultry, Fish, Eggs, Tofu, Nuts, Seeds and Legumes/beans**

The wide variety of foods in this group includes all kinds of lean meats, poultry, fish, eggs, tofu, nuts, seeds and legumes/beans.

In general, the foods in this group are a good source of many nutrients including protein, iron, zinc and other minerals and vitamins of the B group. Vitamin B12 is only found, in adequate quantities, in animal-based foods unless it has been added to fortify a plant-based product. Nuts and seeds can also provide valuable essential fatty acids and vitamin E.

Within this group, lean meats are a particularly good source of iron, zinc and vitamin B12. Consumption of no more than 455g per week of cooked lean red meat is recommended since regular consumption of large quantities of red meat (100–120g/day) may be associated with an increased risk of colorectal cancer.

The iron and zinc in lean meat, poultry and fish is more easily absorbed by the body than the iron and zinc from eggs and plant foods. Iron is especially important during infancy and for growing children, adolescent girls, pregnant women, women of child-bearing age and endurance athletes. Fish and seafood are a valuable source of long chain omega-3 polyunsaturated fatty acids, although the amount varies with the species.

Fish such as herrings, sardines and salmon and all Australian fish and seafood are regarded as 'good sources.' Some imported fish may have lower levels of long chain omega-3 polyunsaturated fatty acids compared with Australian seafood. Regular consumption of fish may be associated with reduced risk of heart disease, stroke, dementia and age-related macular degeneration. Include about 2 serves of fish or seafood a week. Meat from grass-fed animals also contains some long chain omega-3 fatty acids but at a lower level than in most fish.

Fresh, frozen and canned varieties of meats, poultry or fish are in this group, but choose canned varieties that are low in fat and without added salt. Processed meats high in fat or sodium such as salami or Mett Wurst are not part of this food group. They are classified as discretionary choices.

Sausages vary in their composition and may include cereals and other components. They may count as a meat serve if they are salt and fat reduced and made mostly from lean meat, or as a discretionary choice for regular sausages.

Eggs provide a low cost, easy to prepare source of protein and other nutrients. Legumes provide many of the same nutrients as meats, poultry, fish and eggs so have been placed in this food group, as well as with the vegetables group.

Nuts and seeds can provide protein, essential fatty acids and a range of minerals, vitamins and phytochemicals but servings are smaller due to their more concentrated kilojoule content. For those who do not eat meat, fish, dairy foods or eggs, including nuts/seeds, and legumes (or tofu) and grains in meals can provide adequate protein and other nutrients.

Lacto-ovo vegetarian diets that include milk products, eggs, nuts/ seeds, and legumes can provide all of the essential nutrients required for health.

## How much from the meat, poultry, fish, eggs, nuts, seeds, legume/beans group is needed?

The minimum recommended intake ranges are:

- The serves for children and adults ranges from 1 to 3 serves a day depending on age
- 3½ serves a day recommended in pregnancy when extra protein, iron and zinc are required.
- One choice might be to select up to half the serves from this food group as lean meat – this equates to a weekly total intake of approximately 455g cooked weight (600–700g raw weight) for older children, adolescents and adults.
- Choose around 2 serves a week of fish or seafood, especially oily fish.
- Other choices include lean poultry, eggs or tofu, legumes, seeds or nuts.
- If all animal-based choices are omitted from the diet, alternative iron/zinc-rich choices will include legumes, tofu, nuts/seeds, wholegrains and green vegetables.
- Whole nuts and seeds are not recommended for children aged 3 years or under because of potential choking problems. Paste from nuts and seeds such as peanut butter can be included after 6 months of age.

### Examples of meats, nuts, eggs, seeds and legume foods:

Lean Meats	Lean Poultry	Fish, Seafood	Eggs	Nuts and Seeds	Legumes/ beans
Beef, Kangaroo, Lamb, Lean, lower salt sausages, Pork, Veal	Bush birds, Chicken, Duck, Emu, Goose, Turkey	Clams, Crab, Fish, Lobster, Mussels, Oysters, Prawns, Scallops	Chicken eggs, Duck eggs	Almonds, Brazil nuts, Cashews, Chestnuts, Hazel nuts, Macadamia nuts, Pine nuts, Peanuts, Pecans, Pistachios, Walnuts, Nut spreads, Pumpkin, sesame and sunflower seeds, Tahini	All beans, Chickpeas, Lentils, Split peas, Tofu

**A serve of lean meat, poultry, fish, eggs, nuts, seeds, and legumes/beans is approximately 65-100g which is:**

- 65g cooked lean red meats such as beef, lamb, veal, pork, goat or kangaroo (about 90-100g raw)
- 80g cooked lean poultry such as chicken or turkey (100g raw)
- 100g cooked fish fillet (about 115g raw) or one small can of fish
- 2 large (120g) eggs
- 1 cup (150g) cooked or canned legumes/beans such as lentils, chickpeas or split peas (preferably with no added salt)
- 170g tofu
- 30g nuts, seeds, peanut or almond butter or tahini or other nut or seed paste (no added salt)\*

\*Choose those with no added salt



Image credit: NHMRC Eat for Health Educator Guide 2013

## **Milk, Yoghurt, Cheese and Alternatives**

Milk, yoghurt and cheeses are important foods, and their consumption may help reduce risk of high blood pressure, heart disease, stroke, type 2 diabetes and some cancers.

The foods in this group are an excellent source of calcium; very few other foods in the Australian diet contain as much of this important nutrient. These foods are also a good source of other nutrients including protein, iodine, riboflavin and vitamin B12.

However, the milk, yoghurt, cheese group can increase the saturated fat and energy content of a diet if mostly full fat products are chosen.

Therefore, the best choices for most people two years and over, are low or reduced fat milk, yoghurts and cheeses. A wide range of milk and yoghurt products is available with varying fat levels.

