Principles of Health and Fitness

Aim

This unit provides knowledge and understanding of the principles of health and fitness. This includes the benefits of leading a healthy lifestyle, the short and long term effects of exercise on the body, components of fitness, and principles of training. It also covers the key fundamentals of healthy eating, hydration, and professional boundaries when offering nutritional advice.

Learning outcomes

By the end of this unit the learner will:

1. Understand the benefits of an active, healthy lifestyle
2. Understand the effects of exercise on the body
3. Know the components of fitness
4. Know how to apply the principles and variables of training
5. Understand the importance of healthy eating

Health benefits of physical activity and the importance of healthy leaving

What is an active, healthy lifestyle?

Regular physical activity is one component of leading an active, healthy lifestyle. Being physically active on a regular basis will improve quality of life, psychological wellbeing and help to maintain optimal functioning to perform regular daily tasks at home, school or work.

Other components of an active, healthy lifestyle include:

- *Eating a balanced, healthy diet containing the appropriate nutrients*
- *Adequate sleep, rest and relaxation*
- *Not smoking or using illegal drugs*
- *Using alcohol within safe drinking guidelines*
- *Minimising stress*

Benefits of physical activity

Physical activity is an essential for healthy living. Diseases related to inactivity are one of the main causes of death in any developed nations of the world.
(World Health Organisation, 2003). In the UK, less than 50% of adults in each home country meet the recommended physical activity targets (Department of Health, 2009).

Physical activity and exercise con help to improve both physical health and mental health. Individuals who lead an active lifestyle are more likely to live longer and have a much lower risk of being diagnosed with chronic health conditions, e.g. cardiovascular disease, hypertension, chronic obstructive pulmonary disorder, obesity or diabetes. Physically active individuals are also able to handle stress more effectively and ore less likely to experience clinical depression than inactive individuals.

The health benefits of physical activity:

- **up to a 35% lower risk of coronary heart disease and stroke**
- **up to a 50% lower risk of type 2 diabetes**
- **up to a 50% lower risk of colon cancer**
- **up to a 20% lower risk of breast cancer**
- **a 30% lower risk of early death**
- **up to an 83% lower risk of osteoarthritis**
- **up to a 68% lower risk of hip fracture**
- **a 30% lower risk of falls (among older adults)**
- **up to a 30% lower risk of depression**
- **up to a 30% lower risk of dementia**

The benefits of physical activity for chronic health conditions

Physical activity offers a preventative effect against many chronic health conditions. It can also assist in the care and management of different conditions.

Condition	Role of physical activity
Hypertension	Physical activity can help to normalise mild hypertension and assist with the management of other factors, such as stress, that increase risk of hypertension. It can also help to reduce the likelihood of age-related increases in blood pressure.
Diabetes	Physical activity can reduce the likelihood of developing type 2 diabetes; it assists with the management of blood sugar levels and helps to improve sensitivity to insulin.
Osteoporosis	Physical activity helps to build strong bones and develop bone mass in formative years and can slow down the rate of bone mass loss in later life
Stress, anxiety and depression	Physical activity assists with stress management, improves mood and reduces anxiety. It can also help to reduce the risk of clinical depression.
Hypercholesterolemia	Physical activity improves cholesterol balance, it decreases low density lipoproteins (LDL) and increases the ratio of high density lipoproteins (HDL).
Obesity	Physical activity assists weight management, helps to maintain a healthy body composition and increases resting metabolic rate and calorie/energy expenditure.
Low back pain	Physical activity maintains mobility and assists recovery. It can prevent occurrence and recurrence of back pain.
Osteoarthritis	Physical activity improves delivery of synovial fluid to the joints, which nourishes them, assists movement and reduces stiffness and discomfort. It also helps to keep the muscles strong to support and stabilise the joints.
Cancer	Physical activity can help to lower overall risk for some cancers, including colon cancer and breast cancer.

Who needs physical activity?

Everyone needs to be physically active, from children under 5 to older adults aged 65 and over. Individuals of all ages can benefit from being active or taking part in some form of activity, exercise or sport.

Being active does not have to involve intense vigorous exercise, it can be regular daily tasks that slightly increase breathing rate, body temperature and perspiration, such as active play, gardening, housework, using the stairs more often and active travel, e.g. walking to the shops instead of driving the car.

Types of activity

Physical activity can include a range of activities, including activities of daily living, structured exercise
and playing sport.

Activities for daily living - e.g. active play and games, DIY, cleaning the car, gardening, walking- moving more often and sitting down less.

Structured exercise - e.g. circuit training, aerobic, yoga, swimming, cycling, exercise in water, jogging.

Sport -e.g. tennis, rugby, track and field events, basketball, kayaking, climbing.

Physical activity guidelines

The American College of Sports Medicine (ACSM, 2014), Department of Health (2011) and NHS choices (2015) offer the following as the minimum recommended levels of physical activity to maintain health:

Aim to be active every day
Move more often
Minimise sedentary time

The physical activity guidelines for specific age groups are:

Adults (19-64) and older adults (65+)
To maintain health, adults and older adults need to do at least:

150 *minutes of moderate aerobic activity (brisk walking or cycling) every week and strength exercises for all the main muscles, e.g. back, chest, arms and abdominals) on two or more days a week*

OR

5 minutes of vigorous aerobic activity (running, tennis or an energetic exercise class) every week and strength exercises for all the main muscles on two or more days a week

OR

mix of moderate and vigorous aerobic activity every week

Older adults

Older adults at risk of falls (poor balance) also need to include activities to improve balance and co-ordination on at least two days a week e.g. tai chi.

Children and young people (5 to 18)

Children and young people need to reduce the time they spend sitting playing computer games and watching TV. **To maintain health they need to do at least:**

- *60 minutes of physical activity every day- e.g. moderate activity (playground games), to vigorous activity (gymnastics, running and tennis)*
- *Three days a week - activities that strengthen muscles and bones (climbing, jumping, running, push-ups)*

Babies and toddlers (under 5s)

Childen under 5 need to be encouraged to move around often and spend less time in the buggy. They should only be inactive **when** they are sleeping.

Babies - Once babies can crawl, they need to be encouraged to move around as much as they can {moving their limbs, floor **play,** reaching grasping, pulling and pushing, moving their head)

Toddlers - Toddlers who are walking need to be physically active every day for at least 180 minutes (three hours), e.g. moving around, playing ball games, climbing and riding a bike.

Definitions

Light activity	Little or no exertion normally does not cause a noticeable change in breathing.
Moderate activity	Requires sustained, rhythmic muscular movements at least the equivalent of brisk walking and leaves a person feeling warm and slightly out of breath.
Vigorous activity	Requires sustained, large muscle movements at 60 to 70% or more of maximum heart rate, a level that makes a person sweaty and out of breath.

Examples of levels of intensity of activities:

Moderate Intensity	**Vigorous Intensity**
Cycling for pleasure	**Running at 5** mph
Gardening	Hockey
Rowing	**Squash** / tennis
Fly fishing	**Hard** cycling
Walking briskly	**Cross** country
Cricket	**Hill** walking
Golf	Skipping
Swimming	**Stair** climbing

Effects of the exercise on the body

Exercise offers numerous benefits for all body systems. All systems will respond and adapt to exercise, including:

- ***The cardiovascular and respiratory system*** - Heart, lungs and blood vessels
- ***The neuromuscular system*** - Muscles and the nerve pathways
- ***The skeletal system*** - The bones and joints
- ***The endocrine system -*** Glands and hormones

Exercise provides a positive stress to the body and the various systems respond to this stress.

The immediate effects	When exercise starts, the brain will identify the demand and will signal many other systems of the body to take action. Some of these actions will be automatic and out of conscious awareness, e.g. increase heart rate and breathing rate (autonomic nervous system); other responses will be controlled with conscious awareness, e.g. which direction to move, which muscles to move and the speed of movement (somatic system).
The long term effects	If the body experiences these demands on a frequent basis (regular exercise) it will adapt and make long term changes, so that it is equipped to meet the demands the next time it experiences the positive stress of movement and exercise.

Different types of exercise will place different demands on different body systems. The body will respond differently to specific types of training:

Cardiovascular exercises, such as running, swimming and cycling, will place higher demands on the heart and lungs than some other types of exercise, e.g. stretching. Cardiovascular exercises will make demands on the muscles but the demands will be different to the demands made from lifting heavy weights.

