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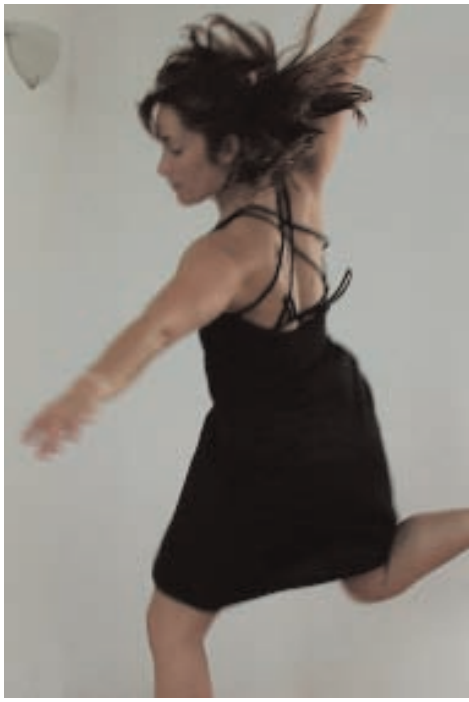

Anatomy and Health Care Study Guide

Grade 10 – 12 | LEARNERS

Directorate: Curriculum Development FET

Acknowledgements

Project Manager: Jennifer van Papendorp,
Senior Curriculum Planner: Dance Arts and Culture

Many thanks to the following contributors:

Writers: T. Scarborough, N. Kaye, R. Levy, E. Bates, Sarah Iles
Illustrations: Skylar Friedman
Translation: D. Henning
Layout and Printing: Edumedia (WCED)

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How to use this study guide:

This Study Guide has been developed to assist Grade 10 – 12 Dance Studies learners. The information that has been included is based on the skills and knowledge required to achieve the Assessment Standards in the Dance Studies Subject Statement of the South African National Curriculum Statement.

Learners should use this book to ensure that they understand and can apply the knowledge, skills, attitudes and values required to develop into a strong and healthy dancer and person.

This Study Guide provides some basic Anatomy and Health Care knowledge but should be supplemented with information from other sources. Further reading material (books and websites) is listed in 'References' at end of this manual.

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ANATOMY AND HEALTH CARE STUDY GUIDE
GRADE 10 – 12
Contents

Section 1

ANATOMY

The human body is built for structure and function. It is a combination of hard and soft tissues designed for both mobility and stability. To understand how your body moves you need to know how it is built and how all the parts work together. This section is divided into the following subsections:

1.1 Anatomical terminology

As your body can assume a number of positions you need to be able to have a point of reference from which to work. This is the anatomical position. It is when your body is in an upright position, with the feet and palms facing forwards. The mid-line refers to an imaginary line through the center of the body.

The following tables provide the descriptions of the terms used frequently in anatomy and when discussing the movements of the body.

Positions and Locations

Position	Description
Anterior or Ventral	To the front, in front, forward.
Posterior or Dorsal	To the back, in the back, backwards.
Medial	Towards the mid-line of the body.
Lateral	Away from the mid-line of the body.
Superior or Cephalic	Above or towards the head.
Inferior or Caudal	Below or towards the feet.
Proximal	Towards the centre of the body.
Distal	Away from the centre of the body.

Movements

Movement	Description
Flexion	To close a joint or decrease the angle between two bones.
Extension	To open a joint or increase the angle between two bones
Hyper extension	To extend a joint beyond normal range
Abduction	Movement laterally away from the mid-line of the body
Adduction	Movement towards the mid-line of the body
Rotation	Circular movement in the long axis of the body
Circumduction	A sequential circular motion describing a cone
Forearm Pronation	Turning away from the anatomical position (palms facing backwards)
Forearm Supination	Turning into the anatomical position (palms facing forwards)
Ankle pronation	Combination of eversion and abduction (dropped arch)
Ankle supination	Combination of inversion and adduction (sickled foot)
Eversion	Turning the sole of the foot outwards
Inversion	Turning the sole of the foot inwards
Dorsiflexion	Flex. Bringing the toes up towards the shin
Plantarflexion	Pointing the toes
Retraction	Backward movement of the scapula
Protraction	Forward movement of the scapula
Elevation	Lifting a body part
Depression	Lowering a body part
External/lateral rotation	Rotation away from the midline
Internal/medial rotation	Rotation towards the midline
Prone	Lying flat facing down
Supine	Lying flat facing upwards

1.2 The Skeleton

The skeleton provides the framework of the body. The skeleton provides:

1. **Support** for surrounding tissues
2. **Protection** for the vital organs and other soft tissues of the body.
3. **Form** and shape for the body.
4. **Attachment** points for muscles
5. **Storage** area for minerals and calcium
6. **Blood cells** which are manufactured in the red bone marrow
7. **Levers** for movement through articulating joints

1.2.1 Regions of the skeleton

The skeleton is organised into two units: axial and appendicular.
[See diagram 1.1 (front view) and 1.2 (back view) on page 6 & 7]

- The **axial skeleton** is the head, neck and spine (skull and vertebral column), ribs and sternum.
- The **appendicular skeleton** consists of the upper and lower extremities (the arms and shoulder girdle and the hips and legs).
- The **thorax** (or thoracic region) consists of 12 pairs of ribs, which attach posteriorly to the thoracic vertebrae of the spine. The upper 6/7 ribs attach anteriorly to the **sternum** (chest bone) and the lower 3/4 are false ribs with no anterior attachment.
- The **pelvic girdle** attaches the legs to the axial skeleton and consists of the Ilium, Ischium and Pubis. These are fused to form what is more commonly known as the pelvis. The lowest two points of the Ischium bone are your sitting bones (called **ischial tuberosities**). The crest (uppermost border) of the Ilium bone serves as an attachment point for many muscles in the torso. The Ilium joins to the part of the spine called the **sacrum**. This join, called the **sacroiliac** joint, is not a true joint but does sometimes have some space for movement and is an area prone to strain, injury or alignment problems.
- The **pectoral girdle** joins the upper extremities (arms) to the axial skeleton. The muscles in the pectoral girdle attach the arms to the **clavicle** (collar bone) and **scapula** (shoulder blades).
- The upper extremity (arm) consists of the long bone of the upper arm, the **humerus** and the long bones of the lower arm, the **ulna** and **radius**. There are 8 carpal bones, 5 **metacarpal** bones and 15 **phalangeal** bones making up the wrist and hand.

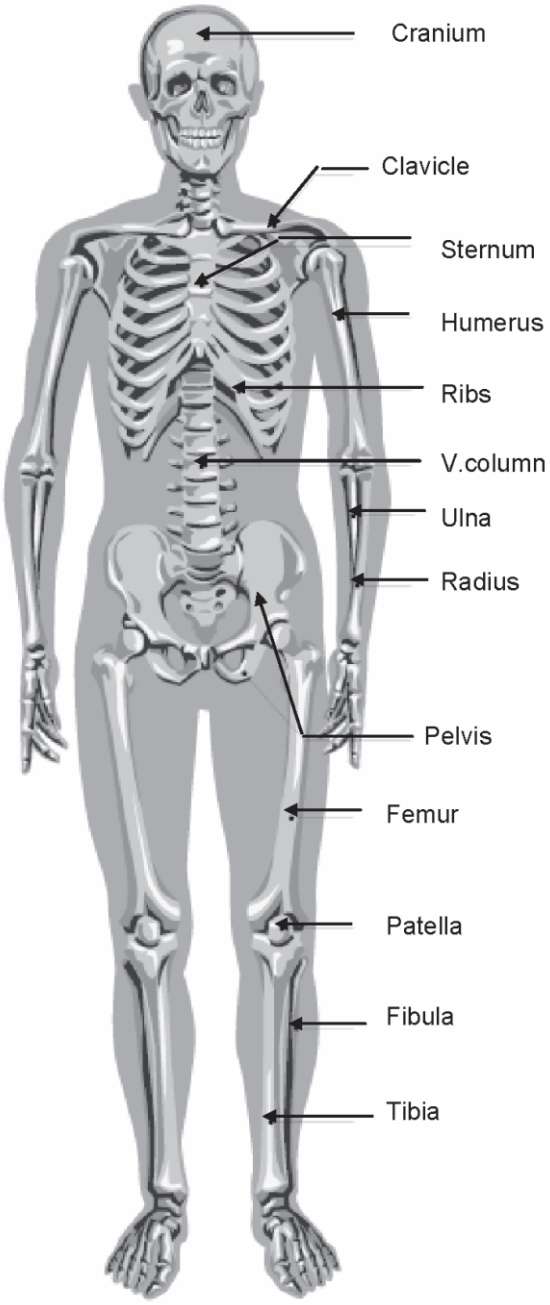

Fig 1.1 Skeleton (front/anterior view)
Reebok Instructors Alliance
Basic Science of Exercise

- The lower extremity (leg) consists of the longest bone in the body, the femur (thigh bone), the **tibia** (shin bone) and **fibula** of the lower leg, and the **patella** (knee cap).
- The foot has 7 **tarsal** bones (ankle), 5 **metatarsals** and 14 **phalanges**. The 7 tarsal bones are individually named according to shape and/or place: there are 3 **cuniform** (wedge shaped) bones – medial, intermediate and lateral cuniform. There is the **navicular** bone (boat shaped), the **cuboid** (cube shaped) and the **talus** (ankle bone). The **calcaneus** is the heel bone.

[See diagram 1.2.1 of foot on page 7]

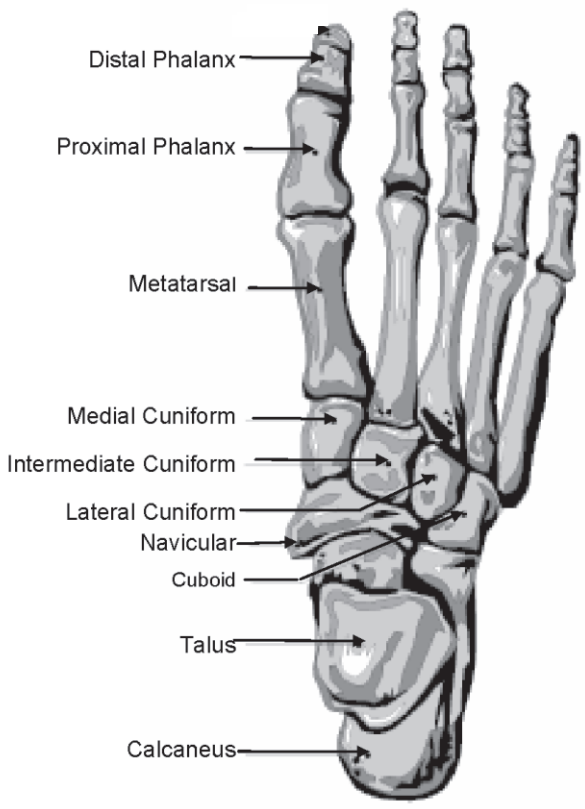

Fig 1.2.1 Bones of the foot
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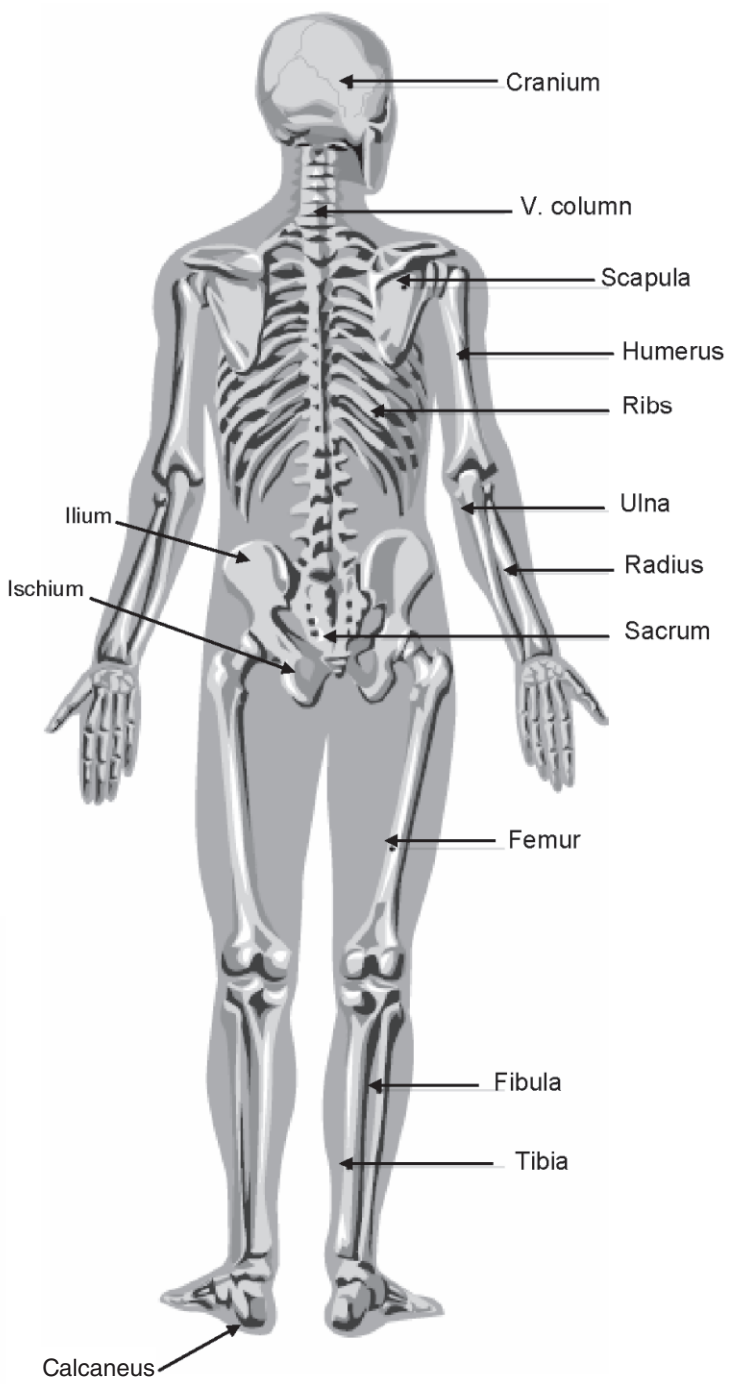

Fig 1.2 Skeleton (back/posterior view)
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1.2.2 The spine

- It is made up of 33 vertebrae.
- It curves in a long S shape which is necessary to absorb shock.
- There are fibrocartilaginous discs between the vertebrae which prevent friction, absorb shock and assist movement.

It functions as:

- a protective shell through which the spinal column runs
- an attachment point for muscles
- a support to the body in the upright position

It is divided into 5 regions. Each region is able to perform a certain range of movement depending on the shape and size of the vertebrae.

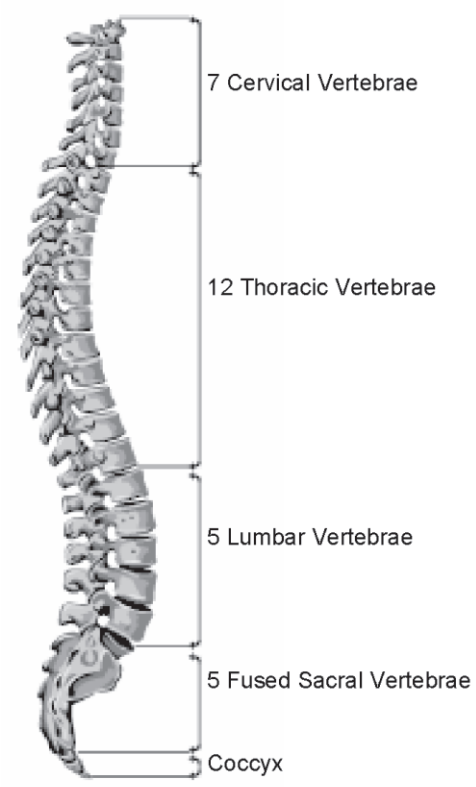

Fig 1.3 Diagram of spine
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Cervical – the neck region has 7 small vertebrae. The first two vertebrae of the neck are unique. The first vertebra, the atlas is just a ring of bone. It supports the head and articulates with the occipital bone (the base of the skull). The second vertebra is the axis upon which the atlas and head pivot. The cervical spine has the largest range of movement in the spine.
Thoracic – the upper back region has 12 vertebrae that are longer and more rounded than the cervical vertebrae. They have long spinous processes onto which the ribs can attach. There is limited movement in this region.
Lumbar – the lower back region has 5 vertebrae which are the longest and strongest in the spine. It has more movement than the thoracic region but less than the cervical region.
Sacral – the sacrum consists of 5 fused vertebrae to form a triangular shaped bone. It joins the Ilium to connect the spine to the pelvis. There is no movement as it is fused.
Coccyl – the coccyx consists of between 2 – 4 fused vertebrae. It is also known as the tail bone. There is slight room for movement which is necessary during childbirth.

1.2.3 Bones

There are 206 bones in the human skeleton.
At birth your bones are made of cartilage. As you grow they calcify and gradually become bone. Bones fully ossify at 25 years of age.

Bones are divided into:

1. **Long bones:** These have a long shaft with two bulky ends. They are mainly compact bone which is thickest in the middle of the bone where it takes the most strain. They have a slight curve which adds to their strength e.g. Femur and Humerus

2. **Short bones:** They have an irregular shape and consist primarily of spongy bone which is covered by a thin layer of compact bone e.g. carpal bones of the wrist and the tarpal bones of the ankle.
3. **Flat bones:** These provide protection for soft body parts. They consist of two flat plates of compact tissue enclosing a layer of spongy bone e.g. scapula, skull.
4. **Irregular bones:** They are similar to short and flat bones. The difference is that they have peculiar shapes e.g. vertebrae.
5. **Sesamoid bones:** These are usually considered a separate type as they are small and rounded. They are enclosed in tendon and fascial tissue and found adjacent to joints e.g. the patella or kneecap.