Milk can be fresh, dried, evaporated, or UHT long-life. Full fat cheese should be limited to two to three serves a week or replaced with cheeses that have reduced levels of fat. Some cheeses such as cottage cheese or fetta have less calcium than most other cheeses per unit weight. Fetta can also be particularly high in salt.

Other milk-based products such as ice cream and fromage frais and dessert style custards contribute some calcium to the diet but may be relatively high in saturated fat and added sugar. These products are therefore classified under as discretionary choices.

For most adults, the best choices are reduced fat milk, yoghurts and cheeses. Infants under the age of 12 months should not be given cow's milk as a drink, although this can be served in small quantities with cereal and in meals. Breastmilk or specially prepared infant formula should be given to infants under 12 months of age as the main milk source.

Regular full fat milk, yoghurts and cheese varieties should be used between the ages of 1–2 years. At this age children receive a large proportion of their energy needs from milk and using reduced fat varieties could limit the energy needed for growth.

After 2 years of age, when children are eating a more varied diet, reduced fat varieties of milk and alternatives are suitable. Alternatives to milk, yoghurt and cheese can be used in place of dairy products, but choose varieties with added calcium, such as calcium-enriched soy or rice drinks.

Check the nutrition information panel on the label of these products to ensure they contain at least 100mg of added calcium per 100ml. Some foods from other groups can also be used to compensate for the use of these alternative foods. For example, canned fish with bones (such as sardines, herrings or salmon), almonds or tofu are rich sources of calcium. Seafood (especially mussels, oysters and prawns) and many plant foods (especially seeds, grain-based foods, and vegetables) also contain smaller amounts of calcium. Some people elect to follow a dairy food free or milk-free diet because of a diagnosed or suspected milk allergy, an intolerance to lactose (the natural sugar in milk), or out of concern that milk increases mucous production.

If allergies and intolerances are diagnosed by a doctor and dairy products must be avoided, an Accredited Practising Dietitian can advise about alternative sources of calcium.

There is no scientific evidence of a link between milk and mucous production.

## How much from the milk, yoghurt, cheese and alternatives group is needed every day?

The minimum recommended intake ranges are:

- 1½–2 serves a day for children up to 8 years old,
- 2½–3½ serves a day for older children and adolescents,
- 2½ serves a day in younger adults, pregnant and breastfeeding women,
- 3½–4 serves a day in older adults, particularly women.

Some additional serves from this group can be included in the overall diet instead of discretionary choices, to account for the additional energy needs of more active people and/or those who are taller.

Milks	Yoghurt	Cheese
<p>All long life milks</p> <p>All reduced fat or full cream milks, preferably unflavoured types</p> <p>Buttermilk Evaporated milk Powdered milk</p> <p>Soy or other beverages (fortified with at least 100mg calcium/100ml)</p>	<p>All yoghurts including reduced fat or full cream, (without added sugar)</p> <p>Soy yoghurt (calcium fortified)</p>	<p>Cheddar Edam Gouda Ricotta</p> <p>Soy cheeses (calcium fortified)</p>

**A serve of milk, yoghurt, cheese and/or alternatives\* is varied:**

- 1 cup (250ml) fresh, UHT long life, reconstituted powdered milk or buttermilk
- ½ cup (120ml) evaporated milk
- 2 slices (40g) or 4 x 3 x 2cm cube (40g) of hard cheese, such as cheddar
- ½ cup (120g) ricotta cheese
- ¾ cup (200g) yoghurt
- 1 cup (250ml) soy, rice or other cereal drink with at least 100mg of added calcium per 100ml

\*Choose mostly reduced fat



Image credit: NHMRC Eat for Health Educator Guide 2013

**The following alternatives contain about the same amount of calcium as a serve of milk, yoghurt or cheese:**

- 100g almonds with skin
- 60g sardines, canned in water
- ½ cup (100g) canned pink salmon with bones
- 100g firm tofu (check the label as calcium levels vary)

## Total Diets for Adults

The dietary patterns below provide the nutrients and energy needed by all men and women of average height with sedentary to moderate activity levels.

Additional serves of the Five Food Groups or unsaturated spreads and oils or discretionary choices are needed only by adults who are taller or more active to meet additional energy requirements.

The Eat for Health Educator guide has more details on how to include additional energy, in a healthy way, for people that require more.

Recommended average daily number of serves from each of the five food groups*							Additional serves for taller or more active men and women
	Age	Vegetables and legumes/beans	Fruit	Grain (cereal) foods, mostly wholegrain, such as breads, cereals, rice, pasta, noodles, polenta, couscous, oats, quinoa and barley	Lean meat and poultry, fish, eggs, nuts and seeds, and legumes/beans	Milk, yoghurt, cheese and/or alternatives (mostly reduced fat)	Approx. number of additional serves from the five food groups or discretionary choices
Men	19–50	6	2	6	3	2½	0–3
	51–70	5½	2	6	2½	2½	0–2½
	70+	5	2	4½	2½	3½	0–2½
Women	19–50	5	2	6	2½	2½	0–2½
	51–70	5	2	4	2	4	0–2½
	70+	5	2	3	2	4	0–2
Pregnant	(19–50)	5	2	8½	3½	2½	0–2½
Lactating	(19–50)	7½	2	9	2½	2½	0–2½

Image credit: NHMRC Eat for Health Educator Guide 2013

## Macronutrients

Macro means “large” and refers to the nutrients we need in larger quantities that provide us with energy: in other words, fat, protein and carbohydrate.

Micronutrients are mostly vitamins, minerals and amino acids, and are equally important but consumed in very small amounts. We generally get our micronutrients along with macronutrients.

Each macro nutrient has a specific role in our bodies and can be found primarily in certain food groups.

Macro nutrients also provide various amounts of energy for our body to use, measured in the form of calories or kilojoules.

A calorie is a unit of energy. Historically, scientists have defined “calorie” to mean a unit of energy or heat that could come from a variety of sources, such as coal or gas. In a nutritional sense, all types of food — whether they are fats, proteins, carbohydrates or sugars — are important sources of calories, which people need to live and function.