Muscular fitness training, such as lifting weights and performing body weight exercises will place greater demands on the muscular and skeletal system. Resistance exercises will also have an effect on the cardiovascular system, but the demands (intensity) will be different from activities like long distance running.

Stretching and flexibility exercises, such as yoga will place demands on the muscles and joints to lengthen and move to a full range of motion. There will be comparatively less stress placed on the heart and lungs.

Balance and coordination exercises will challenge the neuromuscular pathways so that the body moves with control and stability.

Ultimately different types of exercise will provide their own unique stimulus and the body will respond to the specific stimulus. The demands of walking will be different to the demands made from playing rugby or dancing; the demands of yoga will be different to the demands of weight training. Despite these differences, whenever the body moves, every system of the body is engaged and responding to make the movements happen.

The immediate effects of exercise on the body systems

When exercise starts, all systems of the body are called into action.

- The brain recognises the stimulus and sends messages to the body to respond.
- The heart rate increases to circulate more blood, oxygen and nutrients to the muscles.
- The breathing rate increases to bring more oxygen into the body.
- Blood pressure increases to assist circulation of blood.
- The blood vessels dilate so that more blood, oxygen and nutrients can travel to the muscles.
- Body temperature increases
- Muscle temperature increases and the muscles become more pliable and elastic.
- Synovial fluid is released into the joints; this lubricates the joints and allows them to move with greater ease. It can also offer some protection against excess wear and tear.
- The muscles use the nutrients to create energy to sustain the movement.

If the **initial** demand of exercise is within the body's capability to respond, these changes will happen smoothly and efficiently.
If the demand is too high (too intense, too soon), then these changes will not happen so effectively and the exercise intensity will need to be reduced so that the body is able to cope.
This is why it is so important to warm up gradually before starting **any** intense exercise. Warming up gives the body time to prepare and adjust to the demands.

> ***A person who exercises regularly and a person who is inactive or who doesn't exercise regularly will have different immediate responses to exercise.***

The body of the regular exerciser will be more familiar with the demands; the body will have made some of the longer-term adaptations needed to enable it to cope.
For example, the heart muscle will be stronger, it will be able to pump more blood in each contraction and the muscles will become more efficient at extracting the nutrients and oxygen from the blood to be used for energy. These responses will feel manageable and comfortable and the person will be able to sustain or progressive y build the intensity of the exercise.

The body of a sedentary person who is inactive will not be familiar with the demands and their response will be different. The same initial responses will happen, e.g. the heart rate and breathing rate will increase; however, the muscles will not be so efficient at extracting oxygen and nutrients to use for energy. In an attempt to balance this, the brain will signal that more effort is needed. The heart will beat even faster, the breathing rate will increase further, but at the muscular level the necessary long term adaptations will not have been mode. Waste products (lactic acid and carbon dioxide) will build up and the circulatory system will be less efficient at removing these. A burning sensation may be experienced in the muscles (lactic acid) and the person will feel increasingly breathless (carbon dioxide). Ultimately, they will have to slow down or stop to enable the body to return to balance. However, in the long term, if they continue to exercise, their body will adapt and respond so that in future they will be able to cope more effectively.

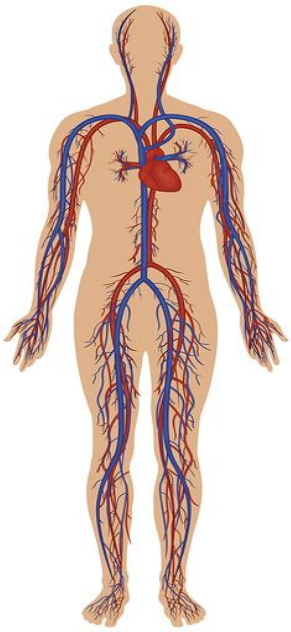
The key consideration is that individuals who have different exercise experience (active or inactive) need to undertake different intensities of exercise. The less fit will need to work at a lower level of intensity to enable them to cope and fitter individuals will need to work at a higher intensity to give their body sufficient challenge. If the challenge is not sufficient, there **will** be fewer adaptations and sometimes fitness gains can be lost.

The risk of delayed onset muscle soreness (DOMS)
It is not uncommon for someone who is unfamiliar to exercise to experience muscle soreness 1 - 2 days after exercise. If it is too severe (usually if the intensity of exercise is too hard), than this can be off-putting and may effect tong term adherence.
Even regular exercisers can experience DOMS, usually if the exercise at a very high or suddenly increased intensity or if the session contains lots of unfamiliar muscle work, such as downhill running, squats or lunges.

Individual fitness levels and experience will have a significant impact on how exercise programmes are structured. The frequency (how often), intensity (how hard), time (how long) and type of exercise has to be tailored to suit the individual, their fitness and other individual differences, such as age and body type. The principles of training and progression are discussed in section tour.

Long term effects of exercise

All body systems will respond positively to regular exercise in the longer term. The specific adaptations from each system are made to allow the body to cope more effectively and efficiently with the stress and demands of exercise.



Long term cardiovascular and respiratory adaptations

The potential adaptations to the cardiovascular system are perhaps those that are most significant for health. The adaptations to this system will reduce the risk of cardiovascular disease. The heart, lungs and circulatory system respond most significantly to aerobic (with oxygen) endurance training that uses the large muscle groups (legs) in a continuous and rhythmical fashion.

There are numerous adaptations to the heart, lungs, blood vessels and muscles in response to long term regular exercise.

These include:

- The heart muscle increases in size, in particular the left ventricle, which circulates blood to the body.
- The heart muscle also becomes a stronger pump. It is able to pump more blood out in each beat (increased stroke volume) and, over the duration of one minute, one contraction/heart beat (increased cardiac output). This decreases the effort required to work at a specific intensity. Increased efficiency means the working heart rate is lower at a specific intensity.
- Increased haemoglobin allows more oxygen to be circulated (which is used by the muscles).
- The functional capacity of the lungs also increases. The respiratory muscles work more efficiently and more oxygen can be drawn into the body.
- Diffusion of gases between the capillaries and alveoli in the lungs also improves (gaseous exchange), which means more oxygen can be taken into the body and carbon dioxide can be removed more efficiently.
- Adaptations to the muscles (increased capillaries and increased size and number of mitochondria) enable more
- efficient exchange of gases at a muscular level.
- More oxygen is delivered to the muscle and used; waste products are removed more effectively.
- The work rate before accumulation of lactate (anaerobic- without oxygen) also increases.
- The body can work harder and for longer because more energy can be taken in and used to produce energy (aerobic energy system and increased maximal O2 uptake or V02max).
- At rest, the heart does not have to work so hard (lower resting heart rate)
- The ratio of blood lipids improves (more high density lipoprotein and reduced low density lipoprotein and
- triglycerides), which improves cholesterol profile.
- Blood pressure will also be reduced during exercise and at rest (both systolic and diastolic blood pressure).
- Metabolically, body fats levels can reduce, insulin resistance decreases and glucose tolerance increases.
- These adaptations have a positive effect on physical health and will reduce the risk of cardiovascular disease.
- There are also psychological benefits including improved sense of wellbeing, improved stress management, and reduced risk of depression and anxiety.

Effects of exercise on blood pressure

The immediate effect of exercise on blood pressure is for it to increase. Systolic blood pressure (the contracting phase) increases in a linear fashion as intensity and heart rate increase. Diastolic pressure (the resting and filling phase) usually remains unchanged. This is significant for individuals who have diagnosed hypertension (high blood pressure). They will need to work at a lower intensity to ensure the body is not placed under unnecessary strain; they should worm up for longer and with a more gradual increase in intensity and avoid isometric muscle work and heavy weight training, as these specific types of exercise increase both systolic and diastolic blood pressure quite significantly.

In the long term, regular exercise at the appropriate level can have a positive and normalising effect on blood pressure (ACSM, 2014). Aerobic exercise can bring about a decrease in both systolic and diastolic pressure for individuals with mild to moderate hypertension; the decrease is estimated to be around 10 mmHg in both (Durstine and Moore. 2003).

The blood pooling effect and venous return

When the body is exercising at a high intensity, the heart is beating at an increased rate and there is an increased volume of blood being circulated. If exercise is stopped suddenly, the same volume of blood will be circulating, because the heart takes time to slow down and reduce its rate of work to match the change of demand.