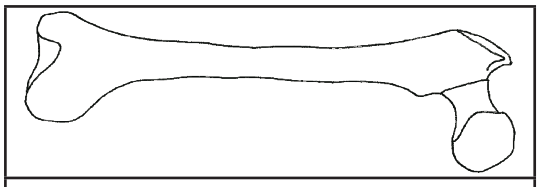


Fig A: Long Bone

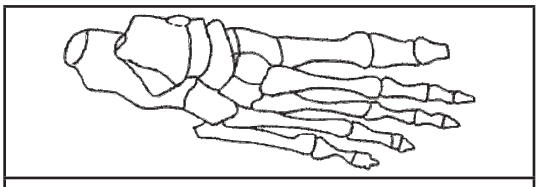


Fig B: Short Bone

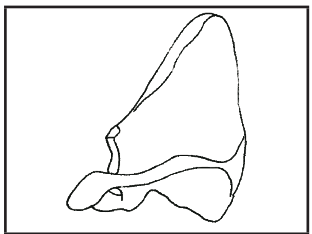


Fig C: Flat Bone

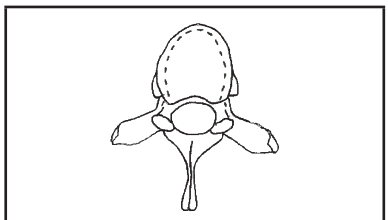


Fig D: Irregular Bone

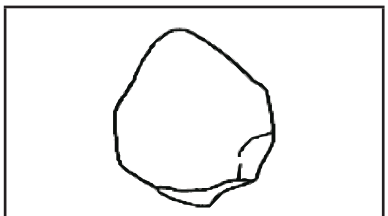


Fig E: Sesamoid Bone

1.2.4 Joints

A joint is the point of articulation where two bones meet. Joints allow movement of body parts and are therefore classified according to their type of mobility:

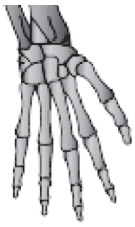
1. **Immovable joints** are joints where tooth-like or saw-like edges of bones are joined by a thin layer of connective tissue e.g. the skull.
2. **Semi-moveable joints** are joints where the bones are connected by ligaments or fibrocartilage e.g. between two adjacent vertebrae in the spine and between the two pubic bones (pubic symphysis).
3. **Freely moveable (synovial) joints** are lubricated by synovial fluid to prevent friction between the ends of the bones.

How synovial joints work.

Where the ends of the adjacent bones meet there is a **joint cavity**. This is enclosed by a **joint capsule** which is lined with a **synovial membrane**. This membrane produces synovial fluid. The ends of the bones are lined with **cartilage** which when lubricated by the synovial fluid provides a smooth sliding surface. The synovial fluid is also a main source of nutrition for the cartilage. Ligaments running directly from one bone to the other provide stability for the joint.

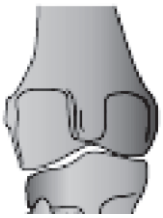
Types of synovial joints.

Saddle



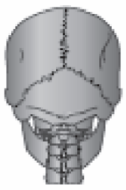
e.g. carpel – metacarpal 1 (thumb)

Hinge



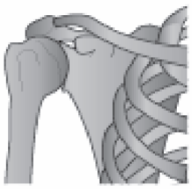
e.g. knee (also elbow, ankle)

Pivot



e.g. atlas-axis

Ball and socket

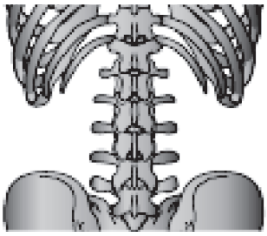


e.g. shoulder (also hip)

Ellipsoid (Condyloid)

e.g. radius-carpals (also atlas-occipital)

Plane (Gliding)



e.g. rib-vertebrae

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1.2.5 Connective Tissue

Your body is made up of more than muscle and bone. Connective tissues join bones to bones; muscles to bones; or muscles to other muscles and fascia (adipose or 'fatty' tissue, or connective tissue that penetrates in between groups of muscles and surrounds nerves and blood vessels.) These tissues perform a protective and stabalising function, and are prone to injury. A proper warm-up and flexibility routine, a balanced training program and correct technique and alignment will all ensure you reduce the risk of injury to these tissues. (Refer to section 2 on 'Safe Use of the Body' and section 3 on 'The Principles of Body Conditioning' for detailed information on these topics.)

There are three main types of connective tissue that are relevant to this course:

1. **Tendons**
2. **Ligaments**
3. **Cartilage**

1. **Tendons** attach muscle to bone, cartilage or other connective tissue. They are elastic but not able to stretch as much as muscle. To prevent injury to tendons a sufficient warm-up is essential and controlled flexibility training is advised.
2. **Ligaments** attach bone to bone. They are non-elastic and provide stability for joints. Once overstretched they cannot regain their original length and the joint then loses some stability. By maintaining strength as well as flexibility in the muscles you can prevent excessive strain being placed on ligaments as the muscles will also play a stabilizing role around the joint.
3. **Cartilage** is the non-calcified tissue of the skeleton. There are different types of cartilage, classified according to their structure and function. Cartilage is either **hyaline**, **fibrous** or **elastic**. The cartilage that makes up your vertebrae is called **fibrocartilage** and acts as a shock absorber. The cartilage that lines the ends of bones at a joint is referred to as **articular** cartilage (is usually **hyaline** cartilage, sometimes **fibrocartilage**). Examples of **elastic cartilage** are found in the epiglottis, external ear and portions of the larynx. Cartilage has very little elasticity and blood supply. It is therefore easily injured and does not heal easily.

1.3 Muscles

As a dancer it is important to understand how your muscles work in order to use your body to its optimum without incurring injury.

Muscles allow us to run, jump, dance, laugh, breath, swallow – a whole range of movements. There are muscles involved in the locomotor apparatus which, along with the bones and joints, allow us to move. There are other involuntary muscles that keep the body systems running smoothly.

- **The three types of muscle**

1. **Skeletal/Striated Muscle**
   This is voluntary muscle (it can be controlled or activated, even though it is also responsive to involuntary reflexes). It is attached to bones via tendons and is stimulated by nerves
2. **Cardiac Muscle**
   This is involuntary muscle, which is found in the heart. It has the striated or striped appearance of skeletal muscle. It is under control of the central nervous system, and therefore cannot be trained.

3. **Smooth Muscle**
   This is involuntary muscle (contraction of this muscle cannot be produced at will), found in the digestive tract, respiratory tract and other organs under control of the central nervous system.

- **Skeletal Muscle – The Facts!**
  - They form up to 50% of your body's weight
  - There are approximately 640 named skeletal muscles in the body
  - They give the body its shape
  - A skeletal muscle links two bones, crossing the joint – when the muscle contracts, or shortens, the bones move.
  - Muscle is arranged in layers over the skeleton. Superficial muscles lie closest to the skin and the muscles closer to the inside of the body are called deeper muscles.
  - Muscles can only pull they cannot push.

- **The make-up of skeletal muscle**
  - Muscles are made up of bundles of cells called **muscle fibres**.
  - Inside each fibre are more tiny cylinders called **myofibrils**.
  - These myofibrils have light and dark bands formed by the protein myofilaments **actin** and **myosin**.
  - The actin and myosin filaments overlap, giving muscle its striated appearance and contractile ability.
  - Actin and Myosin are organised into contractile sections called **Sarcomeres**.
  - When the muscles contract the actin filaments move between the myosin filaments – this causes shortening and thickening of the myofibrils.

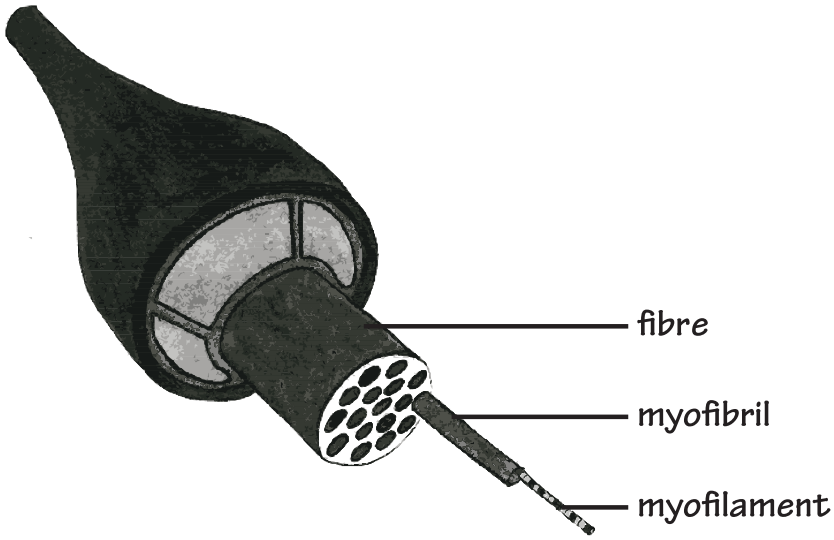

Fig 1.4: Anatomy of skeletal muscle

Skeletal Muscle Organisation:
muscle > muscle bundles > muscle fibres > myofibril > sarcomere > myofilaments > (proteins: actin & myosin)

- **Naming of Muscles**

  Muscles are named according to their:

Shape	e.g. Trapezius
Direction of Fibres	e.g. Transverse Obliques
Location	e.g. Subscapularis
Attachment points	e.g. Sternocleidomstoid
Number of Heads	e.g. Triceps
Group Relation	e.g. Quadirceps
Action	e.g. Flexor Digitorium

- **Muscle Architecture (shape)**

  The fibre bundles of muscles are arranged in many shapes:

Strap Shaped	Sartorius
Two Heads	Biceps
Three Heads	TRIceps
Four Heads	QUADriceps
Unipennate	Extensor digitorum longus
Bipennate	Rectus Femoris
Multipennate	Deltoid
Serrated	Serratus anterior
Segmented	Rectus abdominis

- **Muscle attachment**

  Muscles attach to bone in various ways:
  1. Tendons – the muscle attaches to a tendon that in turn attaches to the bone. e.g. The Achilles tendon attaches the calf muscles to the Calcaneous (heel bone.)
  2. Fibrous Tissue – muscles attach through the end fibres of adjacent muscles. e.g. The Tensor Fascia Latae and the Gluteus Maximus insert into the illiotibial band (ITB) a strong fibrous band of tissue see fig. 1.26.

- **Muscle Characteristics**
  - Irritability – able to receive stimulus
  - Contractibility – ability to shorten and thicken
  - Extensibility – ability to stretch and extend
  - Elasticity – ability to return to original form

- **Muscle Action**
  - When muscles act, they contract and therefore shorten
  - Muscle fibres work according to an **all-or-none** law. This means that once activated a muscle fibre contracts fully. To work harder to overcome a heavier load the CNS (central nervous system) recruits more fibres.
  - Muscles always have tone – called the 'basal tonus' (basic tone) – even when in a relaxed state. This is the constant tension in a muscle, which makes it ready to perform at any time.
  - There are different systems working in the muscles to allow for controlled and successful movement and help prevent injury:

1. The ***origin*** is the fixed point from where the muscle starts and the ***insertion*** is the point at which the muscle attaches to a bone via a tendon. When a muscle contracts or shortens, the **insertion** point is pulled towards the **origin**.
2. Muscles do not work alone. They work in pairs and groups. The PRIME MOVER, or muscle that contracts (shortens) to create movement around a joint, is called the **agonist**. The opposing muscle, which lengthens and acts as a control mechanism, is called the **antagonist**. For example: when the biceps contracts in order to touch the hand to the shoulder, the triceps muscle group lengthens to control the movement.
3. This balancing relationship between agonist and antagonist is called **reciprocal inhibition** and is an important mechanism that prevents muscles from snapping. It is this neuromuscular pathway that is activated in the **stretch-reflex** (see the paragraph on flexibility in section 3 on 'The Principles of Body Conditioning'.)
4. Muscle contractions do not always shorten the muscles. A Muscle contraction can be **concentric** (shorten), **eccentric** (lengthen) (these are known as **isotonic** muscle action) and **isometric** (no change in length).
5. Muscles also work as **fixators** and **synergists**. **Fixators** help stabilize the joint while other muscles work. ***Synergists*** are working muscles that help control the movement.

1.4 The muscles of the body

The muscles moving the head

The main muscles moving the head are **Longus Capitis**, **Splenius Cervicis**, **Splenius Capitis** and the **Sternocleidomastoid**. For the purposes of this study guide you need only be familiar with the Sternocleidomastoid. It is named according to the origins of its two heads and its insertion:

Sterno – originates on the sternum

Cleido – originates on the clavicle

Mastoid – inserts into the mastoid process of the temporal bone

Sternocleidomastoid's actions are – the two side together cause flexion of the head on the neck, one side will cause flexion to the same side and rotation to the opposite side. [See diagram 1.5 (front body muscles) on following page]

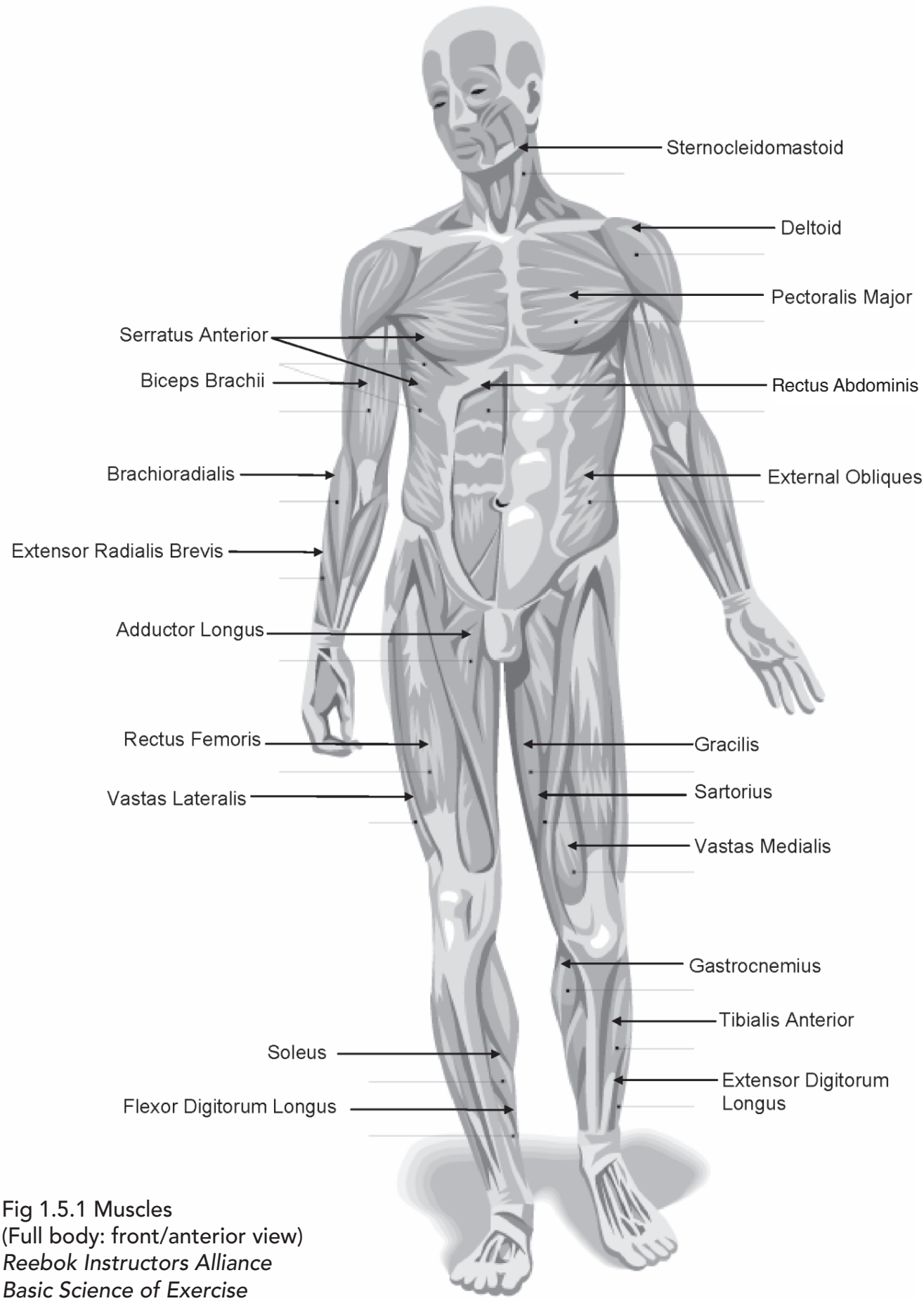

Fig 1.5.1 Muscles
(Full body: front/anterior view)
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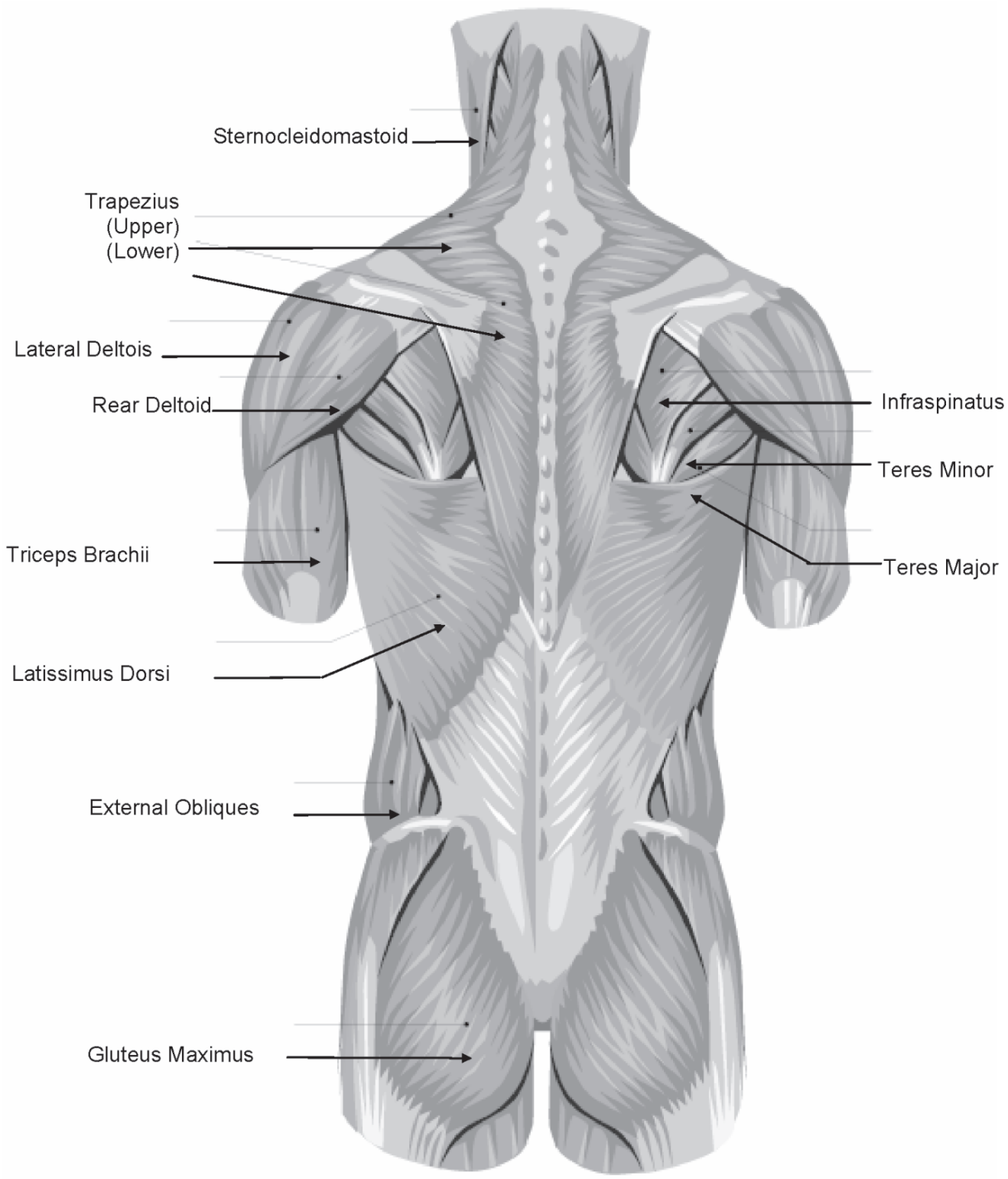