To convert calories into kilojoules: 1 calorie = 4.18 kilojoules



## Carbohydrates

**Energy content: 1g = 4 calories**

**Primary food group source:** Fruits, grains and cereals, vegetables and legumes and beans

**Role in our body:** Carbohydrates are your body's main fuel source. During digestion, sugars and starches are broken down and then absorbed into your bloodstream, where they are known as blood sugar (blood glucose). From there, glucose enters your body's cells with the help of insulin to give us energy.

## Protein

**Energy content: 1g = 4 calories**

**Primary food group source:** Meat, nuts, eggs, nuts, seeds, legumes and beans and dairy.

**Role in the body:** Proteins are made of chemical 'building blocks' called amino acids. Your body uses amino acids to build and repair muscles, skin and bones and to make hormones and enzymes.

Some vegetables also contain considerable amounts of protein.

Low levels of protein intake can lead to weak and thinning hair, skin and nails, loss of muscle mass, stunted growth, immune system deficiency, greater appetite and higher calorie intake.

## Fat

**Energy content: 1g = 9 calories**

**Primary food group source:** Meat, nuts, eggs, seeds and dairy

**Role in the body:** The body uses fat from our food as a fuel source and stores it for energy. Fat has many crucial functions in the body such as protecting our organs, supporting cell growth, keeping cholesterol and blood pressure and body temperature controlled.

Some vitamins are stored in the liver and fat stores for use as we need them. These are Vitamins A, D, E and K.

Pure fat is extracted from food sources. Healthy fats are extracted from olives, nuts, seeds, fish and plant sources like canola.

Less healthy fats are saturated and come from meat and dairy.

## Energy from macronutrients

The estimated Acceptable Macronutrient Distribution Ranges (AMDR) related to reduced risk of chronic diseases are:

- 20-35% of total energy intake from fat
- 45-65% from carbohydrates
- 15-25% from protein
- <5% alcohol

Outside of these ranges, the risk of chronic disease, being overweight and obesity, and inadequate micronutrient intake many increase.

(Australian Dietary Guidelines 2013 P16)

## **Benefits of Variety in our Diet**

Within each food group you would have noticed a wide variety of types of foods.

We are strongly encouraged to eat as wide a variety from each food group as possible to ensure we are consuming as many different nutrients as possible.

Micronutrients are smaller nutrients called vitamins, minerals, amino acids and phytonutrients (like plant sterols and antioxidants etc).

They are present in various quantities and forms in all foods and the more variety we enjoy in our diets every week, the more access we have to a wide range and balanced variety of nutrients needed by our bodies to remain healthy and well.

## **Quality of Food Choices**

The quality of the food we choose will can have a large bearing on the nutritional value in regard to micronutrient density.

### **Discretionary foods**

Some foods and drinks do not fit into the Five Food Groups because they are not necessary for a healthy diet and are too high in saturated fat and/or added sugars, added salt or alcohol and low in fibre. These foods and drinks can also be high in kilojoules (energy). Many tend to have low levels of essential nutrients so are often referred to as 'energy-dense' but 'nutrient-poor' foods.

The problem is that they can take the place of other more nutritious foods. Also, the higher levels of kilojoules, saturated fat, added sugars, added salt and/or alcohol that they contain are associated with increased risk of obesity and chronic disease such as heart disease, stroke, type 2 diabetes, and some forms of cancer.

It is easy to have too much and too many of these foods and drinks, and many people do. If you are trying to lose weight, you are unlikely to be able to fit these foods into your lower kilojoule target. However, for people in their normal weight range, these foods and drinks in occasional, small amounts, can add variety and enjoyment to eating. These 'optional' foods and drinks are referred to as 'discretionary choices.'

'Discretionary' foods and drinks include sweet biscuits, cakes, desserts and pastries; processed meats and fattier/salty sausages; sweetened condensed milk; ice cream and other ice confections; confectionary and chocolate; savoury pastries and pies; commercial burgers with a high fat and/or salt content; commercially fried foods; potato chips, crisps and other fatty and/or salty snack foods including some savoury biscuits; cream, butter and spreads which are high in saturated fats; sugar-sweetened soft drinks and cordials, sports and energy drinks and alcoholic drinks.



## What types of food are included in this category?

Higher added sugars	Higher fat	Higher fat and added sugars	High alcohol
Energy drinks Fruit drinks Honey  Jams, marmalade Some sauces Sugar  Sugar confectionary  Sweetened soft drinks and cordials  Sweetened waters Syrups	Bacon, ham  Butter, cream, ghee  Certain tacos, nachos, enchilada  Crisps  Dairy blends Frankfurt's etc Meat pies Pastry  Pizza  Potato chips Quiche Salami/Mett Wurst  Some processed meats Some sauces/dressings Spring roll	Biscuits Cake  Chocolate/Bars Dessert custards Doughnuts  Ice cream Iced Buns Muesli bars Puddings Slices  Some confectionary Some sauces/ dressings Sweet muffins  Sweet pastries  Sweet pies and crumbles	    Beer Liqueurs  Mixed alcoholic drinks Port  Sherry Spirits Wines

## What is a serve of Discretionary foods?

One 'serve' of a discretionary food, is the amount that contains 600kJ. To find out how much of a particular discretionary food would be equal to one 'serve', you can use the nutrition information panel to work out what amount of the product would contain 600kJ.