This potential risk of stopping suddenly is that blood may pool in the legs (blood pooling). This is because the walls of the veins are less muscular than the walls of the arteries and they do not have the same capacity to circulate blood (lower pressure). This means that blood is not being returned effectively to the heart and the brain and may lead to feelings of dizziness and fainting.

The return of blood to the heart and brain is assisted by the muscle contraction of the legs. As the muscles contract they squeeze the blood vessels, which helps to move blood through the vessels and assists venous return.

Cooling down gradually after exercise to lower the heart rate and keeping the legs moving until the heart rate has lowered will reduce the risk of blood pooling and reduce the risk of any stress on the heart that may be caused by stopping suddenly.

Effects of exercise on bones, joints and muscles

Regular exercise also has a positive effect on the muscular and skeletal systems. Muscular strength and endurance training and flexibility training will offer specific beneficial effects.

Long-term adaptations to the bones, joints and muscles

- Regular exercise improves the efficiency of the muscular and skeletal systems.
- The joints are able to release synovial fluid more efficiently; they warm up quicker and can move through a greater range of motion.
- The ligaments and tendons become stronger, giving greater protection to the joints and reducing the risk of injury.
- The bones also become stronger. Exercise, and in particular weight-bearing exercise (walking, running, weight
- training), will help to reduce the loss of bone mass associated with ageing and can reduce the risk of osteoporosis.
- Flexibility improves, allowing the muscles to move more effectively and through a greater range of motion.
- Muscles become stronger, with the potential for more balance strength.
- Improvements in strength and flexibility help to improve posture and alignment.

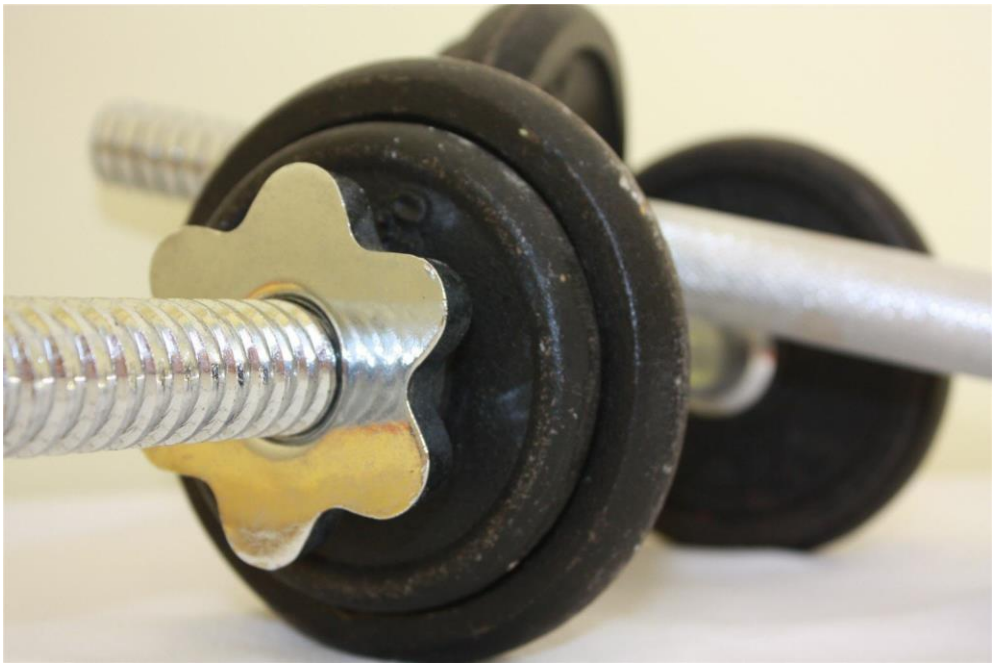
Specific effects of flexibility and stretching

- Regular stretching will have many positive effects on the muscles; these include:
- Improved muscle length and range of motion.
- Reduced muscle tension and tightness.
- Improved muscle balance and posture.
- Reduced risk of low back pain or other postural problems.
- Reduced risk of joint or muscle strains or injuries.
- Decreased muscular soreness (DOMS) associated with other exercise activities.
- Decreased muscle viscosity causing contractions to be easier and smoother.

Specific effects of muscular fitness training

Regular resistance training (body weight or weight training) will also have many positive effects on the muscles. The specific effects be dependent on the type of training, e.g. strength, endurance, hypertrophy or power. Some of these include:

- Increased neuromuscular pathways.
- Increased frequency of nerve impulses.
- Increased motor unit activation.
- Increased actin and myosin.
- Increased number and size of mitochondria (endurance training).
- Increased number of capillaries surrounding the muscle fibres (endurance training).
- Increased stores of fuels for energy (glycogen, adenosine triphosphate (ATP) and creatine phosphate).
- Increased muscle size and strength.
- Hypertrophy of type II muscles fibres (hypertrophy or strength training).
- Improved body composition.
- Increased metabolic rate.
- Improved muscle balance and posture



Components of fitness

Fitness con mean different things to different people. Some people may see fitness as being toned or muscular; others will see it as lifting weights or playing sports and others still may view it as being able to touch the toes.

Physical fitness is an outcome of taking part in regular exercise and activity.

The main components of fitness are:

- Cardiovascular fitness
- Muscular fitness (strength and endurance)
- Flexibility
- Motor fitness or skill-related fitness.

Cardiovascular fitness

What is cardiovascular fitness?

Cardiovascular fitness is the efficiency of the heart, lungs and circulatory system to take in, transport and utilise oxygen and remove waste products effectively.
There are many different types of exercise that can improve cardiovascular fitness. These include activities that involve rhythmic use of large muscle groups, such as: swimming, cycling, walking, running, stair climbing, use of cardiovascular machines, group exercise classes, dancing, indoor cycling.

The FITT principles

The ACSM (2014) recommend the following as targets to work towards to improve cardiovascular fitness.

Frequency	**3 to 5 days a week**
Intensity	**Moderate to vigorous intensity** **The following methods can be used to monitor intensity:** **Maximal heart rate (MHR)** • Moderate intensity: 50-65% of MHR • Vigorous intensity: 65-90% of MHR **Rating of perceived exertion (RPE)** • Moderate intensity: 12-14 RPE • Vigorous intensity: 15-18 RPE
Time	**20-30 minutes or up 60 minutes of continuous or intermittent activity.** **Moderate intensity: 30 minutes, which can be accumulated in bouts of 10 minutes or more.** **Vigorous intensity: 20 minutes sustained.**

Considerations

- Worm up thoroughly before cardiovascular training
- Cool down thoroughly after cardiovascular training
- Vary the type of exercise and activity to minimise the risk of injuries related to overuse, impact or repetitive strain.
- Vary the impact

  High-impact exercises ore those where the body weight is lifted away from the floor, e.g. jumping or running. They ore more stressful for the joints

  Low impact exercises ore those that do not involve jumping or running and, e.g. squats, cycling, rowing or walking.

• When working at more vigorous intensities, reduce the frequency of training and vary the type of activity

Muscular Fitness

What is muscular fitness?

Muscular fitness includes both strength and endurance.

Muscular strength - Is the ability of a muscle or group of muscles to generate maximal force or overcome a maximal resistance. Without strength, a person is unable to produce any form of force to pull, push, or create locomotion. If muscular strength is increased it con increase the maximal load on individual con move. Muscular strength con be improved by training with a Maximal resistance, e.g. 80% of 1 repetition maximum (RM) for short durations (l -10 repetitions).

Muscular endurance - Is the ability of a muscle or group of muscles to contract repeatedly for on extended duration without fatigue. The muscles will continue to contract until the onset of blood lactate accumulation when the individual slows down and then finally has to cease the exercise, e.g. continuous press ups or sit ups until failure.

Muscular endurance con be improved by working with lower resistances 40-70% of l RM for a

sustained duration
(15 + repetitions)

Muscular fitness - A balance of strength and endurance can be improved by working with a moderate resistance (60-70% of l RM) for between 8-12 repetitions

There are many different types of exercise that can improve muscular fitness. These include: gym-based training, studio resistance training, body conditioning classes, core stability, yoga, pilates, resistance machines, body weight exercises, free weights, water resistance, cable machines, portable resistance training equipment, elastic resistance, cable machines, manual or partner resisted movement.