Fig 1.5.2 Muscles
(back of the torso)
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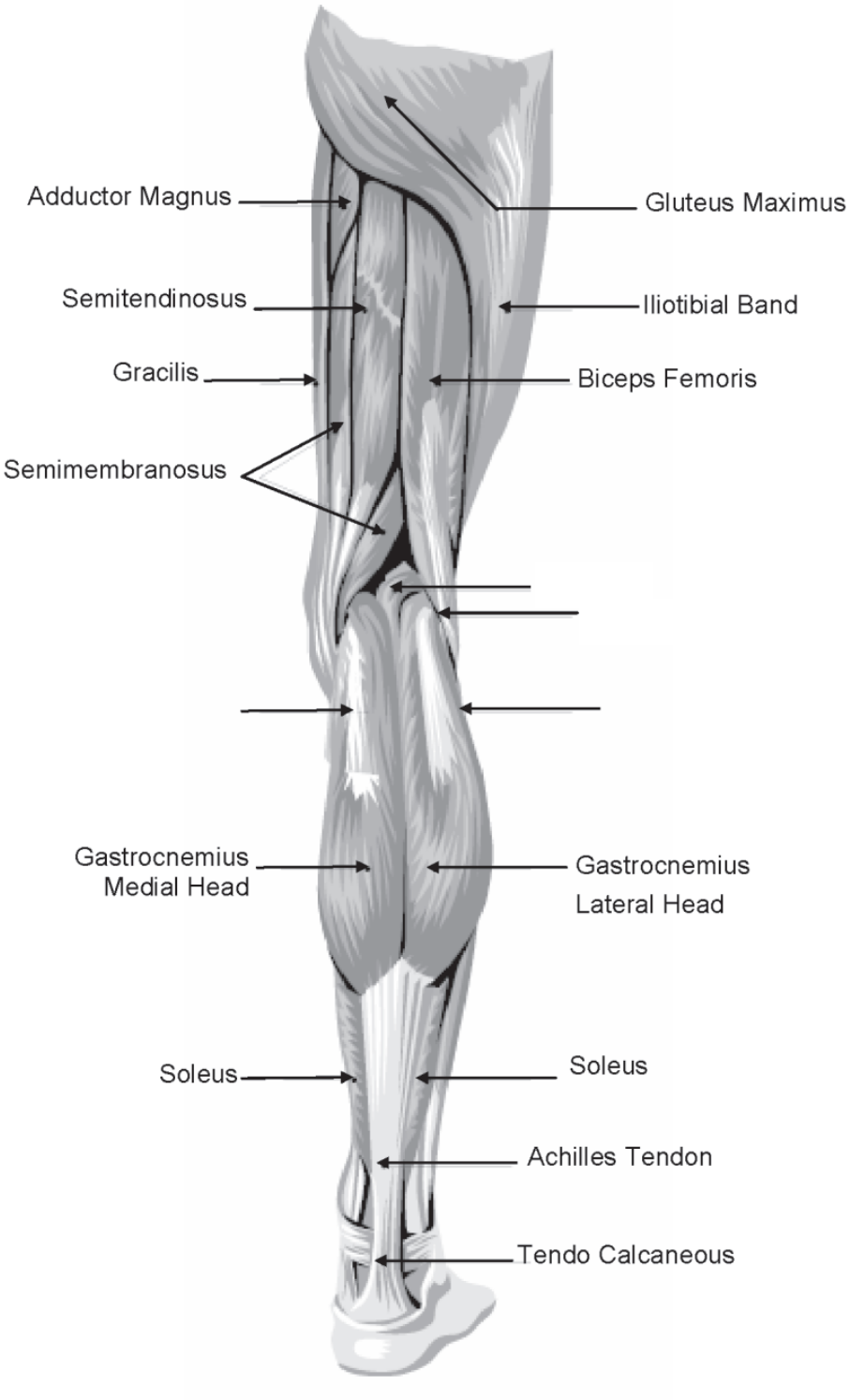


Fig 1.5.3 Muscles
(back of the leg)
Reebok Instructors Alliance
Basic Science of Exercise

Muscles of the shoulder girdle

Trapezius is the large, flat trapezoid muscle whose attachments originate from the base of the skull, neck and thoracic vertebrae a and insert into the clavicle. This muscle is often responsible for de-neutralising the posture and is where you tend to feel tension in your shoulders. Different parts of this muscle can perform different actions.

Actions: stabilization, mid-trapezius: retraction & depression, upper-trapezius: elevation.

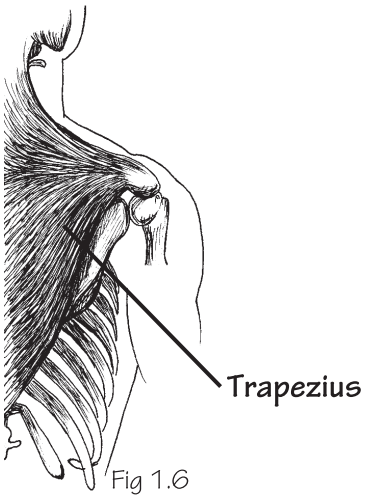


Fig 1.6

Serratus Anterior acts as a stabiliser and to protract the scapula.[fig 1.7] Dovetails with the external obliques.

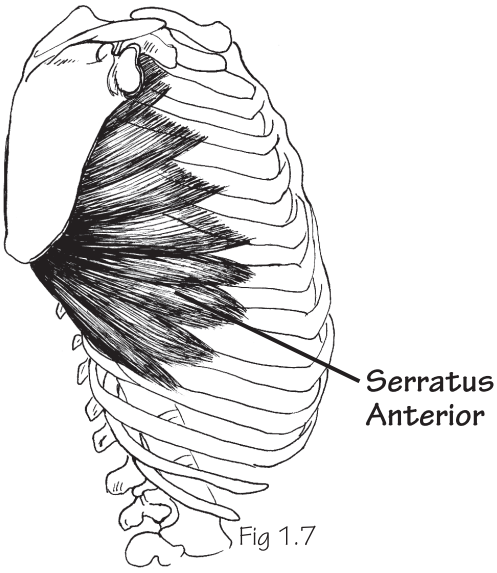


Fig 1.7

Rhomboid major and **minor** act as stabilizers and scapula retractors. [fig 1.8]

Levator Scapula elevates and retracts the shoulder girdle. [fig 1.9]

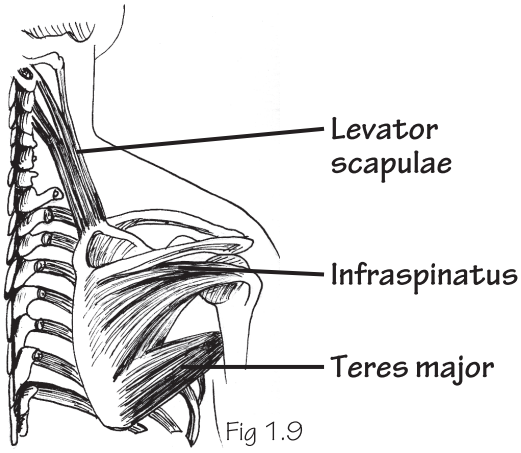


Fig 1.9

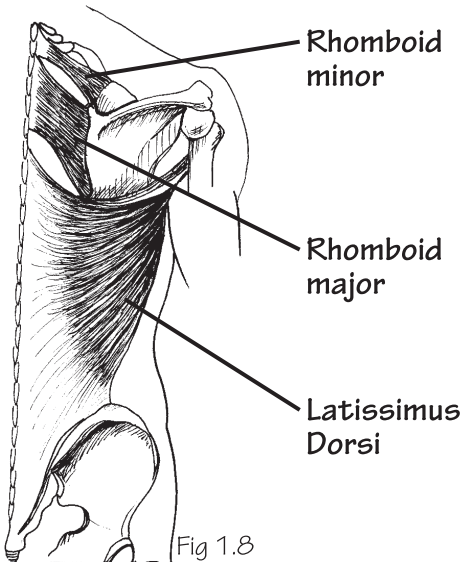


Fig 1.8

Muscles of the shoulder

The shoulder is the most mobile part of the body.

There is a group of four muscles that make up the **rotator cuff**.

They act primarily as rotators of the arm at the shoulder but also play a role in stabilising the humerus.

The easiest way to remember them is by using the acronym **SITS**, made up of the first letter of each muscles name.

Supraspinatus – abduction [fig 1.10]

Infraspinatus – lateral rotator of arm at shoulder [fig 1.9]

Teres minor – lateral rotator of arm at shoulder [fig 1.10]

Subscapularis – medial rotator of arm at shoulder [fig 1.11]

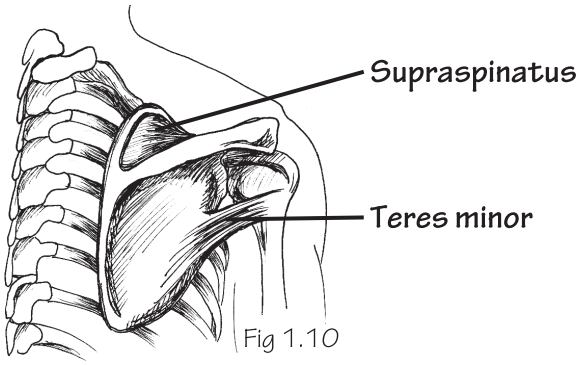


Fig 1.10

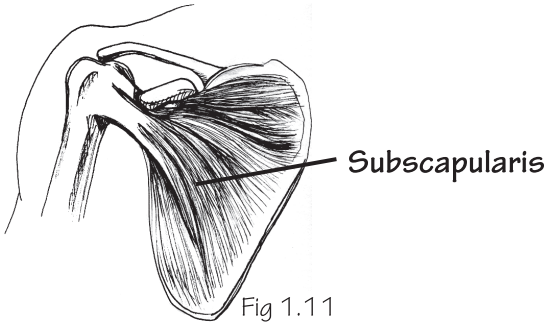


Fig 1.11

Teres Major acts as an adductor and medial rotator of the humerus. [fig 1.9]

Latissimus Dorsi extends the flexed arm, adducts and medially rotates the humerus. [fig 1.8]

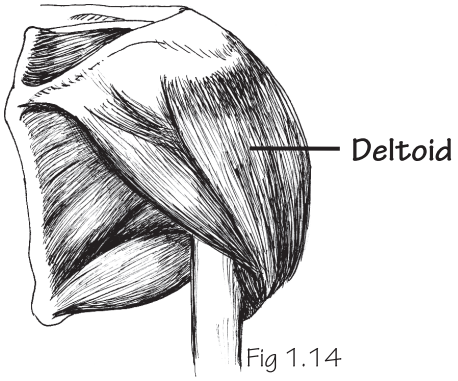


Fig 1.14

Pectoralis Major is the large muscle of the chest. *Action:* adducts and medially rotates humerus. The part that attaches to the clavicle also flexes the humerus. [fig 1.12]

Pectoralis Minor protracts the scapula [fig 1.13]

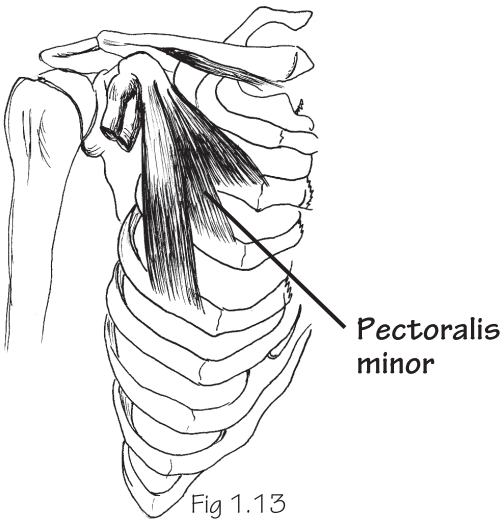


Fig 1.13

Deltoid. This powerful muscle gives the shoulder its rounded shape and is divided into three compartments. [fig 1.14]

Anterior Deltoid acts as a flexor and medial rotator of the humerus.

Medial Deltoid abducts the shoulder.

Posterior Deltoid acts as an extensor and lateral rotator of the humerus. It is also active in abduction.

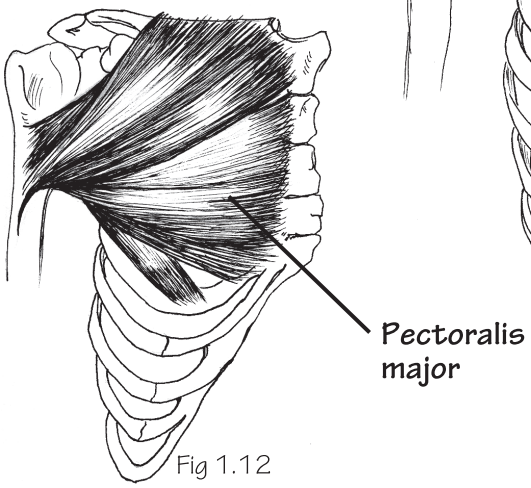


Fig 1.12

Corachobrachialis acts as an adductor and weak flexor of the arm at the shoulder joint. [fig 1.15]

Muscles moving the elbow

Brachialis acts as a main flexor of the elbow joint. [fig 1.15]

Biceps Brachii is named for its two heads or bellies. This muscle crosses two joints (shoulder and elbow) and therefore acts upon both joints.

Action: flexes the elbow, supinates the forearm (when the elbow is bent) and also flexes and stabilises the shoulder joint. [fig 1.16]

Triceps is named for its three heads or bellies. Two of these heads originate on the humerus and the third one on the scapula. It also acts upon both the shoulder and elbow joints.

Action: extends the elbow joint, long head can adduct the arm and extend it from a flexed position. [fig 1.17]

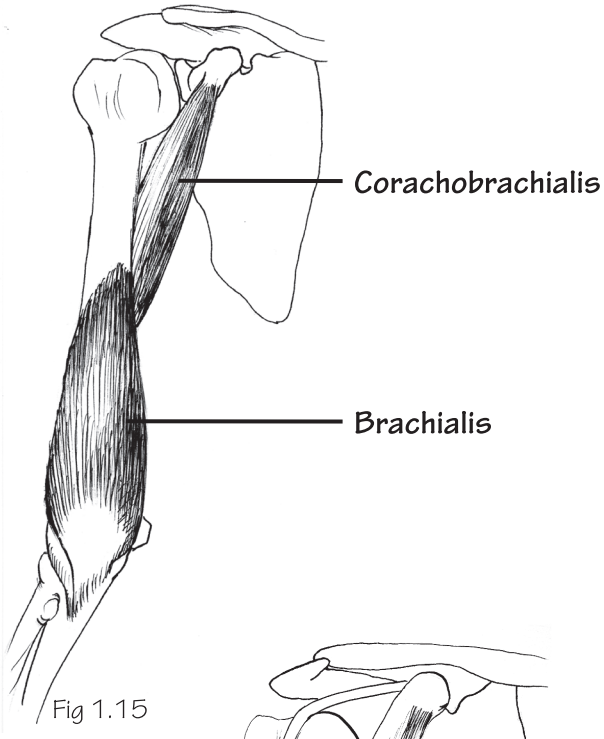


Fig 1.15

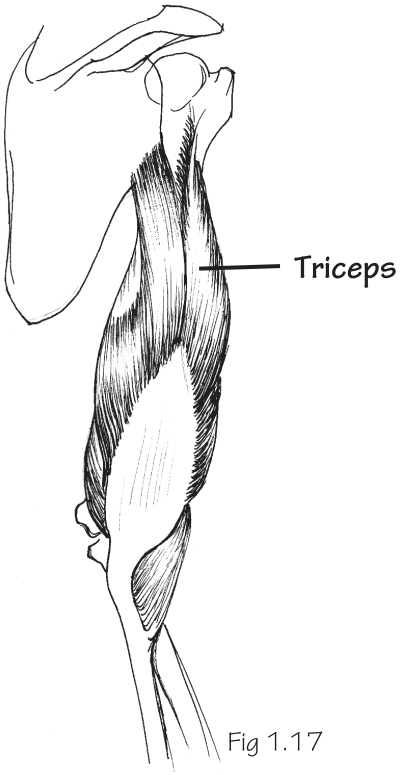


Fig 1.17

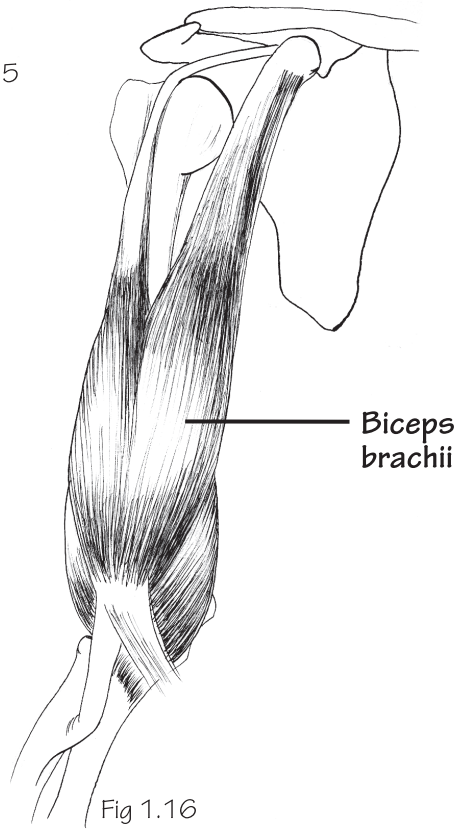


Fig 1.16

Muscles moving the hand

Extensive understanding of these muscles is not essential for this course. Here are some basic facts to increase your understanding of the movement of the wrist:

- These muscles are divided into the anterior and posterior compartments.
- They are grouped as wrist flexors and wrist extensors even though some of the muscles are also involved in pronation or supination of the forearm and movements of the fingers.
- The flexors originate on the humerus and insert into the carpals and metacarpals.
- The extensors originate on the humerus and insert into the metacarpals.