## Examples of one serve of a discretionary food:

2 scoops (75g) regular ice cream

¼ cup condensed milk

50-60g (about two slices) processed meats, salami, Mett Wurst

1 slice (40 g) plain cake or small cake-type muffin

40g sugar confectionary (about 5-6 small lollies)

2 tablespoons (40 g) cream

1 tablespoon (20 g) butter or hard margarine

12 (60 g) fried hot chips

400 mL regular beer (1½ standard drinks)

200 mL wine (2 standard drinks (note this is often 1 glass for many Australian wines))

1 ½ thick or 2 thinner higher fat/salt sausages

30g salty crackers (a small individual serve packet)

2-3 sweet biscuits

1 (40 g) doughnut

60g jam/honey (about 1 tablespoon)

1/2 small bar (25 g) chocolate

1/3 (60 g) commercial meat pie or pastie

60 mL spirits (2 standard drinks)

600 mL light beer (1½ standard drinks)

1 can (375 mL) soft drink

## How do discretionary foods fit into a healthy diet?

Some people require extra serves for example, those who are taller and more active and these can sometimes include extra serves of discretionary foods. It is best if these extra serves come from the five food groups, particularly wholegrain cereals, vegetables including legumes/beans and fruit. However, they can also sometimes include serves of discretionary foods.

If you are aiming to lose weight, you are more likely to be successful if you minimise discretionary foods, because they are high in kilojoules but low in essential nutrients.

There are lots of ways to cut down on discretionary foods that includes; swapping them for foods from the five food groups, planning for eating out and eating more 'mindfully' and limiting portion size.

## Effects of Added Sugar

Added sugars can increase the energy content of our diet and dilute nutrient intake.

High or frequent intake of foods and drinks containing added sugars can lead to tooth decay in both children and adults.

Recent evidence shows that intake of sugar-sweetened drinks can increase the risk of excessive weight gain in both children and adults leading to obesity and the associated risks of obesity to our health.

Foods and drinks that are artificially sweetened can provide a useful alternative to those high in added sugars but should also be consumed sparingly.

Artificially sweetened soft drinks are acidic and may erode tooth enamel.

Infants should be put to bed without a bottle, or the bottle should be taken away when the infant has finished feeding. Do not let the infant keep sucking on the bottle as the sugar can cause mouth irritation and tooth decay.

Sugar can also encourage inflammation in the body causing skin irritations and acne break outs. One study found that people who frequently consumed added sugars had a 30% greater risk of developing acne, while those who regularly ate pastries and cakes had a 20% greater risk.

When blood sugars rise, insulin levels also rise to help shuttle the blood sugars out of the bloodstream and into your cells.

Insulin makes androgen hormones more active and increases insulin-like growth factor 1 (IGF-1). This contributes to acne development by making skin cells grow more quickly and by boosting sebum production.

### Ways to limit sugar in our diets:

- Limit intake of drinks with added sugars including sweetened soft drinks and cordials, energy drinks, sports drinks, vitamin waters and fruit drinks.
- Limit foods which contain added sugar including confectionary (lollies), syrups and sweetened sauces and dressings, jam, cakes, biscuits, sweet muffins, doughnuts, slices, puddings, sweet pastries, pies and crumbles, ice-cream, chocolate and muesli bars.
- Within each food group choose mainly foods with little or no added sugar.
- Choose foods containing added sugars less often, like sweetened breakfast cereals, fruit canned in syrup, flavoured milks and flavoured yoghurts.
- Replace sweet craving with fresh fruit or small portions or dried fruit.
- Consider if you are actually craving sugar, or are actually hungry or thirsty as these have similar sensations
- Consume plenty of water each day, especially when having a sugar craving.

## Whole foods

Many health experts believe that eating more whole foods is our best bet for improving health and preventing disease. Whole foods – like vegetables, fruits, whole grains, nuts, and legumes -- retain their fiber as well as the whole portfolio of beneficial nutrients that are often removed in processed foods.

The best way to make sure we're getting the phytonutrients we know about, as well as the ones we haven't yet discovered or named, is to eat plant foods in their whole, unprocessed form (or ground, if they're grains or seeds).

### Examples of wholefoods:

- Whole grains instead of refined grains whenever possible.
- Fruits, vegetables, and beans instead of supplements to provide the fiber and vitamins they contain.
- A skinless chicken breast cooked with healthful ingredients instead of chicken nuggets processed with added fats, flavourings, and preservatives.
- A baked potato with chopped green onions and light sour cream instead of a bag of sour cream and onion potato chips.
- Fresh berries with breakfast instead of raspberry toaster pastries or breakfast bars.
- A blueberry smoothie made with blueberries, yogurt, and a frozen banana instead of a blue-coloured slushy or ice.

To put it simply, most foods start to lose their nutritional value when they are put through processes in the attempt to make them “more appealing” to consume.

Guideline #3 states that we should “Limit intake of foods containing saturated fat, added salt, added sugars and alcohol”

This usually include highly processed foods that have had much nutrition stripped away from the food. This leaves the food high in calorie content (usually carbohydrates and fats) and very low in vitamins and minerals.

These types of foods are called “Discretionary items” and should only be consumed in very small amounts for enjoyment. They should not make up the majority of our diets, because our diets need to contain nutrient rich foods which benefit our body and health.

## Fibre

Many Australians do not get enough fibre through their dietary patterns.

The dietary guidelines encourage the consumption of foods high in dietary fibre such as vegetables, especially legumes, fruit and wholegrain foods. Fibre is important for health, helps prevent some chronic diseases and helps with weight control.

Follow the Australian Guide to Healthy Eating to choose the appropriate number of serves based on age and sex from plant foods (wholegrains, vegetables, legumes, fruit, seeds, nuts), to provide an adequate intake of dietary fibre.

Nutrition Australia recommends the following amounts of fibre to be consumed for a healthy diet:

### How much fibre do I need?

Gender (over 18 years)	Acceptable intake
Males	30g per day
Females	25g per day

## Types of fibre

Three main types of dietary fibre fit into the categories of insoluble fibre, soluble fibre and resistant starch.

### Insoluble fibre

Insoluble fibre is particularly good for the digestive system. It is bulky and absorbs water, so it is filling for few kilojoules, keeps stools soft and bulky and bowels regular. It also helps prevent some bowel problems such as diverticular disease, haemorrhoids and constipation. Plant foods high in dietary fibre are also associated with a reduced risk of bowel cancer.