The FITT principles

The ACSM(2014) recommend the following as targets to work towards to improve muscular fitness.

Frequency	***2*-3days a week for each major muscle group on non-consecutive days (resting trained muscles for 48 hours between sessions)**
Intensity	**Percentage of one repetition maximum (1 RM):** Older or sedentary adults - 40-50% of l RM Beginners - 60-70% of l RM Experienced - > 80% of l RM
Time	**Repetitions - 8-12 repetitions** Beginners - 10-15 repetitions Endurance - 15-20 repetitions **Sets - Single sets effective for beginners or older adults** Adults - 2-4 sets Endurance < 2 sets Rest - 2-3 minutes between sets

Considerations

- Ensure correct posture and technique.

  Ensure controlled movements through a full range of motion
  Isotonic muscle work (concentric-eccentric) uses full range of motion.
  Isometric (static contractions) strengthen the muscle in the position held.

Aim for muscle balance - muscles work in pairs

Compound exercises, e.g. squats and press ups work more than one muscle at one time

Isolation exercises, e.g. triceps dips target single muscles
Isotonic muscle work (concentric-eccentric) uses full range of motion.

- Progress gradually to minimise delayed onset muscle soreness (DOMS).
  repetition maximum will need to be estimated for beginners or sedentary clients
- Individual factors, such as gender or age, will often determine whether a specific exercise is strength or endurance tor the individual. For example: a client who can only perform 1- 10 repetitions of an exercise strength would be improving strength, whereas a client who can perform multiple repetitions, would be improving their endurance.

Flexibility

What is flexibility?

Flexibility is the ability of a joint and associated muscles to move through the full potential range of motion.

Different people have different levels of flexibility. It is possible to be more flexible in one joint and lack flexibility in another joint. This will often depend on how active or inactive they are and also what sports they participate in.

To assess the range of motion within a joint, a goniometer can be used. Comparisons can be made from normative data to see if the individual's range is comparable with the general or athletic population.

Immobile ***Hypermobile***

A lack of flexibility **Too much flexibility**

Muscle shortening and a loss of mobility and flexibility will negatively affect both posture and efficiency of movement. Loss of flexibility can be caused by a number of factors, which include:

Inactivity and sedentary lifestyles - e.g. long periods of time spent sitting at a desk or driving will shorten specific muscles.

Injury- e.g. when a muscle is injured it may have to be immobilised for a short duration (plaster cast), which will cause adaptive shortening of the muscle.

Participation in some sports - Where the movements required to play the sport only move the muscles through a limited range of motion, e.g. football, rugby, boxing, running.

Imbalanced training programmes - May also create muscle imbalances that cause restrictions in flexibility, e.g. overtraining specific muscles (agonists) and paying less attention to opposing muscles (antagonists).

Excessively high levels of flexibility or hypermobility, which some people inaccurately refer to as being 'double jointed' can lead to a loss of joint stability, which may increase the risk of injury. Activities such as dance, gymnastics and martial arts often demand higher levels of flexibility.

To improve flexibility, it is important to stretch and lengthen the muscles. A muscle is stretching and lengthening when the origin and insertion (two ends of the muscle) move further apart and away from each other, and the muscle relaxes. There are different methods of stretching; some methods provide greater risk than others.

The different types of stretching include:

Static stretching - Moving into a stretch position where the muscle is lengthened and holding the position, without moving for a set duration.

Dynamic stretching -Moving with control into a position where the muscle is lengthening and then moving out of the position and repeating the movement for a set number of repetitions

Proprioceptive neuromuscular facilitation (PNF) - A method of stretching, often involving use of a partner to resist and create tension in a lengthened muscle (using a static/isometric muscle contraction), which is followed by relaxation and further lengthening of the muscle which is then held for a set period of time (a static stretch)

Ballistic stretching -A method of stretching where repetitive movement (and often momentum) is used to stretch further and exceed the range of motion. This risk of injury can be higher with this approach to stretching, so it should only be performed by relevant client groups, e.g. for specific sports that require muscles to lengthen quickly to an extended position, such as martial arts.

The FITT principles

The ACSM (2014) recommend the following as targets to work towards to Improve flexibility.

Frequency	**More than 2-3 days a week and ideally every day**
Intensity	**To the point where a mild tension and discomfort is experienced in the belly of the muscle being stretched.**
Time	**Static stretches - Hold for 10-30 seconds with 2-4 repetitions of specific stretches PNF - A static contraction held for 3-6 seconds followed by 10-30 second static stretch** **NB: A total of 60 seconds of stretching for each muscle group is recommended. Stretches can be repeated 2-4 times to achieve this total, e.g. 3 x 20 seconds**

Considerations

- Ensure the body is warm before stretching
- Ensure correct alignment and exercise technique Lengthen all muscles before exercise
  Stretch all major muscle groups after work (static stretching - developmental or maintenance)
- Avoid exceeding the range of motion or overstretching as this may create DOMs.

Skill related fitness or Motor fitness

What is motor fitness?

Motor fitness includes all the skill-related components, which include:

Speed

Speed is the rate at which a movement can be performed in short time frame, e.g. how fast a person can run l 00 metres or how many repetitions of an exercise they can perform in a set time frame, e.g. one minute.

Power

Power is the ability to exert maximum muscular contraction instantly in one single explosive burst of movement. It consists of strength and speed to give power its force. Power is required to perform explosive movements such as leaping, bounding and plyometric movements, e.g. the power clean, high jump, long jump, javelin and shot putt all require muscle power.

Reaction time

Reaction time is how quickly a person can respond to a stimulus. It is essential in both a sporting context, e.g. a start position in diving and waiting for the gun to go off for a sprint start; and also in daily living tasks, e.g. an item slips out of a person's hand and they are able to catch it.

Coordination

Coordination is the accuracy, efficiency and control of multiple body movements, e.g. performing a gymnastic floor routine, performing a choreographed dance routine, throwing and catching a ball, manoeuvring a basketball between players during a basketball game.

Balance

Balance is being able to control the body's position and centre of gravity, during both static postures, e.g. standing on one leg, or a head stand (a yoga asana) or dynamic movements, e.g. trampoline somersaults.

Agility

Agility is being able to move quickly in different directions and change the position of the body, e.g. most team sports require agility to move around the field or pitch quickly and dodge other players.

Many daily tasks and sporting activities require specific aspects of motor fitness.

These include:

- Walking in a crowded street
- Crossing the road
- Throwing and catching a ball
- Track and field athletic events
- Team games
- Racquet sports, e.g. badminton, tennis
- Dance and gymnastic routines
- Boxing

The exercises used to improve motor fitness will be dependent on the specific skill the individual wants to develop and why they need to develop it, e.g. to improve sports performance or improve the ability to perform daily activities. Exercises and movements that will improve coordination and balance will be different from those that will improve speed or power.

The FITT principles (ACSM. 2014)

The ACSM (2014) recommend the following as targets to work towards to improve skill related fitness.

Frequency	**2-3 days a week**
Intensity	**Variable depending on the specific component/skill**
Time	**20-30 minutes.** **Variable depending on the specific component and other factors, e.g. muscle fatigue.**

Considerations

Skill related fitness is very specific. It is important to know the purpose of skill training and the needs of the individual, e.g. the balance training needs of an older adult at risk of falling will be different to a gymnast wanting to improve their performance on the beam.

When training to improve skill, it is also important to be aware of other body systems that are active (e.g. muscles, heart and lungs) and other components of fitness that may be involved at the same time, for example, training to improve co-ordination may require repetitive muscle contraction (endurance) and power training will require strength.

It would therefore be important to consider physiological considerations for training these other body systems and components of fitness, e.g. not working the same muscles on consecutive days and allowing sufficient rest and recovery between training sessions.

Body composition

What is body composition?

Body composition is the ratio of lean tissue and fat tissue in the body.

It includes the percentages of subcutaneous fat, bone density, muscle mass in relation to the height and weight of an individual. The sum of all these percentages is used in conjunction with normative data to assess if an individual is within the normative ranges for health.

Fat tissue occupies more space than lean or muscular tissue and will give the appearance of a larger body frame or size. For example, two people may be of an equal weight and height, but they may have different ratios of body fat and muscle tissue (body composition) giving them a totally different physical appearance. The percentage of fat in the body, including where it is distributed or carried, can be an indicator of health.