Muscles of the trunk

Rectus Abdominis. The left and right sides of this muscle are separated by a flat tendon, the Linea Alba.

Actions: Trunk flexion, lateral flexion and rotation. [fig 1.18]

Internal Obliques. The fibres of these muscles cross diagonally with those of the external obliques. They lie underneath the external obliques and are therefore not visible.

Actions: Trunk flexion, lateral flexion and rotation, stabiliser. [fig 1.18]

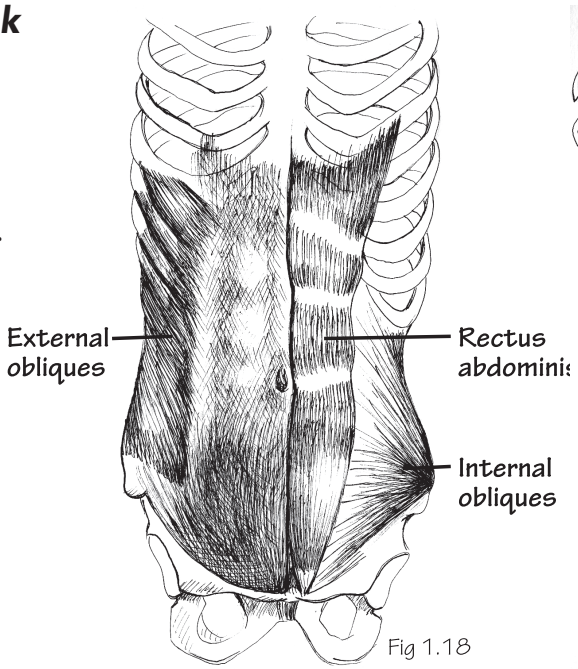


Fig 1.18

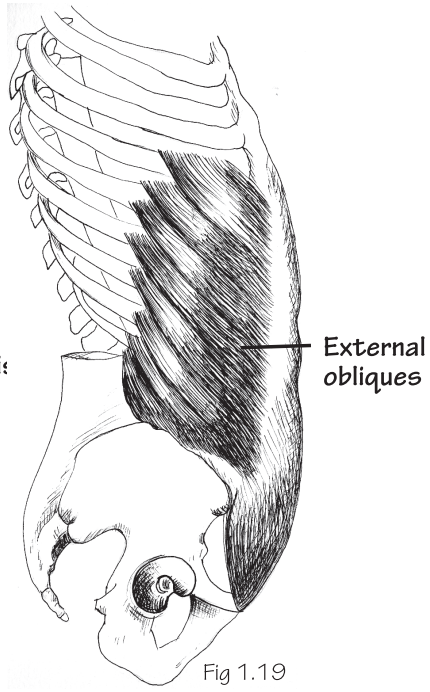


Fig 1.19

External Obliques. As with the other abdominal muscles they are involved in breathing as they attach to the ribs.

Actions: trunk flexion, lateral flexion and rotational stabiliser. [fig 1.18 &1.19]

Transverse Abdominis. This muscle is the deepest lying of the abdominals. It acts as a 'girdle' or 'corset' to raise intra-abdominal pressure. Learning how to contract this muscle is very important as it is a major abdominal stabiliser. [fig 1.20]

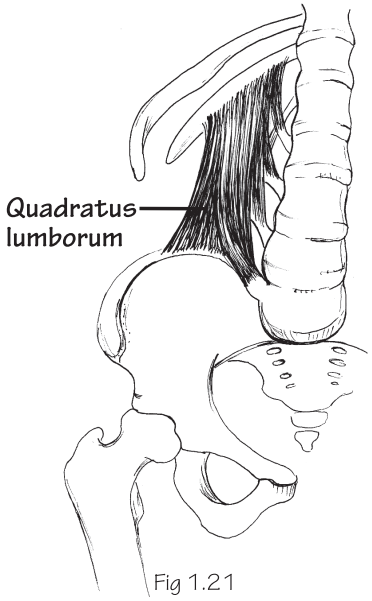


Fig 1.21

Quadratus Lamborum flexes the trunk laterally to the side it is located on and also stabilizes the pelvis and lumbar spine. [fig 1.21]

Erector Spinae (also called Sacrospinalis). This is a group of muscles that run up the spine in layers. There is a lateral, middle and medial layer.

Actions: extend neck and spine. [Fig 1.22]

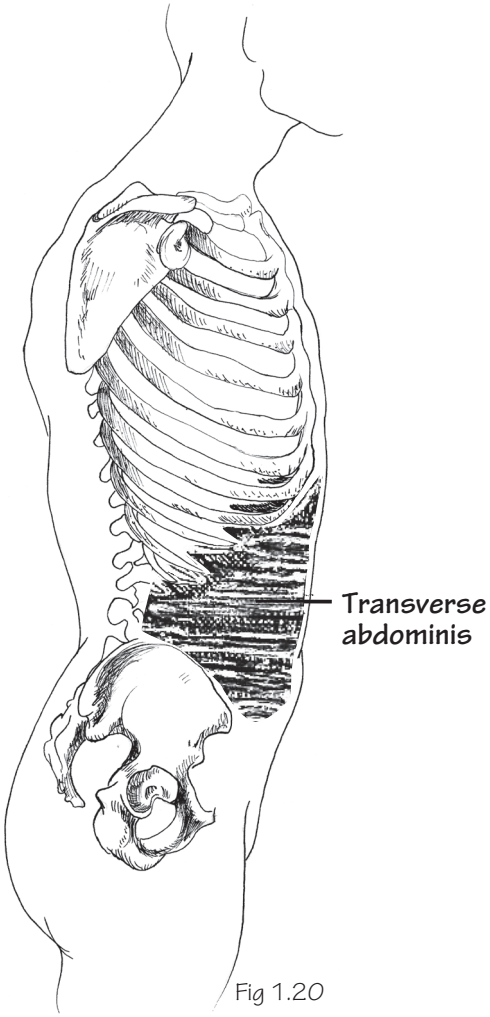


Fig 1.20

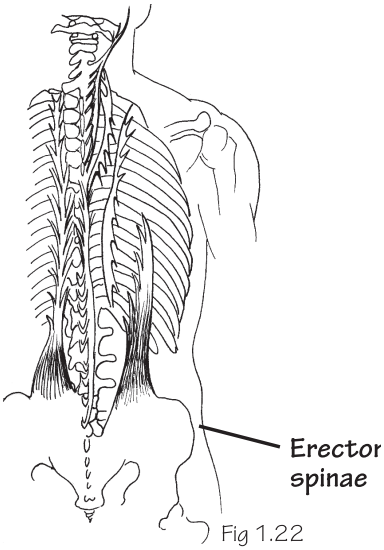


Fig 1.22

The muscles of the hip

Iliopsoas. This muscle consists of two portions: the Iliacus and Psoas Major. Together they act as a hip flexor. [Fig 1.23]

6 Deep Hip Rotators.

- **Quadratus Femoris**. Laterally rotates the femur. [Fig 1.24]
- **Gemellus Superior and Inferior**. Laterally rotate the femur. [Fig 1.24]
- **Obturator Internus and Externus**. Laterally rotates the femur. [Fig 1.24]
- **Piriformis**. Laterally rotates and slightly abducts the femur. [Fig 1.24]
- **Gluteus Medius**. Abducts and medially rotates the femur. [Fig 1.24 & 1.26]
- **Gluteus Minimus**. Abducts and medially rotates the femur. [Fig 1.25]
- **Tensor Fascia Latae**. Extends the knee, abducts and medially rotates the femur. [Fig 1.26]
- **Gluteus Maximus**. Extends the hip against gravity, laterally rotates the femur during extension and abducts femur. [Fig 1.26]

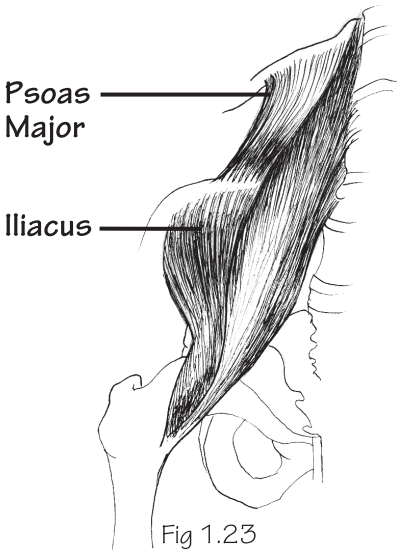
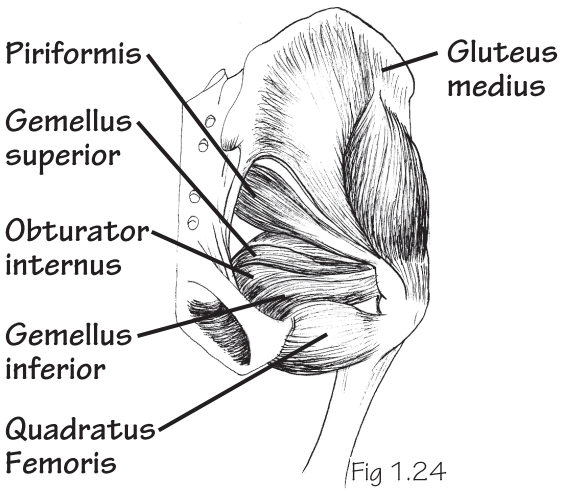


Fig 1.23



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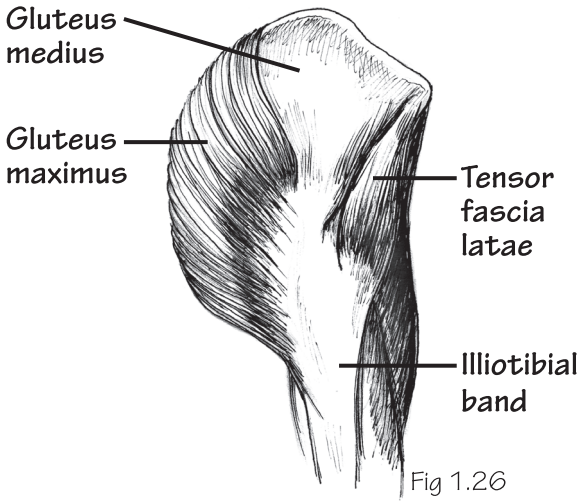


Fig 1.26

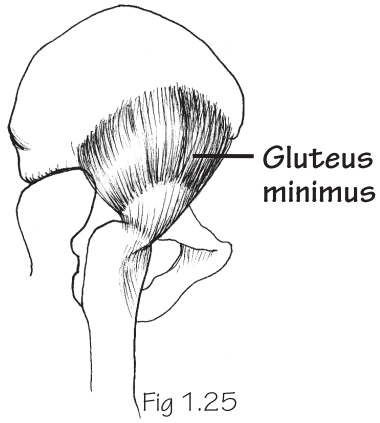


Fig 1.25

The muscles of the thigh

Quadriceps. This powerful group consists of 4 muscles: **Rectus Femoris, Vastus Lateralis, Vastus Medialis and Vastus Intermedius**. They all cross the knee joint and act as knee extensors. The Rectus Femoris muscle crosses the knee and hip joints and acts as a hip flexor as well. [Fig 1.27 & 1.28]

Sartorius. This is the longest muscle in the body. It crosses both the hip and knee joints.

Actions: Hip and knee flexion, lateral rotation and abduction of femur, medial rotation of the tibia on the femur. [Fig 1.29]

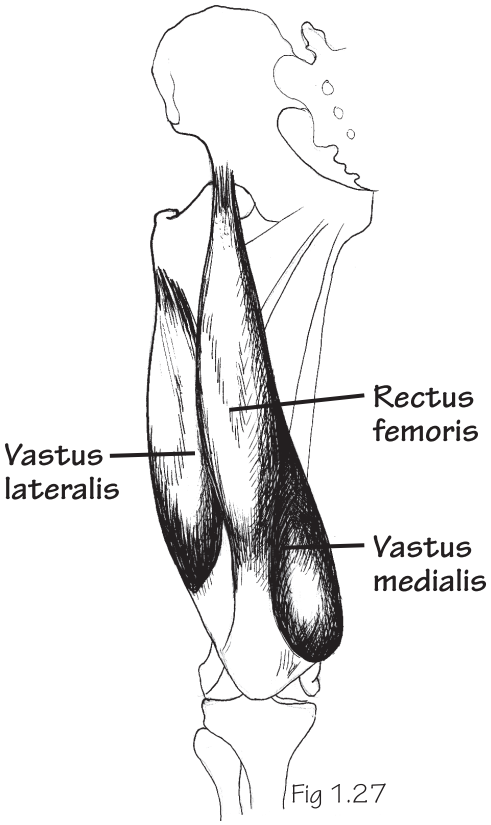


Fig 1.27

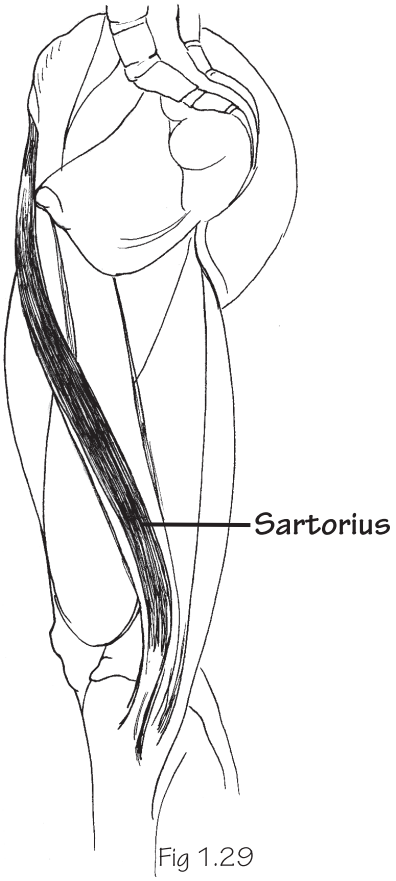


Fig 1.29

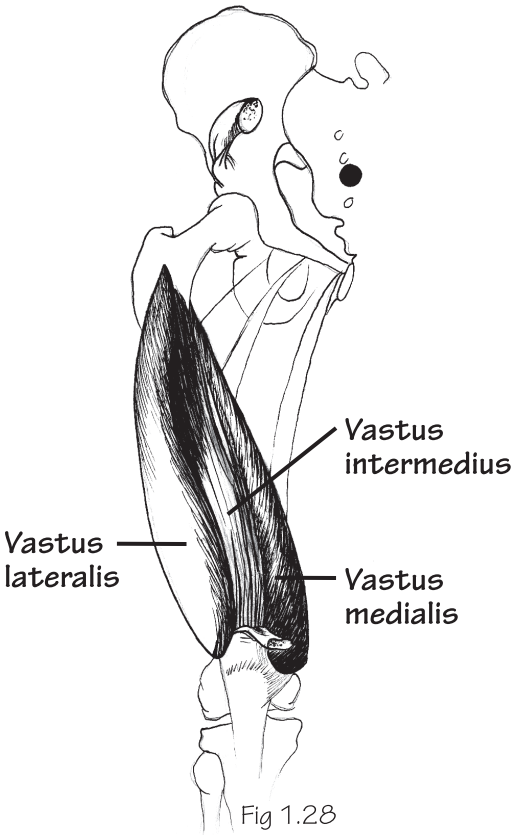


Fig 1.28

Hamstrings. This group consists of 3 muscles:

- Semimebranosus [fig 1.30 & 1.31] and Semitendinosus [fig 1.30] extend the hip, flex the knee and can medially rotate a semi flexed knee.
- Biceps Femoris [fig 1.30 & 1.31] extends the hip, flexes the knee and laterally rotates a semi flexed knee.