Food high in insoluble fibre include wholegrain breads and cereals, fruit, vegetables (especially the skins), legumes/beans, and nuts and seeds. Vegetables and fruits have the added advantage of being low in kilojoules.

### Soluble fibre

Soluble fibre works differently. It still contributes to satiety but can also have favourable effects on blood cholesterol and blood glucose levels.

Foods high in soluble fibre include fruits, vegetables, legumes, barley and oats.

### Resistant starch

When resistant starch travels undigested to the large intestine it is processed by 'good' bacteria and the by-products help keep the bowel lining healthy.

Food rich in resistant starch include under-ripe bananas, cooked potato that has been cooled, legumes such as chickpeas and lentils, wholegrain products such as rye bread and pasta cooked to the al dente stage.

### Where is fibre found?

- Limit discretionary choices as these tend to be low in fibre and may take the place of some of the serves from the high fibre food groups.
- Fruit should be chosen as fresh or canned fruit. Most fruit juices have little or no dietary fibre.
- Use wholegrain breads and breakfast cereals, brown rice and wholemeal pasta more often than white or more refined varieties.
- Eat edible skins on fruit and vegetables, where appropriate.
- Include legumes, nuts and seeds.
- Swap some meat or chicken for cooked/canned legumes or grated vegetables. Try to avoid making up for a low fibre eating pattern by using fibre supplements or foods with concentrated fibre such as brans or psyllium husk.

## Water and Fluid

Water is essential for life!

It is required for digestion, absorption and transportation, as a solvent for nutrients, for elimination of waste products and to regulate body temperature.

It is essential to assist the passing of fibre through our digestive system and keep our bodies functioning optimally.

Water is constantly lost from the body and needs to be replaced. Water requirements vary with age and at some life stages.

More water will need to be consumed if a person is heavily sweating, living in a hot climate or talking a lot as more fluid is lost during these activities than usual.



Water turnover is higher in infants and young children than in adults. Breast milk or infant formula should be the main drink in the first 12 months. Exclusively breastfed infants do not require additional fluids up to 6 months of age. For formula-fed infants, cooled boiled tap water may be used if additional fluids are needed from birth. From around 6 months, small amounts of cooled boiled water can supplement breast milk.

Pregnant and breastfeeding women have a slightly increased water requirement compared with other women because of the needs of the foetus or baby and other changes that occur in the body during pregnancy and lactation. Older people can experience dehydration if they have an inadequate intake of water or other drinks. The normal decline in kidney function with age, plus hormonal changes, decreased perception of thirst, some medications, cognitive changes, limited mobility and increased use of diuretics and laxatives may lead to reduced hydration in older people.

These changes may be normal adaptations of the ageing process but the outcomes of dehydration in the elderly are serious and include cognitive impairment, functional decline, falls or stroke.

Adequate fluid consumption is an integral component of a healthy diet.

Water is a good source of fluid and has the advantage of not adding energy to the diet. The NHMRC Nutrient Reference Values contain guidance on the intake of water that can be consumed over the course of a day.

However, there is no single recommended intake, as water requirements at any one time will vary depending on climate, physical activity, body surface area and individual metabolism.

Total water requirements include the water content of foods as well as fluids.

**The following intakes can be used as a general guide for fluids:**

- about 4–5 cups of fluids a day for children up to 8 years,
- about 6–8 cups for adolescents,
- 8 cups for women (9 cups in pregnancy and lactation)
- about 10 cups for men.

It is preferable to meet most fluid needs by drinking plain water.

Many commonly consumed fluids such as tea and coffee do contain water, although large quantities can have unwanted stimulant effects in susceptible people.

Australian tap water is an ideal option because it is inexpensive and meets high palatability and hygiene standards.

Most tap water in Australia is fluoridated, which has been shown to be a safe and effective public health measure.

Fluoridation of tap water provides an additional benefit for development of strong teeth and bones, making it a good choice to ensure adequate hydration.

# GLOSSARY

**AUSactive:** The peak Health and Exercise Industry Association with the largest register of exercise professionals & facilities across Australia. They aim to provide innovation, standards or conduct and educational leadership across all exercise and wellness modalities nationally.

**Allied Health Professional (AHP):** A variety of professional in the health and social industries that can provide clients with services to compliment fitness services. They may include GP's, Physiotherapists, Dietitians, Psychologists, Podiatrists and more.

**Chronic Disease:** Conditions that last 1 year or more and require ongoing medical attention or limit activities of daily living or both.

**Diet:** The types and amounts of food a person, group of people or animal consume on a regular basis.

**Fitness representative:** Any person with a fitness qualification that is working in the fitness, sports and recreation industries.

**Lifestyle Diseases:** Diseases that are more prevalent in persons or population groups when certain lifestyles factors are also commonly present.

**Systemic review:** A review of evidence on a clearly formulated question that uses systematic and explicit methods to identify, select and critically appraise relevant primary research, and to extract and analyse data from the studies that are included in the review. (NHS Centre for Reviews and Dissemination, University of York. March 2001)

# REFERENCES

<https://www.health.gov.au/health-topics/physical-activity-and-exercise/physical-activity-and-exercise-guidelines-for-all-australians>

<https://www.mayoclinic.org/healthy-lifestyle/pregnancy-week-by-week/in-depth/pregnancy-weight-gain/art-20044360>

<https://my.clevelandclinic.org/health/articles/10643-smoking-and-physical-activity>

<https://www.healthdirect.gov.au/allied-health> <https://www.exercise.com/learn/health-and-fitness-assessments-guide/>

<https://www.daimanuel.com/2016/01/05/the-pre-fatigue-principle-what-it-is-and-how-to-use-it/>

<https://www.issaonline.com/blog/post/exercises-to-improve-speed-training-that-benefits-everyone>