The ACSM (2014) list the following body fat percentages as satisfactory for optimal health:

- ***Women: 20-32% of total body weight***
- ***Men: 10-22% of total body weight***

Percentage of body fat above these levels are generally viewed as excessive and may increase the risk of chronic health conditions. However, the specific point at which body fat become a health risk varies between different age groups and ethnic groups (NICE, 2013).

> ***Excessive body fat contributes to around 58% of cases of type 2 diabetes, 21% of heart disease and between 8% and 42% of certain cancers.***

Some sports people or athletes may have a lower than recommended body fat percentage and this may also have health consequences, e.g. amenorrhoea (loss of the menstrual cycle for women and low bone density).

Factors which affect health and fitness

There are many factors which affect health and fitness.

Age

Throughout the lifespan, the body changes and consideration must be given to how the specific changes affect exercise ability and training potential.

Infants are very flexible, but as soon as they start to walk, they begin to lose their natural flexibility. This is because the joints need greater stability to support the body weight and move the body.

During childhood and adolescence, the body is developing, so excessive training or exercising, such as heavy weight lifting or high impact exercise will increase the risk of growth related injuries.

As the body ages, the functioning of many body systems will decline. Training benefits can still be achieved, but they will often take longer to achieve. Age-related physiological changes generally begin to occur at around the age of 50 years and become more significant and noticeable at around the age of 65 years.

These changes include:

- The joints become stiffer
- The bones and muscles become weaker
- The percentage of body fat increases
- Neuromuscular responses and reflexes become slower and less efficient

Heredity

An individual's health, physical appearance and training potential are all influenced by genetic characteristics inherited from their parents.

Physically inherited characteristics may include eye colour, skin colour and hair texture, which affect physical appearance. They may also include body type and muscle fibre type, which will have a greater influence on training potential. Various health conditions are believed to have a genetic or inherited risk (e.g. cardiovascular disease).

Gender

Males and females have relatively the same fitness levels up to puberty, at which point male and female hormonal profiles dramatically change. Oestrogen and testosterone increase.

Males - Grow stronger and faster with greater amounts of muscle tissue. They generally have larger skeletal structures and organs are relatively propositioned to ensure they have the ability to transport oxygen and blood around the body.

Females - Generally have greater amounts of body fat surrounding their reproductive areas and tend to have a greater amount of flexibility, which can increase further during pregnancy due to relaxin being released.

Body type

An individual's body type will have a significant impact on their ability to perform various physical tasks successfully in relation to sporting performance. A simple system for assessing body type is visual somatotyping. The somatotyping system suggests that there are three distinct body types: ectomorphs, endomorphs and mesomorphs

(McArdle et al, 2001).

Characteristics of somatotypes

Ectomorphs	Mesomorphs	Endomorphs
Naturally thin, minimal muscle mass, narrow hips. They tend to have a high digestive turnover so frequently consuming kcals is essential for their maintenance. They tend to be well suited for endurance events.	Greater muscle mass, tapered physiques, broad shoulders and narrow hips. They are extremely athletic and are well suited to power events.	They tend to be apple or pear shaped with round faces. They are naturally predisposed to fat storage. They can have a lot of muscle mass accompanying their body fat. They are well suited to power events and events which yield strength events such as powerlifting and strongman.

Most people are between each of these somatotypes (body type) for instance ecto-mesomorph (athletically built but very slim), or endo-mesomorph (a lot of muscle with equal or greater amounts of body fat).

Diet

The body needs the correct ratio of macronutrients for it to grow optimally, repair and provide the body with energy. Without these macronutrients we would become prone to disease and unable to function optimally every day.

Disability

There are different types of disability, these include: physical, mental, emotional, learning, psychological, physiological, and neurological.

People with disabilities are able to exercise and do not have to be inactive.

- A physical impairment may prevent a specific part of the body functioning or moving in a certain way, but exercise can be adapted and modified to enable participation, promote inclusion and improve health and fitness.
- A learning disability may affect physical and cognitive skills, but individuals will benefit physically, socially and emotionally from adapted exercise and movement.

Many disabled people are first-class athletes!

Illness

Overtraining or continually over-reaching the body's potential can place stress on the body systems and may contribute to illnesses or injuries that reduce performance levels. Restoration days and tapering phases should be implemented to minimise the risk of overtraining.

During temporary illness (colds or flu) the body needs to be rested. Exercising with a fever (febrile illness) is contra-indicated. All clinical symptoms should have passed before returning to exercise. It may also be necessary to start back with a less intense approach.

Chronic health conditions will require exercises to be modified to enable participation. A person who is obese may need to perform low-impact or non-weight-bearing activities, e.g. swimming or cycling

Drugs

Prescribed (medical) and recreational drugs (alcohol, nicotine, caffeine and illegal substances) will all affect exercise and fitness potential. Prescribed medications used to treat chronic health conditions often have side effects that influence the exercise response. A pharmacist or GP should be consulted to ensure exercise is safe.

Recreational drugs (alcohol, nicotine and caffeine) all have negative effects on health and have an impact on exercise performance.

- ***Cigarettes***

Contain carbon monoxide, which reduces the potential to take in and use oxygen.

- ***Alcohol***

Affects the nervous system, disrupting balance and coordination, which reduces the safety of exercise, especially if using equipment

- ***Caffeine***

  Stimulant and may offer a short-term boost to performance. However, in the long term, excess caffeine can contribute to health conditions including increased blood pressure, anxiety, depression and osteoporosis.

Stress

High levels of prolonged stress can lead to many chronic health conditions including high blood pressure, coronary heart disease and depression. It will have negative impact on the person's overall well being and enjoyment of life.

Exercise and activity can assist with stress management. It provides an outlet for managing the physical tension caused by stress and a distraction for the mind, which can reduce mental strain. Exercise in the outdoors and in natural environments can have further positive benefits on mood and wellbeing. Walking, yoga, and a regular sleeping pattern have all been shown to reduce stress levels.

The Principles of training

Training principles and variables can be applied to alter the demands of an exercise programme. An understanding of these principles and variables is important so that the sports massage therapist can provide appropriate guidance to clients. They can also signpost clients to personal trainers or sports coaches, who will able to support clients with any specific fitness goals that complement the massage treatment.

The FITT principle.

The FITT principles (Frequency, Intensity, Time and Type) can be applied to exercise and sport, to progress the activity (add challenge) or regress (make the activity easier).

The key principles of training are:

F Frequency	The number of exercise sessions in a set period, e.g. how many times a week.
I Intensity	The level of work performed during an activity session, e.g. the repetitions, resistance, range of motion, rest and sets
T Time	The duration of a training session, e.g. 30 minutes, one hour.
T Type	The choice of activity, e.g. the specific type of exercise {running, cycling, gym etc)

Frequency

Frequency refers to the number of training sessions per week. The number of exercise sessions per week should reflect the client's current fitness level and health status, their training goals and reason for training (e.g. health or sport), the component of fitness they are training (e.g. flexibility or strength) and the time they have available, including any other commitments like family and work.

A beginner to exercise would generally need to start with less frequent training, e.g. they may start with three days a week with a rest day in between and progress to training more often.

Competitive athletes may train up to twelve times a week, e.g. a morning and evening training session on most days of the week, emphasising different types of activity on different days and at different times of day.

Different components of fitness require different training frequencies, for example, stretching can be performed every day, whereas muscular strength training requires a rest period of 48 hours between workouts for the same muscle group, e.g. a body builder would use a split routine and work different muscles on different days.

In the context of sports massage and rehabilitation, it may be necessary to reduce the frequency of training while the individual is recovering and build this again slowly and progressively as they start to heal.

Intensity

Intensity is the challenge or demand of an activity. Various factors will affect the intensity of an exercise including the: resistance or% or repetition maximum (RM) lifted, the number of sets of an exercise and the rest between sets for resistance training; the rating of perceived exertion (RPE) or heart rate, including the speed of exercise and impact {high or low) for cardiovascular training; and the range of motion (ROM), including the difficulty of the stretch position (assistance of a partner or use of a wall for balance) for stretching. However, there are additional factors that can influence the intensity.