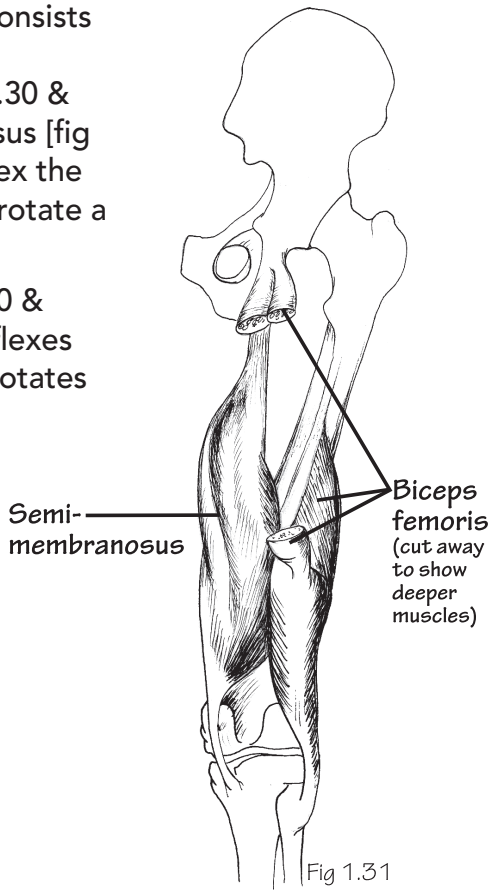


Fig 1.31

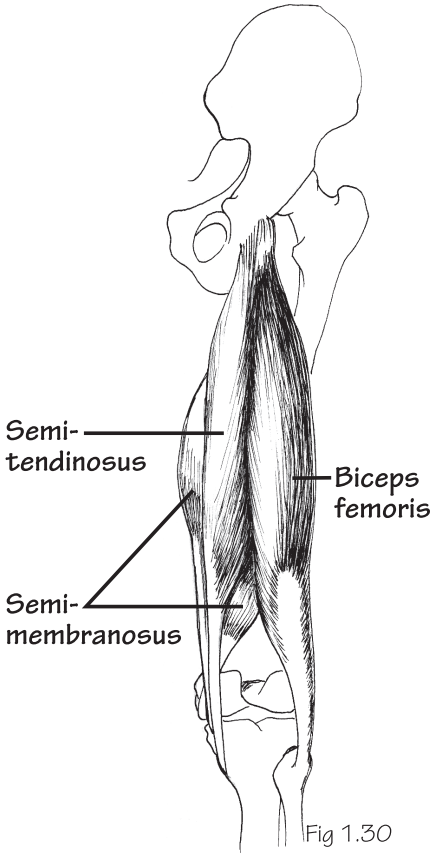


Fig 1.30

Adductors. There are 3 muscles in the adductor group that work together to adduct the thigh: **Adductor Longus, Adductor Brevis and Adductor Magnus**. [Fig 1.32]

Two other muscles involved with adduction are:

- **Gracilis**, which adducts, flexes and medially rotates the femur. [Fig 1.34]
- **Pectineus**, which adducts and flexes the hip joint. [Fig 1.33]

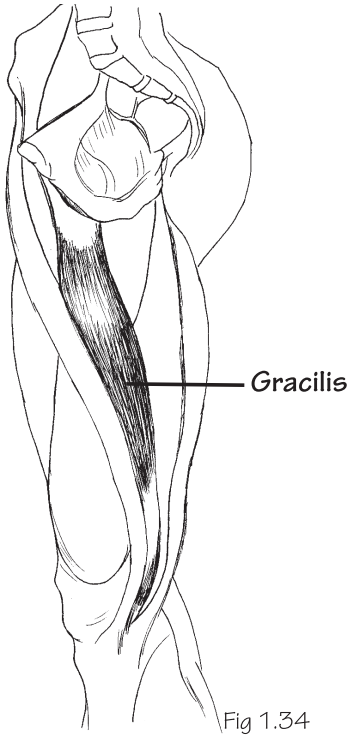


Fig 1.34

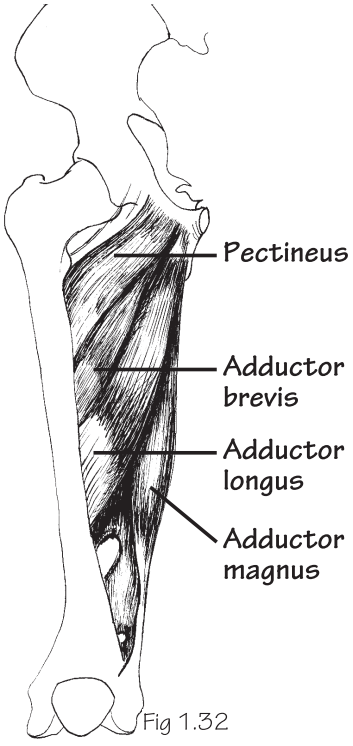


Fig 1.32

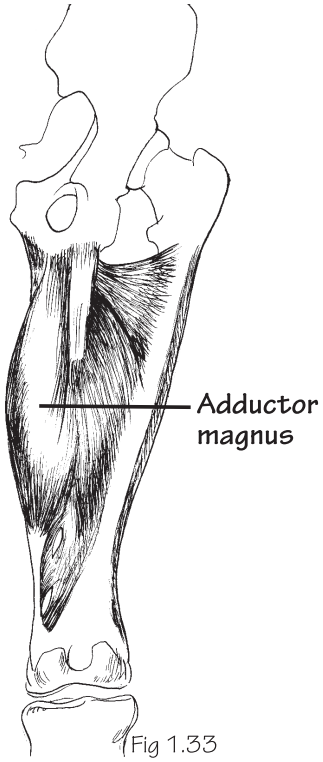


Fig 1.33

The muscles of the lower leg

1. Flexors:

- **Gastrocnemius** is the muscle that gives the calf its rounded shape. It flexes the knee and plantarflexes the ankle. [Fig 1.37]
- **Soleus** lies underneath Gastrocnemius. Both muscles insert into the Calcaneus (the heel bone). Its action is plantarflexion of the ankle. [Fig 1.36 & 1.37]
- **Tibialis Posterior** works together with Tibialis Anterior to invert the ankle. It also assists in plantarflexion. [Fig 1.35]
- **Flexor Hallucis Longus** and **Flexor Digitorum Longus** are the long flexors of the toes. [Fig 1.35]
- **Popliteus** rotates the tibia medially or the femur laterally. [Fig 1.35]
- **Peroneals** are a group of lateral muscles which evert the ankle. They are **Peroneus Brevis**, **Peroneus Longus** and **Peroneus Tertius**. [Fig 1.35, except Peroneus Tertius]

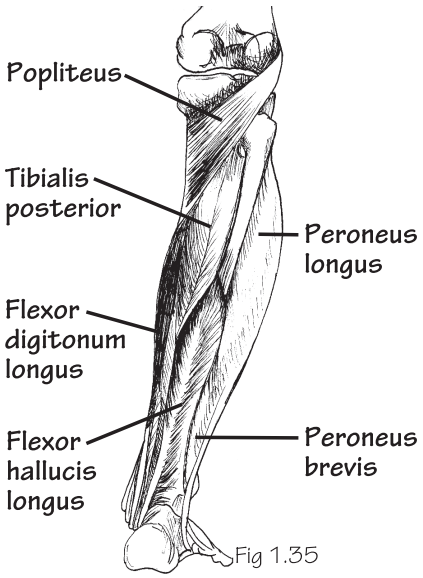


Fig 1.35

2. Extensors

There are three extensors of the foot.

- **Extensor Digitorum Longus** extends the toes. [Fig 1.38 & 1.39]
- **Extensor Hallucis Longus** extends the big toe. [Fig 1.38 & 1.39]
- **Tibialis Anterior** dorsiflexes the foot and also works together with Tibialis Posterior to invert (sickle) the foot. [Fig 1.39]

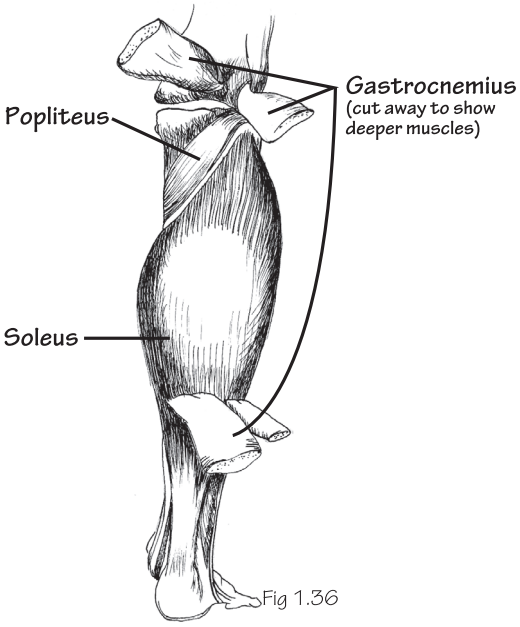


Fig 1.36

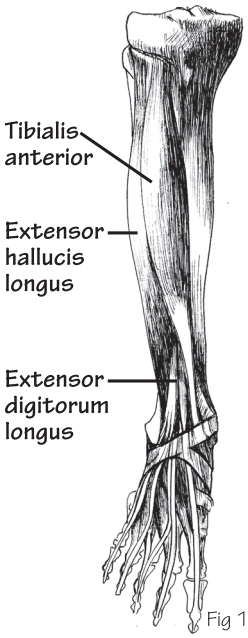


Fig 1.39

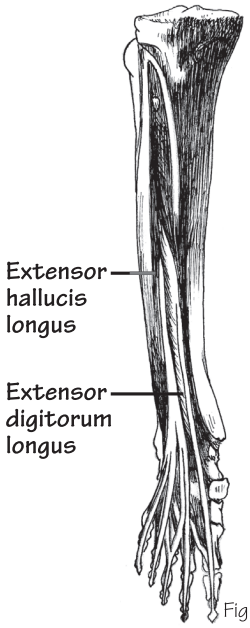


Fig 1.38

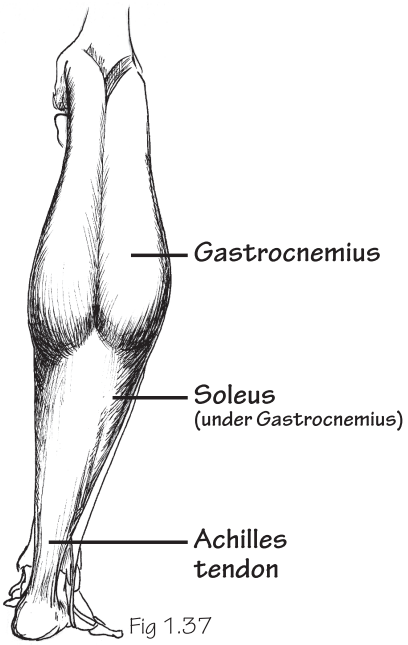


Fig 1.37

Muscles of the foot

Extensor Digitorum Brevis extends the toes.
Lumbricals (4 of them) flex the toes.
Quadratus Plantae helps with toe flexion.
Flexor Digitorum Brevis flexes the second to fifth toes.
Opponens Digiti Minimi pulls the fifth metatarsal bone towards the sole of the foot.
Flexor Digiti Minimi Brevis flexes the little toe.
Abductor Digiti Minimi abducts the little toe.
Adductor Hallucis adducts the big toe.

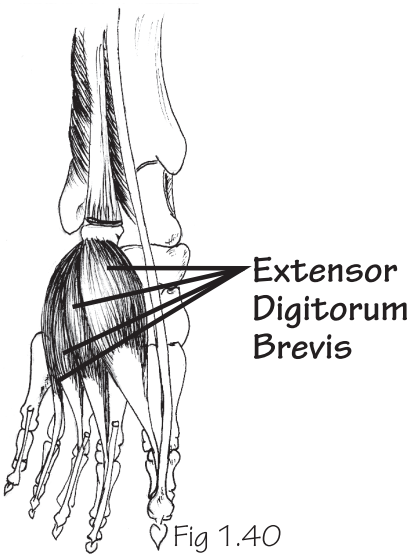


Fig 1.40

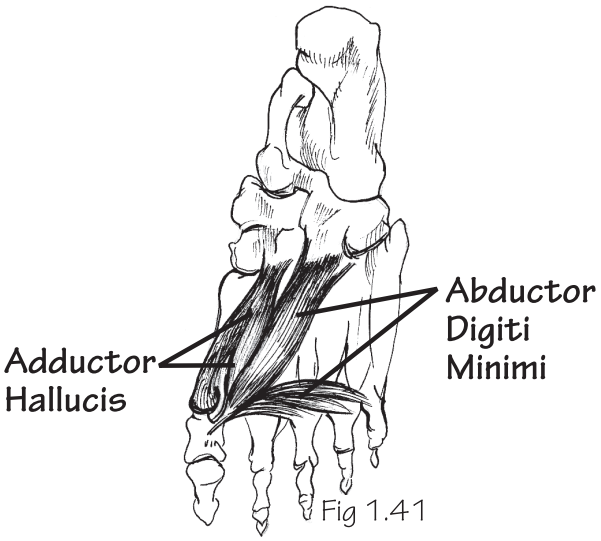


Fig 1.41

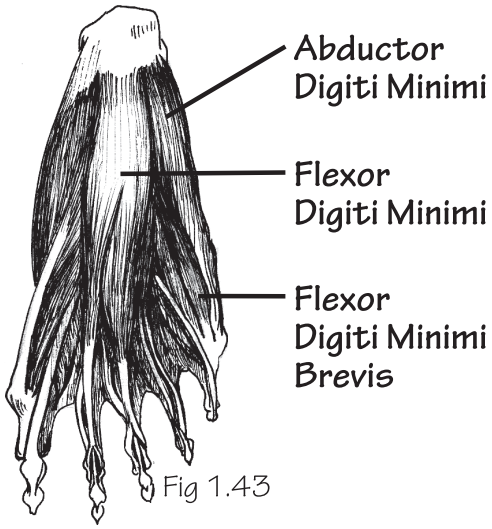


Fig 1.43

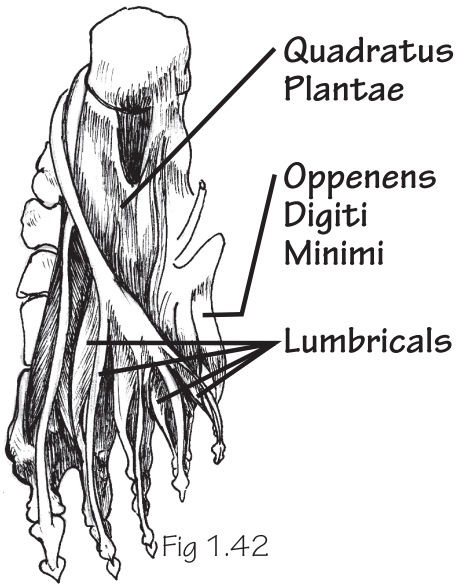


Fig 1.42

Section 2

SAFE USE OF THE BODY

Understanding how to use your body safely will reduce the risk of injury and improve your technical skills. Knowing the names of the muscles is just the beginning of this understanding. To apply this knowledge there are other factors that you need to explore that will influence your dance training. In this chapter you will explore the following questions:

2.1 What is Muscle Tone?
2.2 What are Tension and Stress?
2.3 What is Relaxation?
2.4 What are Posture and Alignment?
2.5 Why do you need to warm-up and cool down?

2.1 What is Muscle Tone?

Muscle tone is described as the constant tension in a muscle that allows for readiness of the muscle to work. Important points to know about muscle tone are:

- It is controlled by the **Central Nervous System (CNS)**. This muscle tone helps protect joints and bones and therefore if tone diminishes so does the stability of joints.
- As you get older your muscle tone starts to deteriorate and the shape of your limbs and muscle groups change. The decrease in tone also means a slowing in movement, as it takes longer for the muscle to ready itself for action. You can slow this process down by maintaining a balanced exercise program as you age.
- You need to maintain a balance of tone between muscle groups on either side of a joint that work together to control movement. This balance also plays a large role in maintaining a healthy posture.
- A long period of rest or inactivity can lead to muscle wasting (atrophy) and in turn to a loss of muscle tone.
- Two types of tone may be seen in all people, not just dancers:

  High tone: Muscles feel hard and there may be a decrease in range of movement in these dancers.

  Low tone: The muscles are soft to the touch. These muscles have to work harder than normal for stability and to hold the joints in place. It may take longer for dancers with low muscle tone to get back into shape after a period of rest.

2.2 What are Tension and Stress?

The terms '**tension**' and '**stress**' can be used to refer to your physical, mental and emotional state.

Physical **tension** can be described as *a state of excessive muscle tone*. Often, emotional and mental strain or '**stress**' can have an effect on the body by creating physical tension. Tension is controlled by the central nervous system and a state of tension can be seen where the inhibitory centers in the brain are under-active, therefore leaving muscles predominately excitable.

Many problems can occur due to tension as there is not enough blood supply to certain areas of the body, which can result in headaches, stiffness and postural pains. This can be greatly reduced through relaxation techniques or exercise.

Many relaxation techniques involve a focus on **breathing**. When you hold your breath your body becomes tense. By focusing on breathing you enable your body to relax and you increase the supply of oxygen to the muscles. This is especially important during flexibility exercises where muscles need to be relaxed to lengthen.

Breath is not only important for relaxation. It is a vital part of dance. Exhaling during the execution of a movement gives the movement power and forces your abdominals to contract (they are involved with the process of breathing as they press the diaphragm upwards to expel air). The contraction of the abdominals provides a strong center from which the movement can occur.

Recognizing mental or physical tension is the first step to reducing it.

2.3 What is Relaxation?

Being in a constant state of tension can lead to restricted blood supply and inadequate breathing which can be physically and emotionally debilitating. To avoid this it is vital to practice some method of relaxation.

Relaxation is the releasing of tension. The aim of relaxation therapy is not to induce sleep but rather a state of rest where the body is working in its minimum capacity i.e. respiration and circulation will be reduced. This is a skill that for some needs self-discipline, time and practice. There are many ways to practice relaxation and a skilled teacher can help you to learn how to achieve a relaxed state.

In order to achieve relaxation you need to be in a state of physical comfort. This means you need make sure of the following:

- you are in a comfortable, supported position so the muscles can relax (seated or lying down),
- the room and your body temperature are warm,
- environmental sounds are relaxing and not distracting (e.g. gentle, quiet music).

Practicing relaxation with or after stretching often achieves the best results.

You can learn relaxation techniques at Yoga, Tai Chi or Meditation classes or through books. Taking the time to develop relaxation techniques will only enhance your health and wellness as a dancer.

2.4 What are Posture and Alignment?

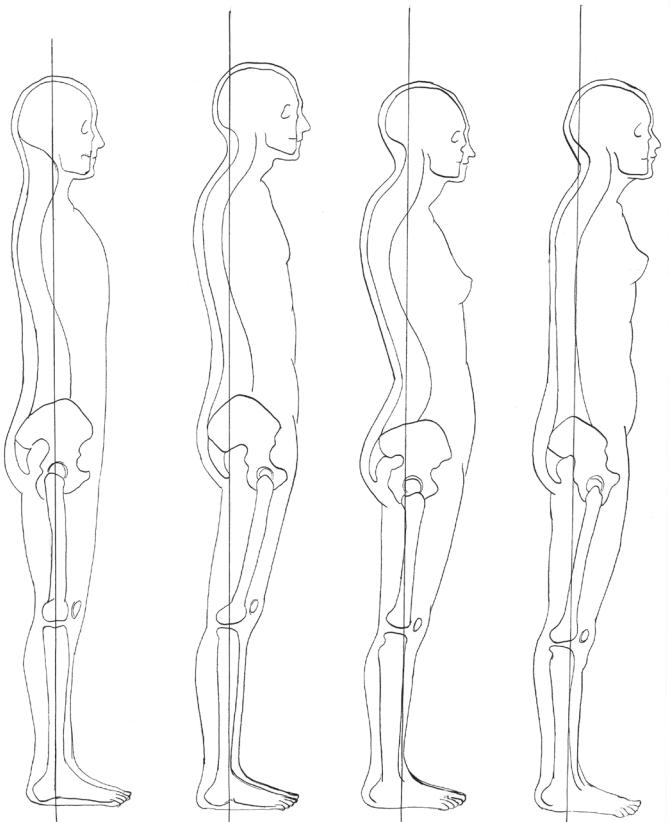
Good posture

Good posture gives maximum function with the least expenditure of energy. A lack of good posture means that postural problems put a strain on your entire body and affect your health and the way you move. If you have a deviation from a "normal" posture in one part of the body, other areas will over-compensate and put everything out of balance. Imbalances create stress on the tissues and can lead to injury.

A "normal" posture has 3 natural curves in the spine. The cervical region has a slight concave curve, the thoracic region a long convex curve, the lumbar region a concave curve and at the bottom a gentle concave curve along the sacrum, ending at the coccyx. These curves act as shock absorbers and enable movement.