<https://www.verywellfit.com/understanding-agility-in-sports-3120338>

<https://www.healthline.com/health/fitness/proprioception-exercises#why-it-matters>

<https://www.healthline.com/health/exercises-for-balance>

<https://www.brianmac.co.uk/reaction.htm>

<https://reflexion.co/blog/improve-reaction-time/>

<https://www.betterhealth.vic.gov.au/health/conditionsandtreatments/menopause#what-is-menopause>

<https://www.menopause.org/for-women/menopauseflashes/exercise-and-diet/fitness-after-40-building-the-right-workout-for-a-better-body>

<https://www.menopause.org.au/health-info/fact-sheets/maintaining-your-weight-and-health>

## Get Body Smart

<https://www.getbodysmart.com/>

<https://www.getbodysmart.com/a-p-resources>

<https://www.getbodysmart.com/circulatory-system>

<https://www.getbodysmart.com/circulatory-system/transport-oxygen-blood>

<https://www.getbodysmart.com/respiratory-system>

<https://www.getbodysmart.com/spirometry/lung-volumes-capacities>

<https://www.getbodysmart.com/nerve-cells>

<https://www.getbodysmart.com/skeletal-system>

<https://www.getbodysmart.com/muscle-physiology>

<https://www.getbodysmart.com/muscle-contraction/contraction-physiology>

<https://www.getbodysmart.com/muscle-fiber-nerve-supply/neuromuscular-junction-structure>

<https://www.getbodysmart.com/muscle-fiber-nerve-supply/motor-units>

<https://www.getbodysmart.com/muscle-fiber/skeletal-muscle-fiber-location-arrangement>

<https://www.getbodysmart.com/muscular-system>

<https://www.getbodysmart.com/muscular-system>

## Ken hub

<https://www.kenhub.com/en/register>

<https://www.kenhub.com/en/library/anatomy/types-of-cells-in-the-human-body>

<https://www.kenhub.com/en/library/anatomy/introduction-to-histology>

<https://www.kenhub.com/en/library/anatomy/introduction-to-tissues-epithelial-connective-muscle-and-nervous-tissue>

<https://www.kenhub.com/en/library/anatomy/review-of-all-the-human-body-organs>

<https://www.kenhub.com/en/library/learning-strategies/master-blood-vessels-with-diagrams-and-arteries-and-veinsquizzes>

<https://www.kenhub.com/en/library/anatomy/the-respiratory-system>

<https://www.kenhub.com/en/library/anatomy/anatomy-of-breathing>

<https://www.kenhub.com/en/library/anatomy/the-nervous-system>

<https://www.kenhub.com/en/library/anatomy/histology-of-neurons>

<https://www.kenhub.com/en/study/main-joints-of-the-human-body>

<https://www.kenhub.com/en/study/types-of-synovial-joints>

<https://www.kenhub.com/en/library/anatomy/intervertebral-joints>

<https://www.kenhub.com/en/library/anatomy/complete-list-of-bone-markings>

<https://www.kenhub.com/en/library/anatomy/bones>

<https://www.kenhub.com/en/study/bones-skeletal-system>

<https://www.kenhub.com/en/library/anatomy/the-neuromuscular-junction-structure-and-function>

<https://www.kenhub.com/en/library/anatomy/the-musculoskeletal-system>

<https://www.kenhub.com/en/library/anatomy/muscles>

<https://www.kenhub.com/en/library/anatomy/the-blood>

## Khan Academy

<https://www.khanacademy.org/login>

<https://www.khanacademy.org/science/ms-biology/x0c5bb03129646fd6:cells-and-organisms/x0c5bb03129646fd6:organization-in-the-human-body/v/ms-organization-in-the-human-body?modal=1>

<https://www.khanacademy.org/science/ms-biology/x0c5bb03129646fd6:cells-and-organisms>

<https://www.khanacademy.org/science/biology/principles-of-physiology/body-structure-and-homeostasis/a/tissuesorgans-organ-systems>

<https://www.khanacademy.org/science/biology/principles-of-physiology/body-structure-and-homeostasis/a/homeostasis>

<https://www.khanacademy.org/science/high-school-biology/hs-human-body-systems/hs-the-circulatory-and-respiratorysystems/v/meet-the-heart>

<https://www.khanacademy.org/science/biology/human-biology#circulatory-pulmonary>

<https://www.khanacademy.org/test-prep/mcat/physical-sciences-practice/physical-sciences-practice-tut/e/the-forearm-as-an-example-of-a-third-class-lever>

<https://www.khanacademy.org/science/high-school-biology/hs-human-body-systems/hs-the-circulatory-and-respiratorysystems/v/meet-the-lungs>

<https://www.khanacademy.org/science/in-in-class-11-biology-india/x9d1157914247c627:breathing-and-exchange-ofgases>

<https://www.khanacademy.org/science/in-in-class-10-biology/in-in-life-processes#in-in-respiration-in-human-beings>

<https://www.khanacademy.org/science/high-school-biology/hs-human-body-systems#hs-the-nervous-and-endocrinesystems>

<https://www.khanacademy.org/science/high-school-biology/hs-human-body-systems/hs-the-nervous-and-endocrinesystems/v/structure-of-the-nervous-system?modal=1>

<https://www.khanacademy.org/science/high-school-biology/hs-human-body-systems/hs-the-nervous-and-endocrinesystems/v/anatomy-of-a-neuron?modal=1>

<https://www.khanacademy.org/science/high-school-biology/hs-human-body-systems/hs-the-musculoskeletal-system/v/ligaments-tendons-and-joints>

<https://www.khanacademy.org/science/ap-biology/ecology-ap/energy-flow-through-ecosystems/a/animal-temperatureregulation-strategies>

<https://www.khanacademy.org/science/high-school-biology/hs-human-body-systems/hs-the-musculoskeletal-system/v/skeletal-structure-and-function>