These Include:

- Lever length
- Speed
- Gravity
- Range of motion

Lever length
The body's appendages (arms and legs) provide levers for movement. Changing the lever length can have an impact upon exercise intensity and may be used as a progression or regression. Lengthening the lever will make an exercise harder whereas shortening the lever will make it easier.

For example: when performing a full press-up, the body lever being moved is longer and this would be harder than performing a press-up with the knees on the floor (a box position).

Different people can also have different lever lengths and this can affect the intensity of an exercise for them. A person with longer levers would find some exercises much harder than an individual with shorter levers, because they would need to move through a greater range of motion, e.g. press-ups, chin-ups, squats and tricep dips. Individual lever length can potentially affect the amount of weight the person can lift and move. This may explain why the most successful power lifters tend to have shorter levers.

The sports massage therapist can consider exercise leverage when advising clients on exercise intensity.

Speed
The speed of movement will also affect the intensity. Sometimes slowing a movement down will make it harder, e.g. when performing a press-up, taking four counts to lower down and four counts to lift up will demand the muscle to contract for longer, which will make the exercise harder and potentially reduce the amount of repetitions that can be performed (more repetitions could be performed if a single count up and down was used).

However, increasing the speed of an exercise can also make an exercise harder. Power lifting involves lifting heavy resistance at speed (explosive movements) and these significantly increase the intensity and would reduce the number of repetitions that can be performed. Similarly, the speed at which athletes run l 00 metres cannot be sustained for the duration of a marathon.

One consideration when using increased speed to offer challenge is that this may have a negative effect on the control of the movement, affecting both posture and alignment. One example would be dynamic stretching: if movements become too quick, control may be lost and the end of the range of motion may be exceeded too quickly. The stretch may become ballistic and this type of stretching can lead to damage.

Gravity
The body has to resist the force of gravity whenever it is moving. The muscles have to contract to maintain the upright position and create locomotion.
Gravity adds resistance, weight and impact to movement and there may be instances in rehabilitation when minimal weight bearing and impact is recommended. Exercise in water can be an alternative to land based training as part of rehabilitation because the buoyancy of water will support the body weight, reduce impact and assist movement. Using lower impact alternatives during land based exercise, e.g. not jumping or jogging, will also reduce the impact forces on the body.

Range of movement
Increasing the range of motion will increase exercise intensity and also maximise the effectiveness of movement. Moving through the full potential range of movement is important to maximise performance, however exceeding the range of motion can place the connective tissues at risk of injury, especially when moving at speed.
Soft tissue dysfunction may be affected by range of motion, e.g. a weight trainer who constantly works through a reduced range of motion to lift heavier weights, will potentially be creating imbalances that lead to increased risk of injury. This is something that needs to be considered by the sports massage therapist.
A further consideration is that during rehabilitation and recovery, it may be necessary to work through a smaller range of motion initially and progressively build this back to full potential range.

Time

The time of training sessions con *vary* according to the fitness levels and fitness goals of the individual and also the type of training they are undertaking.

A newcomer to exercise who is aiming to improve their health may choose to be active for short, accumulated intervals throughout the day, e.g. 30 minutes of vigorous housework in the morning and a 20 minute brisk walk at lunchtime.

An experienced exerciser may train for an hour and sometimes longer, e.g. a weight lifter may spend increased durations in the gym in one training session, because they require longer rest times between sets of heavy resistances.

As a guideline, all the components of physical fitness can be trained in 45 minutes to one hour for general fitness goals. For specific goals, training duration may need to increase, e.g. marathon running.

Anyone recovering from injury may need to re-build their training duration, starting at a shorter duration and increasing gradually.

Type

There are many types of activity and exercise and different types of exercise will improve different components of fitness.

Cardiovascular exercise	Any movement of large muscle groups that is sustained for a longer duration will bring about cardiovascular training benefits, e.g. walking, running, swimming, cycling, dancing, skating, skiing, kayaking. However, the response to each type of training will be specific.
Flexibility	Activities that lengthen and stretch the muscles through the full potential range of motion will improve flexibility, e.g. yoga.
Muscular fitness	Activities that improve muscular fitness (strength or endurance) are those that demand the muscles contract against a resistance, including: body weight exercises, fixed resistance machines, exercise in water, free weights and kettlebell training.

The benefits of varying the type of training are that different stresses will be placed on the body, this can be beneficial during rehabilitation, e.g. a runner may not be able to run on the road due to stress on the joints, but they may be able to swim or run in water.

The disadvantage of changing the mode of training is the training gains will be different (specificity), e.g. swimming performance would not be improved directly by running; stretching will not directly improve cardiovascular fitness.

Training principles

Other key training principles are:

1. **Specificity**
2. **Progressive overload**
3. **Individuality**
4. **Adaptability.**
5. **Reversibility**
6. **Recovery**

1. Specificity

The body responds specifically to the type of exercise undertaken.

Specificity refers to the type of changes the body makes in response to training. Different types of activity place different demands on the body and to different body systems and the body systems will respond and adopt the specific demand.

Specific Adaptation to Imposed Demand

In simple terms, specificity means:

- To improve running performance - run
- To improve cycling performance - cycle
- To improve sprinting ability - practice sprinting for the required distance, e.g. l OOm or 400m
- To improve throwing ability - practice throwing the specific object, e.g. hammer or javelin
- To improve flexibility of the hamstrings - stretch the hamstrings
- To improve the strength of the shoulders - perform on exercise that strengthens the shoulders

This principle applied to sports fitness training means that the overall energy demands of the sport determine the
type of training and which fitness components (e.g. strength, power, endurance, flexibility, cardiovascular) need to be developed so that the requirements of the sport ore matched.

When on athlete or sports person trains, they repeatedly perform activities to prepare for the requirements of the specific sport. In time their body becomes better able to meet the demands of the sport. They may, as port of their training, perform other activities for variety or for other fitness purposes (e.g. stretching), but the focus of training will be on the specific sport or actions used in the sport.

Adaptations to training ore most evident in elite athletes. For example, the effects of years of rigorous training clearly distinguish the bodies of distance runners from throwers.

For distance runners, major adaptations from the demands of sustained running include a larger, stronger heart and increased blood vessels to supply oxygen to the specific muscles involved in running. In contrast, adaptations to training for throwers include increased size and thickness of specific muscles of the body that are trained to improve power.

2. Progressive overload

The body needs to be challenged gradually to continue to adapt.

To adapt to exercise the body needs to be progressively challenged; it has to work harder than it is used to working. To evoke an adaptation the stimulus must be large enough to challenge the individual, without overworking or causing excess strain.

Variables that can be used to provide progressive overload and increase intensity are: repetitions and sets, resistance, range of motion and rest.

- To improve flexibility, it is important to stretch through a progressively greater range of motion
- To improve endurance, more repetitions of an exercise should be performed in one set
- To improve strength, a greater resistance will need to be lifted and more sets of an exercise may be needed

Without progressive overload, the training gains may start to diminish. Even to maintain a specific level of fitness some additional stimulation is required.

The principle of progressive overload is particularly important in the process of recovery from injury and rehabilitation. After any period of rest or immobility, the intensity of exercise will need to be gradually progressed over an

appropriate time frame.

3. Individuality

Unique characteristics and factors specific to an individual that affect training potential.

There are a number of unique characteristics and factors specific to each individual person that will affect their training potential and their ability to achieve specific training goals. These include genetic and inherited factors as well as their level of training experience and familiarity with specific types of training, such as their:

- Body type
- Age
- Gender
- Muscle fibre type
- Body weight
- Health status, e.g. illness or injury
- Level of cardiovascular fitness
- Flexibility and range of motion (ROM) at specific joints
- Strength in specific muscles
- Endurance potential in specific muscles

All these factors must be considered when providing advice and guidance about exercise and activity. A client who is overweight or injured may need to be advised to select activities that are lower impact and less weight-bearing to minimise stress on the joints, e.g. swimming, cycling or rowing.

A client who has a restricted range of movement around their hip joint, may need to be advised to include stretching activities that target the specific area as part of their training.

The sports massage therapist can signpost clients to personal trainers or sports coaches who will be able to support clients with any specific fitness goals that complement the massage treatment they are receiving.

4. Adaptability

How the body responds to exercise and activity.