Alignment

Alignment refers to the way joints line up with one another in movement. To maintain healthy joints you need to ensure you do not place stress on the ligaments by moving the joint beyond its normal range and movement direction. For example, the knee joint is a hinge joint built to bend and flex in one plane with very slight rotation and no space for lateral movement. If excessive load is placed on the knee (like landing from a jump) and there is lateral or rotating movement at that moment the ligaments on either side of the joint can tear. To prevent this you need to make sure your knees line up with your middle toe when you bend them.



Ideal alignment Fig 2.1 | Sway back Fig 2.4 | Kyphosis-Lordosis Fig 2.2 | Flat-back Fig 2.3

Alignment in the joints of one part of the body will have a chain effect on the other joints and ultimately on your posture. It is vital to work towards achieving correct posture and alignment to prevent injury.

Postural and alignment problems can be genetic (inherited) or congenital (from birth) but often they are a result of misuse, neglect and negative habits.

The following are the most common postural deviations:

Kyphosis-Lordosis: This is an exaggeration of the thoracic and lumbar curves. It is accompanied by an anterior tilt in the pelvis and a forward thrusting chin. The abdominal muscles are usually weak. [fig 2.2]

Cervical Lordosis: This is an accentuated curve in the neck. The head is held too far forwards with the chin pointing lightly upwards instead of being parallel to the floor. [Notice examples of this in diagrams 2.2 of Kyphosis-Lordosis posture and 2.3 of Flat-Back posture.]

Flat-back posture: The head is often forward, the pelvis is in a posterior tilt, which flexes the lumbar spine and flattens its curve. This is commonly seen in ballet dancers. To compensate for the shift in weight the knee joint is often extended backwards. [fig 2.3]

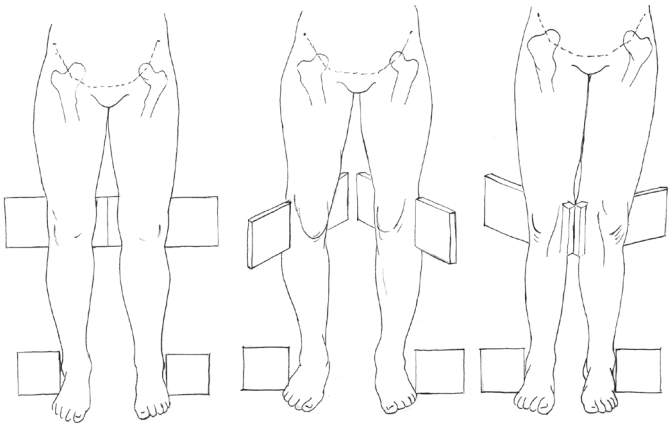
Swayback posture: The pelvis tilts or rotates backwards (posterior), flattening the lumbar spine. To accommodate for the forward shift in the pelvis, the upper body is shifted backwards. The knee joints are often hyper-extended.

Scoliosis: This is the lateral curvature of a segment of the spinal column resulting in asymmetry of the thorax, pelvis and the limbs. An orthopedic surgeon should assess early scoliosis as early detection may allow for treatment and correction.

Problems with alignment in other parts of the body are often due to postural problems, or can have an effect on the posture. Certain structural alignment problems are genetic and cannot be altered, but you can learn how to work with them (depending on the severity) by creating body awareness, strengthening certain muscles and lengthening others.

Listed here are common structural leg alignment problems and ways to deal with them:

- ***Bowlegs:*** (genu varum) knees face inwards, thighs rotate inwards.
  If you have bow legs you need to strengthen the gluteal muscles (gluteus medius and maximus) and focus on working in external rotation in the hip joint (turned-out).
- ***Knock-knees:*** (genu valgum) knees face outwards, thighs rotate outwards.
  If you have knock knees you need to focus on strengthening the adductors and internal hip rotators, working with the legs in parallel.



Ideal knee alignment
Fig 2.5

Bowlegs
Fig 2.6

Knock-knees
Fig 2.7

Maintaining a healthy posture requires a combination of the factors mentioned above, namely a balance of **tone** between the muscle groups (coupled with flexibility in the joints), the ability to recognize physical and mental **tension** and the regular practice of **relaxation**.

As a dancer you are often required to perform movements that require your body to work beyond it's so called 'normal range' and you may put your back at risk. It is essential for you to be aware of how to care for your back and to know how to maintain a "neutral" posture. This will be looked at in more detail under '**core stability**' in the section on **The Principles of Body Conditioning**.

2.5 Why do you need to Warm-up and Cool Down?

Warming-up the body before any form of dance or exercise is essential to prevent injury and ensure optimal training and movement quality.

2.5.1 Why warm-up?

- Reduce risk of injury
- Increase heart rate
- Increase body temperature
- Increase oxygen intake
- Increase flexibility of joints and elasticity of muscles
- Improve posture and alignment
- Focus the mind

2.5.2 What happens when you warm-up?

- Your heart rate increases so that oxygen rich blood can be pumped to the muscles. The oxygen helps break down fuel for muscle action. The increased blood flow also helps to get rid of waste products (e.g. lactic acid which causes cramps).
- Your body temperature rises, increasing the elasticity of the muscles and making them more pliable.
- Synovial fluid is released from the synovial membrane into the joints to lubricate them and prevent friction.
- You begin to focus your mind on the class/activity you are about to take part in and clear your mind of other matters not related to dance.
- You start to focus on the way you hold your body and improve your posture and alignment.
- You learn through repetition. Repetitive movements are needed to warm-up the body, but they also improve your ability to remember movement patterns.

2.5.3 How should you warm-up?

Whether your teacher creates his/her own warm-up or you have to find a way to warm yourself up there are certain elements that should be included in any warm-up:

- **Ritual**: Repeat the same warm-up over a period of time to improve your memory of the movements and to continuously improve the way you perform these movements
- **Focus and Posture**: Warm up the spine and focus on posture and alignment
- **Small to big**: Start with smaller movements and progress to bigger movements as the body warms-up
- **Mobilize**: Focus on large movements that mobilize the joints and get the blood moving
- **Specific**: Warm-up the large muscle groups but also include parts of the body that will be utilized in the class/performance (e.g. Spanish Dancers would focus on their wrists as well as their feet)
- **Stretch**: Once the body's temperature has increased, perform light stretching to improve the elasticity of the muscles
- **Safety**: Avoid jumps and high impact movements

2.5.4 Why do you need to cool down?

- It helps your heart rate and breathing gradually return towards normal
- It helps avoid the fainting or dizziness, that can occur when blood pools in the large muscles of the legs after vigorous activity is suddenly stopped
- It helps prepare your muscles for the next exercise session, whether it's the next day or in a few days' time
- It helps to remove waste products from your muscles which can build up during vigorous activity (e.g. lactic acid)

2.5.5 How should you cool down?

- Continue moving but gradually reduce the speed and size of the movements performed e.g. you may choose to perform an adage (a slow movement sequence) or gentle floor exercise.
- Follow this with a stretching routine.

Section 3

THE PRINCIPLES OF BODY CONDITIONING

As a dancer your body needs to be fit and strong to cope with the demands placed on it and to be able to perform movements that are beyond the requirements of normal daily use.

3.1 Fitness includes the following components:
3.2 Endurance
3.3 Strength
3.4 Flexibility
3.5 Core stability
3.6 Neuromuscular skills

These components are part of the overall fitness required for most sports and physical activities. Dance is an art form and unlike sport requires so much more than these basic elements. At the end of this chapter you will also explore some important terminology when answering the question: What other elements influence the way you dance?

3.1 Endurance (also known as Stamina)

Endurance is the ability to perform work over an extended period of time. It is a function of both the **cardiorespiratory** and **muscular** systems.

CRE (Cardiorespiratory Endurance) is:

- the ability to effectively deliver oxygen to muscle tissue over long periods
- needed for muscular endurance and strength and should be considered the baseline of training
- achieved when a well conditioned heart muscle pumps a greater volume of blood into the general circulation, which improves transportation of oxygen to the muscles and organs, therefore improves the breakdown of fuel for use by the body

ME (Muscular Endurance) is:

- the ability to sustain many muscle contractions over a given period of time
- closely related to CRE because an active muscle needs sufficient oxygen and nutrients to work optimally

3.2 Strength

This is the capacity to exert a muscle contraction or force against resistance.

When a muscle is exercised regularly certain **functional** and **structural** changes take place in order to cope with the work it needs to carry out.

- Functional change refers to when a muscle becomes more efficient in order to work for longer periods of time (ME) or at higher intensities.
- Structural changes would refer to a muscle increasing in size (muscle hypertrophy) due to increased load placed on the muscle over a period of time.

Strength can be divided into dynamic and static:

- ***Dynamic Strength:*** "the ability to overcome resistance through a complete range of motion", in other words strength through movement.
  There are three types of dynamic muscle action:
  Isotonic or concentric – a muscle shortens under tension while it contracts, creating movement around a joint e.g. the biceps shorten when you flex the elbow trying to lift your shopping bag up towards your shoulder.
  Eccentric – a muscle lengthens under tension, acting in opposition to the muscle performing a concentric contraction e.g. during the action explained above the triceps will be lengthening controlling the movement.
  Isokinetic – a muscle shortens and increases in tension while working at a constant speed against a variable resistance e.g. this type of contraction requires specific **Isokinetic** weight training equipment, but it can be seen in the arm stroke in swimming where the water provides resistance to maintain constant speed.
- ***Static Strength:*** the ability to apply resistance against an immovable force. This is also called **Isometric** strength. In this contraction the muscle does not change length. Isometric strength is important for holding positions against gravity e.g. in an arabesque position, your back and abdominal muscles will be working isometrically to stabilise your posture.

It is essential for you to develop your strength for dance, but a balance between muscle groups must be maintained for your body to be highly effective and strong.

You do not need to train with weights to increase your strength. Body weight training (i.e. using your own body weight as an external load), body conditioning with light weights or Pilates equipment work can sufficiently improve your strength without creating bulky muscles.

It is a fallacy that weight training builds bulk. It is very difficult for women to build very large muscles through weight training as they lack sufficient testosterone (the male hormone).

3.3 Flexibility

It is very important for you as a dancer to understand what flexibility is, how it works and how to safely improve it. Improved flexibility is important as it affects your movement quality. By exploring the following questions you should gain a better of understanding of flexibility:

3.3.1 What is flexibility?

Flexibility is broadly defined as range of movement (ROM) about a joint. It can be more accurately defined as freedom of movement (mobility) and an absence of restriction to movement (stiffness).

Flexibility is joint specific and is influenced by structural and functional factors.

Structural (passive) factors:

- includes joint architecture, ligaments and joint capsules.
- are not always alterable (some are inherited e.g. your pelvis may be shaped in such a way that you are tight in the hip joints) e.g. there is greater range of motion in your hip which is a ball and socket joint (flexion, extension, abduction, adduction, rotation) than in your knee which is a hinge joint (flexion and extension, minimal amount of sliding and rotation)

Functional (active) factors:

- are the **voluntary** and **involuntary** mechanisms which activate muscles, causing muscular contraction or relaxation e.g. muscle spindle, golgi-tendon organ.
- Can be manipulated to improve flexibility.
  e.g. using correct stretching techniques you can safely increase the length of muscles and therefore create more range in the joints that those muscle cross.

3.3.2 How does flexibility work?

When you stretch a muscle beyond its normal length, there is an involuntary neurological reaction that takes place to prevent it from tearing – the **STRETCH REFLEX!** Inside the muscle, lying along the muscle fibers are muscle spindles that look a little like a spring. When these are stretched along with the muscle fibers they send a message to the **CNS** (Central Nervous System) warning that the muscle is being lengthened beyond its range. The CNS sends a message back to the muscle to CONTRACT! This all happens without your conscious thought and creates that tight feeling you experience when you first move into a stretch.

When you hold a stretch for a long enough period (more than 8 - 16 seconds) there is a new reaction – the **REFLEX-RELAX!**

Muscles attach to bones via tendons, so when you stretch the muscle you also stretch the tendon. Where the muscle and tendon join (the musculo-tendinous junction) there is a sensor called a **golgi-tendon organ**. This sensor sends another message to the CNS that the stretch is not tearing the muscle or tendon (if it is held long enough). The CNS then overrides the previous contractile message to the muscle which then relaxes and allows the muscle to lengthen.

3.3.3 How do you stretch safely?

Stretching of muscles, ligaments and tendons must be done slowly and carefully and should only be done when muscles are warm as there should be no pain or stress felt. Light stretching can be done as part of the warm-up as it helps prepare the body for activity. The best time to stretch to improve your ROM (range of movement) is at the end of a class when your body is very warm.

There are many different stretching techniques, but certain safety measures apply to all of them:

- Always stretch when warm
- Ballistic stretching is dangerous, can cause injury and is best avoided
- Focus on feeling the 'tension' of a stretch rather than 'pain'
- Never force someone else into a stretch
- Stretch slowly and in a controlled manner

Flexibility can be static (passive) or dynamic (active/functional). As a dancer you need to develop both forms of flexibility. You can make use of both types of flexibility by using one or more of the following stretching techniques:

- ***Passive:*** Passive stretching is also referred to as relaxed stretching, and as static-passive stretching. A passive stretch is one where you assume a position and hold it with some other part of your body, or with the assistance of a partner or some other apparatus e.g. a hamstring stretch where you lie on your back and use your hands to pull your leg towards your chest.
- ***Active:*** This is also referred to as static-active stretching. An active stretch is one where you assume a position and then hold it there with no assistance other than

using the strength of your agonist muscles e.g. bringing your leg up high and then holding it there without anything (other than your leg muscles themselves) to keep the leg in that extended position. Many of the movements (or stretches) found in various forms of yoga are active stretches.

- ***Ballistic:*** This involves bouncing and puts excessive force on muscles and tendons which can cause muscle tears. It is sometimes used in sports specific training but is dangerous.
- ***S.A.S.S*** (slow and static stretching) is the safest way to stretch. This makes use of passive stretching. Find the stretch position where you feel the tension in the muscle but NOT pain. Hold that position until the tension starts to ease (between 16 – 30 seconds). Once it has eased push further into the stretch to find the tension again. Repeat this process 3 or 4 times.
- ***Isometric:*** This is a type of static stretching which involves the resistance of muscle groups through isometric contractions (tensing) of the stretched muscles. Assume the position of a passive stretch for the desired muscle. Next, tense the stretched muscle for 7 – 15 seconds (resisting against some force that will not move, like the floor or a partner). Finally, relax the muscle for at least 20 seconds.
- ***PNF*** (Proprioceptive neuromuscular facilitation) stretching is a specific technique that makes use of the sensors (muscle spindle and golgi-tendon organ) and must be done under guidance. This is a technique combining passive and isometric stretching. There are different PNF techniques, the most common of which is the hold-relax. After an initial passive stretch the muscle being stretched is isometrically contracted for 7–15 seconds, relaxed for 2 – 3 seconds and then passively stretched again for 10-15 seconds. This technique is repeated a few times.
  [PNF stretching is a more advanced technique and should only be done under the supervision of an experienced teacher or coach. *For more information on other ways to perform PNF stretches look on the following website:*
  http://www.cmcrossroads.com/bradapp/docs/rec/stretching/stretching_4.html

3.4 Core Stability

Core stability is an important part of overall fitness, especially in dance where a strong center or core is needed to maintain balance while moving through space.

Your body is designed for both **mobility** and **stability** which means that while some body parts move others need to hold or stabilize. The function of the different parts of the body relates closely to its structure – the axial skeleton and the muscles supporting it play a stabilizing role whereas the appendages (appendicular skeleton - arms and legs) and the muscles involved in their movement are the movers. In dance the whole body moves, not just the arms and legs. Maintaining strength in the torso throughout all movement will make you more stable, give more power to your movements and prevent stress to your spine.

Core strength can be achieved by:

- consistently practicing good posture and being aware of maintaining correct alignment during all movement
- engaging the abdominal muscles during movement, especially when the movement requires you to work out of neutral alignment
- performing regular conditioning exercises for the abdominal and back muscles
- maintaining a balance of strength between the abdominal and back muscles
- conditioning the stabilizing muscles in moving and holding positions

The midsection of your torso is composed of a group of muscles that aid in the movement and stabilization of your trunk and can be divided into the inner and outer units.

- The inner unit consists of the **transverse abdominis** (TA), **internal obliques** and the **multifidus** as well as a few other smaller muscles. The role of the inner unit is to provide stabilization and support for the joints throughout the trunk.
- The outer unit comprises the muscles typically trained when doing abdominal exercises i.e the **external obliques**, **rectus abdominis**, **erector spinae** group and the **quadratus lumborum**.

The abdominal muscles also attach the pelvis to the spine. This means that the position of the pelvis plays an important role in posture and strength.

If you feel you need assistance, there are training systems such as **Pilates**, **Feldenkrais** and **Alexander Technique** that can help you to achieve a healthy posture, strong core and a functional, injury free body.

3.5 Neuromuscular Skills

NMS are a result of co-operative interaction between the nervous and musculo-skeletal systems. These skills are not automatic, they must be developed. Another term for these skills is **motor co-ordination**. NMS will affect the overall quality and efficiency of your movement.

NMS can be divided into 6 essential skills:

a) **Balance** is your ability to maintain equilibrium over a base support.
b) **Agility** refers to how able you are to move quickly and efficiently within and between movement patterns.
c) **Kinesthetic awareness** is how sensitive you are to the movement of your body through space. It also relates to your ability to recognize and develop efficient movement patterns.
d) **Spatial Orientation** describes the awareness you have of the space your body occupies during activity.
e) **Maintenance of Rhythm** is your ability to match a movement or movement pattern to a pre-determined sequential pattern of rhythm.
f) **Reactivity** is how your body responds to changing circumstances.

(NMS Adapted from Reebok Instructors Alliance, Basic Science Short Course Manual. 2004. Pg34)

What other elements influence the way you dance?

Dance is so much more than just moving bones, muscles and joints; it is a dynamic, ever-changing, challenging art form. The following elements all have an effect on the way you move your body:

Element	Definition	Explanation
STAMINA	The staying power of body in given activity	It refers to your ability to dance for long periods of time without tiring and involves both muscular and cardiovascular endurance. Dancers with a high degree of stamina can maintain efficiency and accuracy in movement for an entire class, and during extended rehearsals and performances.