<https://www.khanacademy.org/test-prep/mcat/organ-systems/the-skeletal-system/v/cellular-structure-of-bone>

<https://www.khanacademy.org/test-prep/mcat/organ-systems#the-skeletal-system>

<https://www.khanacademy.org/test-prep/mcat/processing-the-environment/somatosensation/v/proprioceptionkinesthesia>

<https://www.khanacademy.org/test-prep/mcat/processing-the-environment/somatosensation/v/pain-and-temperature-1>

<https://www.khanacademy.org/science/biology/human-biology>

<https://www.khanacademy.org/science/biology/human-biology#muscles>

<https://www.khanacademy.org/science/high-school-biology/hs-human-body-systems#hs-the-musculoskeletal-system>

<https://www.khanacademy.org/test-prep/mcat/organ-systems/the-respiratory-system/v/oxygen-movement-from-alveolito-capillaries>

<https://www.khanacademy.org/test-prep/mcat/organ-systems#the-respiratory-system>

### Other sources

<https://my.clevelandclinic.org/health/articles/21205-respiratory-system>

<https://www.medicalnewstoday.com/articles/320444>

<https://www.ncbi.nlm.nih.gov/books/NBK279392/>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3037021/>

Cite: Kohrt, W. M., Barry, D. W., & Schwartz, R. S. (2009). Muscle forces or gravity: what predominates mechanical loading on bone? *Medicine and science in sports and exercise*, 41(11), 2050–2055. <https://doi.org/10.1249/MSS.0b013e3181a8c717>

<https://study.com/academy/topic/the-skeletal-system.html>

<https://pdhpe.net/the-body-in-motion/how-do-biomechanical-principles-influence-movement/force/how-the-bodyapplies-force/>

<https://www.visiblebody.com/blog/biomechanics-lever-systems-in-the-body>

<https://link.springer.com/article/10.2165/00007256-199111060-00003>

Cite: Doubt, T.J. Physiology of Exercise in the Cold. Sports Medicine 11, 367–381 (1991). <https://doi.org/10.2165/00007256-199111060-00003>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4914008/>

Cite: Carpio-Rivera, E., Moncada-Jiménez, J., Salazar-Rojas, W., & Solera-Herrera, A. (2016). Acute Effects of Exercise on Blood Pressure: A Meta-Analytic Investigation. Arquivos brasileiros de cardiologia, 106(5), 422–433. <https://doi.org/10.5935/abc.20160064>

<https://www.acsm.org/blog-detail/acsm-certified-blog/2019/02/27/exercise-hypertension-prevention-treatment>

<https://www.ahajournals.org/doi/10.1161/hypertensionaha.112.197780>

Cite: Timm H. Westhoff from the Departments of Sports Medicine (F.D.) and Nephrology (N.P., F.S., R.A., W.Z., T.H.W.), Charité-Campus Benjamin Franklin, Berlin, Germany.

<https://www.visiblebody.com/learn/circulatory/circulatory-blood-vessels>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7764033/>

Hackett D. A. (2020). Lung Function and Respiratory Muscle Adaptations of Endurance- and Strength-Trained Males. Sports (Basel, Switzerland), 8(12), 160. <https://doi.org/10.3390/sports8120160>

<https://www.ncbi.nlm.nih.gov/books/NBK482502/#:~:text=Tidal%20volume%20is%20the%20amount,proper%20ventilation%20to%20take%20place.>

Hallett S, Toro F, Ashurst JV. Physiology, Tidal Volume. [Updated 2022 May 8]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK482502/>

<https://simplifaster.com/articles/central-nervous-system-fatigue-effects-speed-power-athletes/>

<https://jps.biomedcentral.com/articles/10.1007/s12576-019-00669-6>

<https://healthybonesaustralia.org.au/your-bone-health/exercise-bone-health/>

<https://physioworks.com.au/pain-injury/overuse-injuries/>

<https://www.frontiersin.org/articles/10.3389/fmed.2021.697954/full>

<https://www.betterhealth.vic.gov.au/health/conditionsandtreatments/ageing-muscles-bones-and-joints>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5389428/>

Roberts, S., Colombier, P., Sowman, A., Mennan, C., Rölfling, J. H., Guicheux, J., & Edwards, J. R. (2016). Ageing in the musculoskeletal system. Acta orthopaedica, 87(sup363), 15–25. <https://doi.org/10.1080/17453674.2016.1244750>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5983157/>

Hughes, D. C., Ellefsen, S., & Baar, K. (2018). Adaptations to Endurance and Strength Training. Cold Spring Harbor perspectives in medicine, 8(6), a029769. <https://doi.org/10.1101/cshperspect.a029769>

<https://www.nature.com/articles/s42255-020-0251-4>

<https://www.sciencedirect.com/topics/immunology-and-microbiology/mitochondrial-biogenesis>

<https://medium.com/in-fitness-and-in-health/what-happens-when-you-stretch-9be500af5498>

<https://www.coreprinciples.com.au/online-personal-trainer2/item/the-science-behind-stretching.html>

<https://www.niams.nih.gov/health-topics/sports-injuries>

<https://www.mayoclinic.org/healthy-lifestyle/fitness/in-depth/overuse-injury/art-20045875>



[https://www.physio-pedia.com/Sport\\_Injury\\_Classification](https://www.physio-pedia.com/Sport_Injury_Classification)

<https://www.youtube.com/watch?v=szJaHahmBn8>

<https://www.youtube.com/c/NasmOrgPersonalTrainer>

<https://www.youtube.com/playlist?list=PLeVb1RGNTvddYk2ixJqdmstqY3DuTsTSd>

[https://human.biodigital.com/view?id=production/maleAdult/bony\\_landmarks\\_complete\\_anatomy&lang=en](https://human.biodigital.com/view?id=production/maleAdult/bony_landmarks_complete_anatomy&lang=en)