The principle of adaptation refers to the process of the body getting accustomed to a particular exercise or training program through repeated exposure. As the body adapts to the stress of the new exercise or training programme, the programme becomes easier to perform. This explains why beginners to exercise are often sore after starting a new routine, but eventually, as they become used to the exercise, they experience no soreness.
The physiological adaptations the body makes in response to exercise will be specific to the type of training, e.g. exercises to move the joints will help to improve joint mobility; lifting weights will help to improve the strength
of the muscles.
The specific effects of different types of exercise and activity are explained in section two.

5. Reversibility

Use it or lose it

If exercise is stopped for any significant period of time, the adaptations made will start to decline. Exercise has to be performed on a regular basis to maintain the positive effects.

6.Recovery

Plan rest intervals to give the body time to recover.

The body cannot repair itself without sufficient rest and time to recover. Recovery time may include:

- Short rest periods (e.g. the rest time between sets in a training session, or the number of hours between multiple training sessions in a day)
- Longer rest periods (e.g. the number of days between training sessions, or the number of weeks to recover from a long training season)

Rest and recovery time is necessary to ensure the body does not suffer from exhaustion or overuse injuries.

Progression

All exercise and activity programmes should be progressed gradually. Progression will ensure any plateaus or decreases in performance are minimised. It will also ensure that any risk of overwork is minimised.

When an overload is applied it should be gradual and sufficient enough to elicit an adaptation, but it should
not be excessive. Excessive stimulus is counterproductive, it may cause damage to the muscles and contribute to muscle soreness.

Sports massage therapists are not expected to be fitness experts, but they do need to be aware of the general principles of progression to identify whether their clients may be overworking.

Untrained or new exercise	Progression can be achieved by
Warming up	
Longer duration Lower intensity Simpler exercises and movement patterns Slower pace	Shorter duration Intensity can be built more rapidly Use of more complex exercises Slightly faster pace
Cardiovascular training	
Shorter duration Lower intensity Lower impact Simpler exercises and movement patterns • Slower speed	Increase duration Higher intensity and inclusion of higher impact (as appropriate) Increase complexity, e.g. more challenging machines (rowing machine instead of upright bike) Increase speed
Muscular fitness training	
Lower resistance Lower repetitions • Less sets • Controlled speed • Use of resistance machines and/or body weight exercises instead of free weights	Increase resistance (strength) or Increase repetitions {endurance) Increase sets Use of free weights to replace resistance machines
Cooling down	
• Longer duration Easier and more supported stretch positions • Smaller range of motion Decreases length of time stretches are held for	• Shorter duration Use stretch positions which are more challenging to range of motion and balance. Increase range of motion of stretch positions Increase length of time stretches are held for

Overtraining

All exercise programmes require a balance between overload and recovery. If the overload stimulus exceeds the body's ability to adapt or insufficient recovery periods are planned as part of a training programme, then this may result in injury.

The sports massage therapist should be aware of the signs and symptoms of overtraining which may include:

- Lack of training gains
- Loss of enjoyment of enthusiasm for training
- Deterioration in performance
- Burnout
- Increased muscle soreness and fatigue
- More frequent illness and depleted immune system
- Increased injuries
- Decreased libido
- Decreased appetite
- Mood disturbance
- Decreased self-esteem
- Mental fatigue
- Insomnia
- Compulsive need to exercise

If overtraining is suspected, the sports massage therapist should discuss this sensitively with the client and may need to signpost them to another professional, e.g. the individual's sports coach, a GP or even a sports psychologist. Signposting will depend on the needs of the client.

Understanding the importance of healthy eating

Professional role boundaries

A basic understanding of the science of nutrition is essential for the sports massage therapist, as many clients may seek advice in this area of health.

There are a variety of sources that provide nutritional information, some evidence-based and some non-evidence based and many that provide conflicting or different information. This information transcends to the public, athletes and fitness enthusiasts and there can often be lots of misunderstanding and misinterpretation. Clients may be following the latest 'fad diet' or restricting certain macronutrients, which can create an imbalance in the diet and lead them to be deficient in a specific nutrient.

As part of their role, sports massage therapists can offer guidance and signpost clients to the national guidelines for healthy eating. They cannot recommend diets or supplements, plan diets or provide advice to clients with health conditions or specific needs (e.g. pregnancy). This is beyond their scope of practice. Clients with specific dietary needs, e.g. health conditions, obesity, pregnancy and children, should be signposted to their GP for referral to a

registered dietician, who is qualified to provide specific dietary advice and guidance

Nutritional terminology

Diet	An individual's food intake, eating habits and behaviours
Healthy eating	Following a healthy diet and eating a balanced intake of all nutrients in the appropriate quantities.
Unhealthy eating	Following an unhealthy diet and eating an unbalanced intake of the recommended nutrients, inappropriate quantities of specific nutrients (too little or too much)
Nutrition	The branch of science that deals with nutrients and nutrition
Balanced diet	A diet that contains adequate amounts of all the necessary nutrients
Glycaemic index (GI)	A ranking given to carbohydrate foods based on their effect on blood sugar and glucose levels: **Low:** 55 or less **Medium:** 56-69 **High:** 70 or more
Glycaemic Load (GL)	A method used to compare the speed and amount of glucose released from different carbohydrate foods, calculated by: GL = (GI x the amount of carbohydrate) divided by 100 **Low:** 10 **Medium: 11 - 19** **High:** 20 or more
Calorie	A unit of heat used to indicate the amount of energy that foods will produce in the human body
UK dietary reference values	New guidelines (replace ROA and RDI), developed to promote

(DRV)	the concept of health and not just avoidance of disease. Guidelines provided for energy and all nutrients
Recommended daily allowance (RDA)	The average quantity of a nutrient that should be provided if the needs of all members of a specific population have to be met
Recommended daily intake (RDI)	The amount sufficient, or more than sufficient for the nutritional needs of nearly all healthy people in the UK

The importance of healthy eating

Eating a healthy and balanced diet containing all the main dietary nutrients (carbohydrates. fibre, fats, protein, vitamins, minerals and water) in the correct quantities is essential for health and wellbeing.

Healthy eating is essential for:

- ***Wellbeing*** - Prevention of chronic diseases, illness and injury.
- ***Growth*** - Optimal growth during childhood, adolescence and pregnancy.
- ***Repair*** - Repair and healing of body structures and optimal recovery from injury.
- ***Energy*** - Food is the main energy source used to fuel the body's activities.
- ***Sporting performance*** - Eating the right balance of the main nutrients can enhance and optimise sporting performance.
- ***Mental health*** - some foods have a positive impact on mood and others have a negative impact on mood, e.g. sugar, caffeine.

The risks of unhealthy eating and poor nutrition

An imbalanced and unhealthy diet and poor nutrition offer a significant risk to health and wellbeing.

In the short term an unhealthy diet can cause:

- Fatigue and lethargy
- Poor concentration and memory
- Headaches

In the long term, an unhealthy diet and poor nutrition is a contributory factor in a number of chronic health conditions including:

- Anxiety and depression
- Osteoporosis
- Obesity
- Diabetes (type 2)
- Cardiovascular disease (stroke, coronary heart disease, hypertension, high cholesterol)

Some cancers

The main nutrients and their role in the diet

A healthy and balance diet should contain the correct balance of macronutrients and micronutrients.

Macronutrients are protein, fat and carbohydrate

Micronutrients are mineral and vitamins

The Macronutrients

Protein

Protein is made up of amino acids. There are 22 proteinogenic (protein forming) amino acids, which make up proteins in the human body. The body can make some amino acids from others, but some cannot be synthesised in the body and have to be obtained in the diet. The amino acids that have to be obtained from the diet are known as essential amino acids, there are nine in total. Those that can be synthesised in the body are known as non-essential amino acids. Protein is essential for building nearly every part of the body.

It **is essential for:**

- Formation, growth and repair of body cells
- Producing hormones, enzymes and antibodies
- A source of fuel.

Proteins provide 4 calories per gram

Protein can be found in two types of sources:

Animal
Contains most essential amino acids, e.g. meats, fish, poultry, eggs, and dairy produce. all good forms of animal protein.

Plant
Contain fewer amino acids, e.g. groins, cereals, nuts, legumes, and beans.
To ensure all the essential amino acids are provided in the diet, a combination of both plant and animal based protein should be consumed. Individuals who do not eat animal products should aim to consume a variety of plant sources of protein to ensure they have a balance of the essential amino acids.