Element	Definition	Explanation
FLUENCY	An ability to communicate well in a particular dance language.	A fluent dancer is able to be articulate, assured and show command of the genre, dancing with control and ease.
FLUIDITY	The ability to flow easily.	It relates to the smooth flow of movements within a sequence, creating the effect of constant, effortless movement.
ENERGY	The capacity for work or vigorous activity.	A source of power. As a human you take in energy by eating, drinking and breathing and use this energy to perform daily tasks. Expressing your emotions and feelings requires a type of energy too. Throughout the ages humans have used movement for self expression, communication and as a way of releasing this energy. By making use of this energy in your performance of movements becomes larger, more radiant and you seemingly become more aware, present, and alive.
TURNOUT	External rotation of the femur in the hip socket.	This is the ability to turn the legs out at the hip joint and is important in most dance forms, especially Ballet and Contemporary dance. It allows you to lift your leg higher when in second position due to the shape of the hip joint. It also assists with control of the legs and offers a wider base for balance. It is essential that turn-out happens at the hip joint rather than the knee or ankle to prevent injury. The amount of rotation in the hip joint differs from one individual to another due to skeletal differences and it is important for you to work on improving your turn-out in a safe manner and to not compare yourself with others.
BALANCE	Equal weight around a central point.	Balancing is a learned skill that requires concentration. The more you practice the easier it becomes. Balance requires a steady base (e.g. the foot on the floor), the feeling of constant energy out the limbs and control of the abdominals (your centre). E.g. if you are balancing on one foot in an arabesque position, you would stabilize the foot on the floor by spreading it as wide as possible and then reach out through the arabesque leg and the arms in opposite directions to maintain balance, keeping the abdominals tightened.
WEIGHT	Body mass.	By making use of the weight of your body you can make some movement easier, particularly floor-work. The floor supports your body so you don't need as much muscle tension to support the limbs. By 'giving' your weight to the floor you reduce muscle tension and can increase mobility and the speed at which the limbs can move.
GRAVITY	The force that holds you down on the earth.	Just by standing upright you are constantly attempting to defy gravity. Dance works even harder to defy gravity with its leaps and elevated movements. Gravity is also a useful tool. By making use of gravity when falling and rolling on the floor it provides a contrast to the weightless movements. By using gravity and body weight movements happen along natural energy lines and require less muscular tension.

Section 4

DANCE INJURIES

As a dancer, you use your body as an instrument of expression just as an artist uses his/her paintbrush. By understanding the way your 'instrument' works, and knowing how to look after it, you will be better equipped to maintain it and prevent injury.

There are times when injuries will occur, whether from overuse or other factors. Knowing how to treat injuries is important to prevent any further damage from happening.

In this chapter the following will be covered to enable you to take care of your valuable instrument:

4.1 Classification of injuries
4.2 Common causes of injury
4.3 General complications of injury
4.4 Treatment of dance injuries
4.5 Dance-specific injuries
4.6 Medical treatment for injuries

4.1 Classification of injuries

Injuries can be classified into two broad categories:

4.1.1 **Acute** – these are sudden in onset e.g. a twisted or sprained ankle.

4.1.2 **Chronic** – these are gradual in onset and may recur over a period of time e.g. Achilles tendonitis.

4.2 Common causes of injury

The following causes can be factors in both acute and chronic injuries e.g. a concrete floor can over time cause ongoing tendonitis problems (chronic) and can cause a sprain or strain in the ligaments of the feet when landing incorrectly from a jump (acute).

4.2.1 Overuse injuries / overtraining

Too much, too fast, too soon, too often, too hard.

As a dancer your body works at very intense levels and is prone to overuse injuries due to the repetitive nature of movement patterns. It is important to ensure sufficient rest to prevent strain from overuse. Performing alternative types of exercise when not dancing (e.g. on non-dance days, weekends, holidays or when injured) can assist maintenance of fitness without straining the body. Complimentary forms of exercise include swimming and water aerobics (both non-weight bearing and kind to the joints), and Pilates.

4.2.2 Poor technique

Dance technique can be compromised in a number of different situations, including:

- Lack of education
- Poor teaching methodology
- Lack of adequate supervision
- Resistance to change and new developments

As a dancer you are unique. Your body's reaction to the physical and technical demands placed on it may differ to other dancers' bodies. You should keep this in mind and learn how to train your body to work to its optimum potential without forcing it to do things

that could risk an injury. Understanding the way the body works (i.e. anatomy) and knowing which factors (outlined in the next section on Biomechanics) can be changed and which cannot, will assist you in learning how to make the most out of your unique physique.

During recovery from an injury, or if your body is experiencing fatigue, you are more at risk of forgetting correct technique; overcompensating; developing negative habits and incurring further injury.

4.2.3 Biomechanics

Your body has structural and functional limitations. Structure and function work together and affect one another. If there is a structural problem it will affect the way your body functions. Think of a motor car – it has a structure: metal frame, four wheels and an engine full of parts that work together to make the car move. Your "STRUCTURE" is the way your body is built e.g. your skeleton, joints, ligaments. The motor car's function will depend on how well its structure is maintained – if you do not regularly put oil in the engine it will stop working, if you do not replace worn shock absorbers it will feel all the bumps in the road and rattle the rest of the car and may even swerve and crash. The same applies to your body. Your body's "FUNCTION" is how things work e.g. ability of the heart to pump oxygen rich blood to the muscles so that they can work.

Abnormal structural and functional biomechanics can cause injury e.g. different leg lengths, knock knees, scoliosis. Even within a "normal" structure, however, there are certain musculoskeletal limitations such as:

- **Joint architecture:**
  - Certain joints are built for mobility (movement), some for stability e.g. the shoulder has a large range of motion, whereas the knee has a limited range.
- **Tissue type:**
  - Muscles are very elastic and can endure changes in length without permanent damage.
  - Tendons are less elastic and more easily injured.
  - Ligaments have the least elasticity and once overstretched cannot regain their original length which leads to joint instability.
- **Genetic make-up:**
  - Certain body structures are inherited and cannot be altered e.g. some people have bandy legs or swayback knees.
  - Some people have congenital problems – this means they happen from birth as opposed to being developed over time due to misuse (e.g. Scoliosis can be either congenital or can develop in adolescence).
  - You need to understand your body so that you can work to your unique best.
- **Muscle imbalances:**
  - If a joint has overly strong muscles on one side and weak muscles on the other side caused by incorrect or insufficient training, postural problems can result. This can be rectified through conditioning and flexibility training.

Both you and your teacher have a responsibility to prevent injuries. When mastering new techniques your teacher needs to guide you to work within your range and to develop gradually. You need to accept and celebrate your intrinsic differences from other dancers and aim towards improving yourself rather than competing with others.

4.2.4 Environmental Causes

The following environmental factors need to be controlled to ensure safety:

- **Floor:**
  - A sprung-wood floor is essential as it acts as a shock absorber (like the shock absorbers in the car!). Without it you may experience injuries and problems with your feet, tibia ("shin-splints") and spine.
  - A wet floor creates a slipping hazard.
  - Too much resin can create sticky spots which make turning difficult and result in twisted knees or ankles.
  - Cracks and holes in floorboards need to be dealt with immediately as they can tear open the skin of your feet.
- **Studio Temperature:**
  - Muscles need to be warm to work well and to prevent injury. An excessively hot studio, however, can lead to excessive sweating and a loss of body fluids and electrolytes. Replacement of these fluids is essential to prevent dehydration.
- **Shoes:**
  - In dance forms where shoes are worn, the correct fitting of a shoe is vital to prevent injury.
- **Clothing:**
  - Very loose clothing can hamper movement and increase the risk of injuries e.g. pants that are too long can hook under the foot.
  - Too tight clothing can hamper mobility.
  - Dancing in socks increases the chance of slipping and should be avoided.

Although you may have little or no control over environmental factors, through awareness of safety you should be able to notice potential environmental risks and take the necessary precautions. Early recognition of these dangers and subsequent altering of techniques or style could help prevent injury.

4.3 General Complications of Injury

- ***Decreased cardio-respiratory fitness:*** When your body has to rest due to injury, your heart and lungs adapt to the decreased demands. When you return to training, you may feel out of breathe and weak as your body copes with the increased demands on the cardio-respiratory system. It is important for you to re-enter training slowly to give your body time to adapt.
- ***Generalised muscle wasting:*** Muscles may atrophy (lose size and strength), tighten and weaken when not in use. This may result in a decreased range of movement which although not necessarily permanent can lead to frustration and sometimes strain. This can in turn lead to further injury.
- ***Psychological Effects:*** Frustration, sadness, and depression can result when you are unable to dance due to injury. These can lead to (amongst other negative habits) insomnia (sleeplessness) or the desire to sleep excessively. It is essential that you be mentally prepared for the fact that you may not be able to dance for a while when injured. This preparation plus further support and guidance can help you prevent negative feelings.
- ***Persistent swelling:*** Swelling usually occurs at the time of injury due to the increase in fluids to the injured area. This helps with the healing process. Swelling may occur for some time after the injury has taken place and it is advised that you sleep with the injured area elevated in order to drain excess fluids from the site of injury. If swelling continues for some time, even with elevation, it may be due to fibrous tissue

traveling and lodging in this area to help healing. This can lead to permanent scar tissue damage. Where there is excessive swelling it is advisable to contact a doctor for advice or medication.

- ***Stiffness in Joints:*** This is due to inactivity. Joint range needs to be maintained through movement and this is not always possible with injuries. You should ease your way back into dancing when ready to return in order to prevent any strain or further injury.

4.4 Treatment of Dance Injuries

Early diagnosis of the injury is vital so that healing can begin with the appropriate treatment. Although certain injuries can be managed through self treatment, it is advisable to consult a medical professional. Until medical assistance is available immediate on scene treatment may be necessary. Listed here are first aid treatments to be carried out immediately and ongoing treatment to be continued at home.

4.4.1 First Aid

- The following advice is a very simple outline and should not be seen as a comprehensive guide to first aid. It is advisable for any dancer, dance teacher or choreographer to complete a course in first aid. A simple CPR course takes only 2-3 hours to complete.
- A first aid kit should be kept in the dance studio for emergencies.
- The **RICE** method can be used immediately with sprains and strains.
- In the case of a bad fall where you are unsure if there has been damage to the back or neck, the individual must be immobilized and medical help sought immediately. Do not attempt to move the dancer, rather cover him/her to keep the body warm, keep checking for **shock** and wait for the paramedics.
- The following are the symptoms of shock:
  - **The skin is cool and clammy**. It may appear pale or grey.
  - **The pulse is weak and rapid**. Breathing may be slow and shallow, or hyperventilation (rapid or deep breathing) may occur. Blood pressure is below normal.
  - **The eyes look dull and may seem to stare**. Sometimes the pupils are dilated.
  - **The person may be conscious or unconscious**. If conscious, the person may feel faint or be very weak or confused. Shock sometimes causes a person to become overly excited and anxious.
- If you suspect shock, even if the person seems normal after an injury take the following steps:
  1. *Call your local emergency number.*
  2. *Have the person lie down on his or her back with feet higher than the head. If raising the legs will cause pain or further injury, keep him or her flat. Keep the person still.*
  3. *Check for signs of circulation (breathing, coughing or movement). If absent, begin CPR.*
  4. *Keep the person warm and comfortable. Loosen belt(s) and tight clothing and cover the person with a blanket. Even if the person complains of thirst, give nothing by mouth.*
  5. *If the person vomits or bleeds from the mouth, turn the person on his or her side to prevent choking.*
  6. *Seek treatment for injuries such as bleeding or broken bones.*

- With minor cuts and scrapes follow these steps:
  1. **Stop the bleeding**. *Minor cuts and scrapes usually stop bleeding on their own. If they don't, apply gentle pressure with a clean cloth or bandage. Hold the pressure continuously for 20 to 30 minutes.*
  2. **Clean the wound**. *Rinse out the wound with clear water. Soap can irritate the wound, so try to keep it out of the actual wound. If dirt or debris remains in the wound after washing, use tweezers cleaned with alcohol to remove the particles. If debris remains embedded in the wound after cleaning, see your doctor. Thorough wound cleaning reduces the risk of tetanus. To clean the area around the wound, use soap and a washcloth.*
  3. **Apply an antibiotic**. *After you clean the wound, apply a thin layer of an antibiotic cream or ointment.*
  4. **Cover the wound**. *Bandages can help keep the wound clean and keep harmful bacteria out. After the wound has healed enough to make infection unlikely, exposure to the air will speed up healing.*
  5. **Change the dressing**. *Change the dressing at least daily or whenever it becomes wet or dirty.*
  6. **Get stitches for deep wounds**. *A wound that cuts deeply through the skin or is gaping or jagged-edged and has fat or muscle protruding usually requires stitches.*
  7. **Watch for signs of infection**. *See your doctor if the wound isn't healing or you notice any redness, drainage, warmth or swelling.*
  8. **Get a tetanus shot**. *Doctors recommend you get a tetanus shot every 10 years. If your wound is deep or dirty and your last shot was more than five years ago, your doctor may recommend a tetanus shot booster. Get the booster within 48 hours of the injury.*

- The following websites are useful for information on first aid. Make copies of pages that you feel are relevant and put them up on a notice-board in your dance studio.
  www.mayoclinic.com
  www.healthy.net

4.4.2 Ongoing Treatment – R.I.C.E

R.I.C.E stands for: **R**est – **I**ce – **C**ompression – **E**levation

- **(P)RICE** – is an acronym used frequently to replace the standard **RICE** as it includes **Prevention**. If you prevent injuries in the first place you do not have to pay the price of dealing with them! There are many facets to the prevention of injuries, therefore this will be covered in detail at the end of this section.

- **Rest**
  - helps the body with the healing process as energy is focused on healing.
  - allows recovery instead of working excessively while weak and causing further injury.
  - if possible active rest can be practiced by exercising the uninjured parts of the body (e.g. water-exercise which is non-weight bearing).
- **Ice**
  - should be applied to the area as soon as possible to decrease swelling.
  - the cold has an effect on the sensory nerves and can decrease the pain.
  - when the ice is later removed circulation increases and brings necessary nutrients to the site of injury to aid healing.

- apply ice for 10 – 20 minutes (it takes at least 10 minutes for the cold to penetrate the muscle) with regular intervals of relief in between as often as possible in the first 24 – 48 hours post injury.
- never place ice directly onto the skin as it can cause skin burn.

[Note: heat packs or hot baths may be used to treat chronic injuries, but always in conjunction with other methods of treatment. Raising the temperature of the tissues increases the blood flow to facilitate healing, relieve muscle spasm and increase the flexibility of any scar tissue which may have formed.]

- **Compression**
  - is used when there is excessive bleeding to help stop the bleeding at the site of injury.
  - can be used for external and internal bleeding (bruising).
  - must not be done for too long as it can compress the vessels and damage future blood supply to the area.
  - Is used in the form of bandaging or strapping (e.g. a twisted ankle) which counteracts the accumulation of fluid in the injured area.
  - as with ice it is essential to relieve the compression at regular intervals.
- **Elevation**
  - is done to decrease swelling.
  - of the injured area above the level of the heart facilitates drainage of fluid from the area.
- **Prevention** is the primary aim in avoiding dance injuries. This can be achieved by ensuring the following are managed:
  - *Good Technique:* Ensure regular attendance at classes taught by competent and observant teachers. This also involves keeping motivated and positive about yourself and your dancing.
  - *Safe Environment:* The environmental conditions must be adequate to prevent injury (see section B above: Common causes of injury).
  - *Muscle Strength and Joint Range:* Improvement and maintenance of strong and flexible muscles and joints through correct conditioning and flexibility training.
  - *Management of Muscular soreness and stiffness:* Follow a program of gradual stretching before and after exercising in order to reduce muscle tension and to prepare the body for an increase in activity.
  - *Warming Up and Cooling Down:* Warming up allows the muscles to become warm and relax. It also helps elongate musculature and fascia in preparation for activity. A proper warm up helps speed up the heart rate to increase general blood flow and also assists in increasing the speed of nerve transmission in the body. It is dangerous to suddenly stop activity while the heart is still pumping vigorously and it is therefore important to cool down to decrease the heart rate. Cooling down also helps prevent muscle stiffness by elongating muscles and fascia. Warming-up and cooling down are covered in more detail in Section 1: Safe use of the body.
  - *Preservation of Cardio-Respiratory Fitness:* Any form of exercise will have an effect on the cardiovascular and respiratory systems helping maintain them in peak condition. During holidays it is advisable that you continue to exercise in some form or another in order to maintain this fitness. This exercise can be recreational, e.g. Tennis or swimming and not necessarily related to dance. With regards to health, you should avoid habits and behaviors that could impair the cardio-respiratory systems, e.g. smoking.
- *Good Nutrition:* This is essential in the prevention of injuries and also in the healing of

injuries. You should maintain a balanced diet including all food groups in order to get the minerals and nutrients necessary to strengthen both body and mind.

4.5 Medical Treatment for Injuries

- **Physiotherapy:** The purpose is to promote healing, prevent further damage and assist you in avoiding recurrence of injury. The therapist will assess your physique, muscle strength, range of movement and postural control in order to provide exercises for improvement.
- **Medical and Surgical:** It is hoped that orthopedic intervention is for diagnosis alone and not for further operations. However, in both cases a surgeon and physiotherapist should work hand in hand to devise the best treatment program for you in order to return to dance as soon as possible with little to no risk of injury.
- **Alternative therapies:** These may include chiropractic or body stress release sessions to help with re-alignment of the spine. Acupuncture and acupressure may be given to relieve pain.

4.6 Injuries related to dance

Injury	Prevention	Causes	Immediate treatment	Ongoing treatment
Cramps	Warm-up sufficiently. Balanced diet. Hydration.	Cold muscles. Insufficient minerals in diet. Dehydration.	Stretch out cramped muscle slowly. Stop activity until cramps cease. Drink fluids – water and electrolyte replacement drinks or sports drinks.	Warm-up sufficiently and stay warm while stretching. Address diet. Ensure more rest. Increase intake of fluids and electrolytes.
1st Degree muscle strain Slight tear of muscle or tendon will hurt and may swell but still be able to bear weight.	Warm-up. Correct, safe flexibility training.	Sudden movements. Ballistic stretching. Cold muscles. Inadequate flexibility. Incorrect stretching techniques.	(P)RICE Stop activity. Ice injured muscle immediately and again frequently over 24-48 hours.	Allow time for recovery before working the muscle (usually about a week).
2nd Degree muscle strain Partial tear of muscle or tendon will hurt and swell weight bearing is difficult.	Warm-up. Slow stretching.	Same as above.	RICE May require soft cast and immobilization for 3 to 4 weeks. Physiotherapy.	Gradual return to training on permission from doctor. Sight of injury may need to be strapped on return to training.

Injury	Prevention	Causes	Immediate treatment	Ongoing treatment
3rd Degree muscle strain Complete tear of muscle or tendon severe pain and swelling weight bearing virtually impossible.	Same as above.	Same as above.	Stop activity. RICE. Will require plaster casting and complete immobilization. Takes about 8 weeks to heal. May require surgery.	Gradual return to activity with permission of doctor.