<https://pubmed.ncbi.nlm.nih.gov/6373687/>

<https://pubmed.ncbi.nlm.nih.gov/1642145/>

<https://pubmed.ncbi.nlm.nih.gov/12477376/>

[https://www.physio-pedia.com/Neuromuscular\\_Adaptations\\_to\\_Exercise](https://www.physio-pedia.com/Neuromuscular_Adaptations_to_Exercise)

<https://sites.udel.edu/coe-engex/2019/04/30/acute-short-term-effects-of-stretching/>

<https://www.healthline.com/health/why-does-stretching-feel-good>

<https://www.verywellfit.com/is-high-impact-exercise-right-for-you-1230821>

<https://athletesauthority.com.au/nervous-system/>

Short term effects of exercise on the body systems - Long and short term effects of exercise - Eduqas - GCSE Physical Education Revision - Eduqas - BBC Bitesize

<https://www.livestrong.com/article/131711-what-are-effects-exercise-skeletal-system/>

<https://pubmed.ncbi.nlm.nih.gov/27613719/>

<https://pubmed.ncbi.nlm.nih.gov/1642145/>

<https://positivepsychology.com/exercise-neurological-benefits/#neurological>

<https://www.nebh.org/blog/short-and-long-term-effects-of-exercise-on-the-cardiovascular-system/>

[https://en.wikipedia.org/wiki/Neurobiological\\_effects\\_of\\_physical\\_exercise](https://en.wikipedia.org/wiki/Neurobiological_effects_of_physical_exercise)

<https://www.who.int/> <https://www.who.int/health-topics/nutrition> <https://www.eatforhealth.gov.au/>

[https://www.eatforhealth.gov.au/sites/default/files/content/n55\\_australian\\_dietary\\_guidelines.pdf](https://www.eatforhealth.gov.au/sites/default/files/content/n55_australian_dietary_guidelines.pdf)

[https://www.eatforhealth.gov.au/sites/default/files/files/the\\_guidelines/n55b\\_eat\\_for\\_health\\_educators\\_guide.pdf](https://www.eatforhealth.gov.au/sites/default/files/files/the_guidelines/n55b_eat_for_health_educators_guide.pdf)

[https://ausactive.org.au/wp-content/uploads/2021/11/Nutrition\\_Advice\\_within\\_SoP\\_for\\_AusREPs\\_F.pdf](https://ausactive.org.au/wp-content/uploads/2021/11/Nutrition_Advice_within_SoP_for_AusREPs_F.pdf)

[https://ausactive.org.au/wp-content/uploads/2021/11/ED\\_Fitness\\_Recommendations\\_FINAL.pdf](https://ausactive.org.au/wp-content/uploads/2021/11/ED_Fitness_Recommendations_FINAL.pdf) <https://www.betterhealth.vic.gov.au/health/conditionsandtreatments/heart-disease-and-food> <https://www.betterhealth.vic.gov.au/health/conditionsandtreatments/cholesterol-healthy-eating-tips> <https://www.mayoclinic.org/diseases-conditions/obesity/symptoms-causes/syc-20375742> <https://www.betterhealth.vic.gov.au/health/conditionsandtreatments/metabolism> <https://www.healthdirect.gov.au/high-blood-pressure-hypertension>

<https://www.canceraustralia.gov.au/resources/position-statements/lifestyle-risk-factors-and-primary-prevention-cancer/lifestyle-risk-factors/diet>

<https://www.wcrf.org/diet-activity-and-cancer/> <https://www.heartfoundation.org.au/heart-health-education/healthy-eating> <https://www.betterhealth.vic.gov.au/health/healthyliving/healthy-cooking-tips> <http://daa.asn.au/for-the-public/find-an-apd/what-is-an-accreditedpractising-dietitian/> <https://dietitiansaustralia.org.au/seeing-dietitian/what-expect/dietitian-or-nutritionist>

[https://www.who.int/health-topics/breastfeeding#tab=tab\\_1](https://www.who.int/health-topics/breastfeeding#tab=tab_1) <https://dietitiansaustralia.org.au/working-dietetics/credentialing-dietitians> <https://nutritionaustralia.org/fact-sheets/fibre-2/> <https://www.sportsdietitians.com.au/sda-blog/healthy-eating-right-advice/> <http://www.scandpg.org/sports-dietitian-job-description/>

Anderson AL, Harris TB, Tyllavsky FA, Perry SE, Houston DK, Hue TF et al. Dietary patterns and survival of older adults. J Am Diet Assoc 2011;111(1):84–91.

Buckland G, Bach A, Serra-Majem L. Obesity and the Mediterranean diet: a systematic review of observational and intervention studies. Obes Rev 2008;9(6):582–93.

de Groot CP, van Staveren WA. Nutritional concerns, health and survival in old age. Biogerontol 2010;11(5):597–602.

Roman B, Carta L, Martinez-Gonzalez MA, Serra-Majem L. Effectiveness of the Mediterranean diet in the elderly. Clin Interv Aging 2008;3(1):97–109.

Scarborough P, Nnoaham KE, Clarke D, Capewell S, Rayner M. Modelling the impact of a healthy diet on cardiovascular disease and cancer mortality. J Epidemiol Community Health 2010.

Serra-Majem L, Roman B, Estruch R. Scientific evidence of interventions using the Mediterranean diet: a systematic review. Nutr Rev 2006;64(2):S27.

Undertaking Systematic Reviews of Research on Effectiveness. CRD's Guidance for those Carrying Out or Commissioning Reviews. CRD Report Number 4 (2nd Edition). NHS Centre for Reviews and Dissemination, University of York. March 2001.

Wasserfurth, P., Palmowski, J., Hahn, A. et al. Reasons for and Consequences of Low Energy Availability in Female and Male Athletes: Social Environment, Adaptations, and Prevention. Sports Med - Open 6, 44 (2020). <https://doi.org/10.1186/s40798-020-00275-6>



[www.f-i-t.com.au](http://www.f-i-t.com.au)