Fats
Fat is one of the main fuels used for energy. It also has a range of other important functions in the diet. Fat is made up of fatty acids which are an essential component for every membrane and every cell in the body (Bean, 2014).

Fat is essential for:

- The development of the myelin sheath that surrounds the nerves.
- The absorption of the fat soluble vitamins D, A, E, and K.
- Providing a protective layer around the vital organs.
- Serving as an insulator under the skin (adipose tissue).

Fats provide 9 calories per gram

There are three major kinds of dietary fats;

Saturated fats
They are found in all fats, are higher in animal product. Sources include: meat, butter, egg yolks, cheese, whole milk products, coconut oil and palm oil.

Saturated fats help the bones take up calcium and protect the liver from the effects of alcohol. They assist functioning of the immune system and have a role in signalling messengers for hormone production (Bean, 2014)

Mono unsaturated fats

They are found in olive oil, avocado oil, seeds, peanut butter, rapeseed oil and nuts.
Monounsaturated fats have been shown to have the greatest effect on the reducing LDL (low density Lipo protein) cholesterol, which may offer a preventative effect against coronary heart disease and cancer.

Polyunsaturated fats

They are found in nuts and seeds, sunflower oil margarine and safflower oil. There are two types of polyunsaturated fats omega 3 and omega 6. They are essential fatty acids and must be consumed in the diet because the body cannot produce them.

Omega 3 is found in oily fish (mackerel, sardines, fresh tuna and salmon) and plant sources (walnuts, pumpkin seeds, dark green leafy vegetables). They protect against cardiovascular disease and assist brain functioning and may have a role to play in managing depression and preventing dementia. They also assist with recovery from injury and help to reduce inflammation (Bean, 2014).

Omega 6 is found in various oils (soya oil, sunflower oil, corn oil, peanut oil). Omega 6 is not usually deficient in the diet.

A dietary recommendation is to eat one portion of oily fish per week to assist the balance of omega 3 and 6.

Trans fats are harmful fats. They are primarily found in processed and fast foods. They increase LDL (low density lipoprotein) cholesterol levels (the harmful cholesterol) and decrease HDL (high density lipoprotein) cholesterol levels (the healthy cholesterol). Consuming too much of this type of fat can increase the risk of cardiovascular disease. Foods with labels listing hydrogenated fat as an ingredient are best avoided.

Carbohydrates

Carbohydrates are the main fuel for muscle work. Anyone who exercises regularly or takes part in sport should ensure
they have an adequate intake of carbohydrate. Carbohydrate is broken down into glycogen which is stored in the muscles and liver. Individual carbohydrate requirements will depend on the intensity of training; the more intense the
training programme, the greater will be the requirement.

Carbohydrates provide 4 calories per gram

Carbohydrates can be divided into three categories:

Sugars
Simple carbohydrates. They are found in foods that have a high sugar content, such as table sugar, jam, honey, fruit
juice and fruit.

Starches
Complex carbohydrates. They are found in starchy foods, such as bread, pasta, rice, cereals, potatoes, grains, and vegetables.

Fibre
High fibre foods can be useful for weight loss because they help the person to feel full. They can also help to manage blood sugar levels and reduce the risk of type 2 diabetes (Bean, 2014).
These are two types of fibre- soluble and insoluble.

- Insoluble fibre cannot be broken down and used as fuel but instead is able to provide bulk in the diet and helps to assist the passage of food through the digestive system, prevent constipation and keep the digestive system healthy and functioning optimally. Sources include whole grains, pasta and rice.
- Soluble fibre can help to reduce LDL cholesterol, it is found in vegetables, lentils, fruit and oats

The importance of micronutrients

Vitamins and minerals are needed in small quantities. They have many diverse roles which include: assisting performance, helping to maintain health and supporting optimal development and functioning of many body tissues and systems.

A varied diet, rich in fruit and vegetables, especially those that are colourful will provide sufficient intake of vitamins and minerals.

Minerals

Minerals help the body to grow, develop and stay healthy. The body uses a variety of minerals for many different roles.

Mineral	Role	Dietary source
Iron	• Prevents anaemia Formation of red blood cells Oxygen transportation	Meat, offal and whole grain cereals
Zinc	• Immune system • Wound healing • Cell growth	Eggs, whole grain, dairy products and meat
Calcium	• Healthy bones and teeth • Healthy gums • Immune function • Assist wound healing. •Iron absorption • May protect against free radical damage	Green leafy vegetables, milk and dairy products, nuts and seeds
Potassium	Fluid balance Muscle and nerve function May help to reduce cramp	Fruit, vegetables, cereals
Magnesium	Healthy bones Cell formation	Milk, fruit and vegetables

Vitamins

- **Water soluble vitamins** are not stored in the body. They are more easily destroyed when cooking, e.g. over-boiling. The water soluble vitamins are B-C
- **Fat soluble vitamins** are stored in the body and are rarely deficient. The fat soluble vitamins are A - D-E - K

Vitamin	Role	Dietary source
Vitamin A	• Good vision and eyesight • Healthy skin	Liver, milk, cheese, butter and oily fish
Vitamin B complex	Work collectively to assist functioning of the nervous circulatory and digestive systems • Have a role is supporting energy production	Wholemeal bread, cereals, pulses, nuts and grains
Vitamin C	• Healthy bones and teeth • Healthy gums	Oranges, lemons, broccoli, peppers

	• Immune function • Assist wound healing • Iron absorption May protect against free radical damage	
Vitamin D	• Assists calcium absorption by the bones	Oily fish, liver, eggs. Exposure to sunlight also boosts vitamin D
Vitamin E	• Antioxidant role • Protection against heart disease • Promotes cell growth • May reduce free radical damage	Vegetable oils, nuts, seeds, oily fish
Vitamin K	Assists blood clotting	Green leafy vegetables - spinach, broccoli, kale) and cereal grains

The importance of water

Water is vital for life. It makes up around 60% of the total body weight and plays an essential role in cell activity and the transportation of nutrients and oxygen {via the blood).

The body loses water through perspiration, breathing and urine, so water levels have to be refilled. Dehydration can affect mental and physical performance.

As a general guideline, it is recommended that individuals should drink between 6-8 glasses of water a day or 2.5 litres. However, this requirement will also be affected by climate temperature, humidity and exercise intensity levels.

On a normal day a person will perspire about half a pint of water. Somebody exercising on a severely hot day may lose as much as l4 pints of water and this needs to be replaced as they could be at risk of severe dehydration.

Healthy eating guidelines

Current guidelines for healthy eating are available from Public Health England (2016). Information includes:

- The Eatwell Guide
- Healthy Eating Guidelines

The Eatwell Guide

The Eatwell guide offers a visual guide to inform the diet. The guidance suggests the diet should include:

- Plenty of fruit and vegetables and starchy foods.
- Some meat, fish, eggs, beans and dairy products
- Only a small amount of foods that are high in sugar or fat

The guidance also suggests that individuals should: Eat the correct amount of calories to meet specific needs. Eat a wide range of foods to ensure all the nutrients are consumed.

Adult males: 2500 calories per day
Adult females: 2000 calories per day

Eight tips for healthy eating (NHS choices, 2015b)

The following are offered as general guidelines for healthy adults:

- Base all meals around starchy foods, e.g. whole grains
- Eat a minimum of 5 portions of fruit and vegetables a day
- Reduce saturated fat and sugar, e.g. less cakes and biscuits, less processed food
- Eat at least 2 portions of fish per week (l oily)
- Eat less salt
- Maintain a healthy weight
- Be active
- Drink plenty of water
- Eat breakfast

Weight management

Any intake of food and drink that is surplus to the body's requirements will usually be stored as fat. In the long term, this surplus may lead to weight gain and obesity. It is currently estimated that around one in every four adults and around one in every five children aged 10 to 11 in the UK are obese (NHS choices, 2015c)

Energy intake	Includes all the foods and drinks taken into the body that contain calories, including tea, coffee and alcohol. • Alcohol provides 7 calories per gram Fat provides 9 calories per gram Protein contains 4 calories per gram • Carbohydrate contains 4 calories per gram
Energy output	Includes all the sources for energy expenditure and use of calories, including resting metabolic rate (RMR), activities of daily living (ADLs), exercise and sport and the thermic effect of food.

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