The same degree of injury is applied to ligaments however injury to a ligament is called a **sprain** rather than a **strain**.

Broken bones / fractures	Safe dancing conditions.	Accidents due to floors, clothes, choreography.	Seek immediate medical attention. Immobilize area. Elevate area. **FIRST AID**.	Alternative training until safe to dance. Strengthen muscles in that area.
Ingrown toenails	Cut toenails straight, not round. Ensure well fitted shoes.	Incorrect cutting of toenails. Restrictive shoes.	Seek medical assistance. Soak in warm water and apply antibiotic cream. DO NOT dig into skin around nail – will cause infection.	Keep nails short and straight.
Skin Splits	Keep feet moisturized by rubbing with an oil based moisturizer daily.	From turning on heel or ball of foot. Dry or callused skin is nonresilient and prone to splitting.	Hard to eliminate if dancing must continue. Apply plasters and then tape with adhesive plaster to protect and keep clean. Clean feet and dressing regularly.	Tape feet, especially under the ball of the foot, until the split has healed.
Knee problems (e.g. pulled/torn ligaments; torn cartilage)	Ensure correct technique and alignment. Warm-up. Strengthen thigh muscles.	Overuse. Incorrect technique. Structural problems e.g. pronation of feet. Sudden jarring or contact movements. Falling.	Stop activity. RICE. Seek medical attention.	Strengthen thigh muscles. Strap knee. Find alterative ways of exercising while injury heals.

Injury	Prevention	Causes	Immediate treatment	Ongoing treatment
Shin splints	Dance on sprung wood floors. Strengthen lower leg muscles. Wear correct footwear (may need to have special shoes made if dancing in shoes). Increase the intensity of your training gradually. Warm-up and cool down. Stretch lower leg muscles, front and back.	Overuse. Inflammation of tissues (tendons and muscles) OR stress fractures in Tibia. Dancing on hard surfaces e.g. concrete.	R.I.C.E for symptoms.	Seek medical assistance.
Tendonitis Inflamation of a tendon	Warm up. Correct training	Overuse. Incorrect technique	R.I.C.E for symptoms. Gentle stretching	Allow time for recovery Correct technique

Section 5

NUTRITION

Nutrition, dieting, weight and dance live in a sometimes symbiotic and sometimes destructive relationship. There may often be a conflict between your desire to be healthy and your wish to maintain the stereotyped svelte physique seen as typical of the dancer. This is a particularly great dilemma for ballet dancers since the model figure in this dance form is so slim and lean. As health care is increasingly recognized as vital for preventing injury and physical and mental disease, good nutrition for dancers is encouraged.

Destructive Habits

Many dancers adopt dangerous eating habits in the attempt to stay slim. Besides the common methods of following very low calorie diets, smoking, excessive caffeine intake and the use of diet pills are used in an attempt to suppress the appetite.

The consequences of some eating programs are dire; lethargy, anaemia, hair loss and even osteoporosis are common outcomes. In many cases, a dancer's wish to simply "lose a few kilos" can turn into a destructive psychological disorder, such as Anorexia nervosa and Bulimia nervosa (see the chapter on Lifestyle Choices.)

Constructive Habits

Following a balanced diet, endorsed by a medical practitioner and adapted to suite you as an individual, can enhance your performance and even prolong your career. Appropriate nutrition is particularly important for you as a dancer, as your body is the primary instrument of your craft.

The Necessity of Food

To live, you must eat. Without food the body cannot function and will eventually break down. The body requires food for three functions:

- Fuel
- Building and replenishing body tissues
- Regulating body processes

Fuel

Carbohydrates, fats and proteins are all sources of fuel for the body. To release energy (i.e. fuel) the body oxidizes carbohydrates, fats and proteins. Also important are vitamins and minerals.

5.1 Carbohydrates

Carbohydrates are a vital part of your diet. Carbohydrates exist in both simple and complex forms. **Simple carbohydrates** have a high Glycacidic Index (GMI) and provide a rapid boost of energy. Such carbohydrates are not, however, sources of sustainable energy. These carbohydrates tend to raise the level of your blood sugar quickly and for a short period of time. Once the blood sugar drops again you are left feeling tired and possibly even dizzy.

E.g. some simple carbohydrates are processed cane sugar, white bread, pasta made from white flour, potatoes.

Complex carbohydrates are more effective in providing a slow and stable supply of energy. For dance your carbohydrate intake should consist of mainly complex carbohydrates. You should make an effort to eat complex carbohydrates, as they will sustain you though many hours of rehearsals and performances.

E.g. Brown rice, whole-wheat pasta, Soya products and certain vegetables such as corn, carrots and butternut

5.2 Fats

The body stores excess energy in the form of fat. Different body types have different fat distribution. For some fat is distributed around the lower abdomen, but particularly the buttocks and thighs. For others, fat is stored predominantly in the abdomen.

Fatty tissue is necessary to protect vital organs, such as the kidneys, and to insulate the body. Excess fat, however, increases one's risk of heart disease and even sometimes of cancer.

Fats are made up of fatty acids. Fatty acids are long-chained molecules. Fat exists in **saturated** and **unsaturated forms**. Saturation of fat occurs when the molecular structure of fat changes and a hydrogen molecule is added.

The molecular bonds of **unsaturated** fats are looser than those of saturated fats. Unsaturated fats can be categorized under two headings: **Polyunsaturated** fats and **mono-unsaturated** fats.

Mono-unsaturated fats are fatty acids with one *double-bonded carbon* in the molecule. All of the others have *single-bonded carbons*. In contrast **polyunsaturated** fatty acids have more than one double bond.

Fatty acid fluidity increases with increasing number of *double bonds*. Therefore, monounsaturated fatty acids have a solidification temperature that is higher than that of polyunsaturated fatty acids, but still below that of saturated fatty acids. This means that saturated fat is solid at room temperature.

E.g. **Saturated fat:** Found in meat, dairy products including milk, cheese, yoghurt, butter, cream, white margarine, commercial fats. (Low fat dairy products are available.)
Mono-unsaturated fat: Olive oil, peanut oil, most nuts, yellow Margarine.
Poly-unsaturated fats: Fish, cereals, certain vegetable oils including sunflower, walnuts, polyunsaturated margarine.

Cholesterol is a fatty substance, which is made by the body and is contained in animal products. It is attached to a protein and transported around the body via the blood. The combination of fat and protein is called a **lipoprotein**. Lipoproteins can be high density (HDL), low density (LDL), or very low density (VLDL), depending on how much protein there is in relation to fat.

- **LDL [low density lipoprotein]** About 70% of cholesterol is transported as LDL. This is mostly fat and not much protein. LDL causes cholesterol to be deposited in the arteries. High levels of LDL are associated with an increased risk of heart disease. LDL is sometimes referred to as "bad cholesterol".
- **HDL [high density lipoprotein]** About 20% of cholesterol is transported as HDL, which is mostly protein and not much fat. HDL actually helps prevent cholesterol building up in the arteries. Low levels of HDL are associated with an increased risk of heart disease. HDL is sometimes referred to as "good cholesterol". Women tend to have a higher HDL cholesterol level than men.

If the total cholesterol level is too high, this is one risk factor for health problems. However, it's important to consider the relative amounts of HDL and LDL. A high level of HDL and a low level of LDL are desirable. It also plays a role in the formation of bile acids in the liver (which help absorb fats) and certain hormones.

E.g. Cholesterol is present in liver, kidneys and other offal, some shellfish and eggs. It is also present in hydrogenated vegetable oil which is used in the production of commercial foods such as biscuits – this type of cholesterol should be avoided.

Ideally you should limit your fat intake to only unsaturated fats as they provide healthy and easily digested forms of "good" fat.

5.3 Protein

Your body is largely made up of protein. Protein is essential in providing 8 of the 22 amino acids necessary for life. The remaining 14 amino acids are created in your body.

The composition of amino acids in protein is very important as this affects the ability of your body to absorb and use them. The 8 amino acids your body cannot produce on its own must exist in the source of protein (e.g., chicken breast) in the correct proportions. If they exist in the incorrect proportions, your body will be unable to absorb the amino acids.

The main function of protein is to build and maintain the tissues of your body.

e.g. Found in meat, chicken, eggs, fish, and dairy products. Vegetarians can find protein in soya products, tofu, legumes (lentils, beans) nuts and seeds.

5.4 Vitamins

All natural vitamins are organic food substances found only in living things, that is, plants and animals. With few exceptions your body cannot manufacture or synthesize vitamins. They must be supplied in the diet or in dietary supplements. Vitamins are essential to the normal functioning of your body. They are necessary for your growth, vitality, and general well-being.

Vitamins cannot replace food. Vitamins cannot be assimilated without ingesting food. That is why you should take them with a meal. Vitamins help regulate metabolism, help convert fat and carbohydrates into energy, and assist in forming bone and tissue.

There are 20 different vitamins that have been identified. Vitamins can be classified as either **water soluble**, which means they dissolve easily in water, or **fat soluble**, which means they are absorbed through the intestinal tract with the help of lipids.

Fat soluble – A, D, E, F and K

Water Soluble – B, C and F

5.5 Minerals

The nutritional minerals needed in your diet include (amongst others) calcium, magnesium, potassium and iron. These are all vital for health and life and are needed in specific quantities. Some of the effects of deficiencies in these particular minerals are:

Iron – fatigue, anemia

Calcium – osteoporosis

Potassium and Magnesium – muscle cramps, interrupted heartbeat

These healthy minerals are found in the following food groups:

Iron – raisins, lean red meat, liver, potatoes, dried apricots, spinach, kidney beans, leafy vegetables

Calcium – dairy products, green leafy vegetables, nuts and seeds

Magnesium – wholegrain products, green leafy vegetables, fruits and other vegetables

Potassium – meat, fish, poultry, cereals, bananas, oranges, fresh vegetables

The toxic minerals include **lead, mercury and aluminum**. Excessive levels of these minerals have been linked to various diseases such as Alzheimers, Thyroid disease, and ADHD (attention deficit and hyperactivity disorder).

5.6 Fiber

Dietary fiber is the portion of plants that cannot be broken down (digested) by the body. Most high fiber foods are also high in other nutrients making them doubly valuable in your diet. Fiber itself adds little or nothing to your nutrition because it is not digested in the gastro-intestinal tract. It is important in the effects it has on the bodily processes, namely:

- The passage of food through the gut
- The absorption of nutrients
- The excretion of waste products

e.g. Fiber can be found in wholegrain cereals and their products, fruits, vegetables, nuts and legumes.

5.7 Water

Water is one of the essential nutrients, yet we tend to regard it as an optional extra. Your body is made up of about 60% water. Approximately 72% of the weight of lean muscle tissue is made up of water. Water is lost through urine, faeces, via the lungs and through your skin when you sweat. As a dancer you will need to ensure you keep yourself hydrated by taking in lots of fluids, preferably water, throughout the day. Thirst is not a good indicator of fluid need. Make it a habit to drink water 15 minutes before you dance and to take frequent sips from a water bottle during your class/rehearsal. The effects of dehydration are:

- Fatigue
- Strain on the heart, lungs and circulatory system
- Nausea, vomiting and diarrhea
- Dizziness, labored breathing, weakness and confusion

A BALANCED DIET

A balanced diet should include all the food groups and a high intake of fruit and vegetables to ensure sufficient vitamins. The following diagram represents the healthy daily proportions of each food group that make up a balanced diet.

Section 6

LIFESTYLE CHOICES

The choices you make in every area of your life will affect you as a dancer. Making SMART decisions will ensure you remain healthy and strong and able to continue dancing for many years. Knowledge is the best base from which to make decisions especially when you are faced with pressure and expectations from your peers and family, which you may not feel are the best for you. The information discussed here on the following topics should help you to make informed decisions:

6.1 Substance Abuse (drugs, dieting pills, cigarettes, alcohol)
6.2 Diet
6.3 Eating disorders
6.4 HIV/AIDS
6.5 Stereotyping
6.6 Peer pressure

6.1 Substance Abuse

There is an enormous amount of pressure on dancers, sportsmen and athletes to succeed in very competitive environments, which often leads to the use and abuse of performance enhancing drugs. The most common of these among dancers are Caffeine, Amphetamines and Ephedrine. Many diet pills contain these ingredients.

Other drugs that are used and abused are usually done so because of their effects on appetite and energy. Examples are Cocaine and Nicotine.

The abuse of drugs amongst dancers is often linked to the stereotyping of body image and peer pressure, both of which are discussed later in this chapter.

The following table provides a simple overview of the commonly used drugs and their effects.

Type of drug	What it does / uses	Effects / dangers	Other info
Cocaine (stimulant) "Snow" "Snarf"	Creates a state of euphoria. Works on nervous system – raises blood pressure and speeds up breathing. Makes you numb to pain. Elevated blood pressure, dilated pupils, decreased appetite, excessive activity, and talkativeness.	Addictive because the user needs more and more to create the same high. Irritability, argumentative behaviour, nervousness or agitation. Loss of coordination, collapse, perspiration, blurred vision, dizziness, feeling of restlessness, anxiety, delusions, heart attacks, chest pain, respiratory failure, strokes, seizures and headaches, abdominal pain, nausea, paranoia.	Dancers may take cocaine to induce that feeling of endless energy and also to reduce appetite. Gelsey Kirkland, the famous ballerina had a Cocaine addiction which almost ruined her life.

Type of drug	What it does / uses	Effects / dangers	Other info
Crack – a freebase form of cocaine that is smoked. Is cheaper than cocaine and highly addictive.	Provides an instant high, within 10 seconds (faster than cocaine.)	Sleeplessness, increased heart rate, convulsions and tremors, chest pain, eating disorders and permanent damage to blood vessels which can lead to strokes and long term physical disorders. Hostile, angry and violent behavior and blurs mental clarity and decision-making skills	Long term crack cocaine users find that it is almost impossible to "get off" the drug" even when they have a desire to stop for good. The addiction is too strong for them to take care of themselves.
Methamphetamine "tik" Crystal meth	Increased alertness, motivation, and brain activity (short-term). Euphoria in high doses. Weight loss (may also be an adverse effect, depending upon circumstances). Heightened sexual stimulation.	Severe psychological addiction. Acne. Depression. Formication (false sensation of flesh crawling with bugs, with possible associated compulsive picking and infected sores). Amphetamine psychosis.	Compulsive fascination with useless repetitive tasks. Long-term cognitive impairment due to neurotoxicity. Tooth decay ("meth mouth") Damage to immune system. Death.
Amphetamines (stimulant) "uppers" "speed"	Speeds up the nervous system – all the cells and muscles in the body work faster, brain works harder, blood circulates faster.	Warning signals (e.g. hunger and fatigue) are shut off and can lead to collapse. Addictive. Can cause brain damage, heart murmurs and stroke, dizziness, restlessness, aggression, agitation, insomnia, dry mouth and dehydration. Some types are used in diet pills and even in cough and cold remedies.	Commonly found in most diet pills. Also causes dry mouth, bad breath, racing heart and shaking hands. Usually need more and more to achieve the same effect – often combined with downers. Withdrawal is painful and frightening.
Barbiturates (sedatives) "downers"	Used to help patients relax before surgery and to treat high blood pressure and ulcers.	Addictive. Thick speech, blurred vision, slow reactions, mixed up words and speech. Abuse can lead to death. Available by prescription only.	Often first taken to counteract effects of other stimulants.

Type of drug	What it does / uses	Effects / dangers	Other info
Ecstasy (stimulant) "E", love drug or hug drug	Suppresses the need to eat, sleep or drink. Used at "raves" or nightclubs.	When taken at raves, where allnight dancing usually occurs, often leads to severe dehydration and heat stroke in the user since it has the effect of "short-circuiting" the body's temperature signals to the brain. May cause hyperthermia, muscle breakdown, seizures, stroke, kidney and cardiovascular system failure, possible permanent damage to sections of brain critical to thought and memory, and death.	An Ecstasy overdose is characterized by a rapid heartbeat, high blood pressure, faintness, muscle cramping, panic attacks, and, in more severe cases, loss of consciousness or seizures. One of the side effects of the drug is jaw muscle tension and teeth grinding. As a consequence, users will often suck on pacifiers to help relieve the tension.
Nicotine, found in cigarettes (Stimulant)	Dancers often smoke to keep their weight down.	Affects taste buds, dulling the sense of taste. Worsens asthma. Can cause cancer of mouth, throat and lungs. Causes bad breath, shortness of breath, yellow teeth and fingers, and wrinkles around the mouth. Addictive.	Speeds up the metabolism which is why you put on weight when you stop smoking. Is used as a way to keep the hands and mouth busy (oral fixation).
Alcohol (depressant) "booze"	Socially accepted and legal "drug" (over 18 years in South Africa) CNS Depressant – often used to help relax or de-stress. Alters physical and mental state.	Fattening, addictive, reduces inhibitions, slows down reactions. Can cause brain damage, heart disease and Cirrhosis of the liver. Causes dehydration, slurred speech, aggression, bloating and gastrointestinal disturbances.	In moderation some forms of alcohol have been shown to have health benefits e.g. a small glass of red wine with dinner is said to decrease cholesterol. Linked to breast, liver and pancreatic cancer.

Type of drug	What it does / uses	Effects / dangers	Other info
Caffeine (stimulant)	Found in coffee, tea, caffeine cold drinks, chocolate, some cold/ cough remedies Speeds up heart rate, makes you feel alert and awake. Mobilises fat for fuel. Often used by dancers to avoid eating and to induce the feeling of energy.	A diuretic and can cause dehydration. Can cause insomnia, the shakes, irritability, headaches and nausea.	Has been found to improve performance in certain sports but should only be used in moderation. Green tea also contains caffeine and is a healthier alternative to coffee

6.2 Diet

Maintaining a healthy diet is essential for a dancer as your body needs to have the correct balance of food, minerals and vitamins to keep it in optimal condition and to help it to cope with a heavy workload. Often dancers feel the need to go on a diet that restricts calories in some way, especially ballet dancers because they are expected to conform to a certain "look" which is thinner than normal. If you really do feel the need to diet to lose extra weight the safest option is to seek the help of a **dietician**. This is a professional who has been specially trained to understand the body in relation to nutrition and he/she will be able to tailor-make a diet for you that allows you to lose weight safely.

If you are unable to make use of a dietician keep the following points in mind when trying to lose weight:

a) **Fad diets** come and go and are often popular at a certain time because they are endorsed by some celebrity. They are not a safe option because:
   - often require you to discard a whole food group or groups (e.g. vegetable or fruit only "detox" diets) or to eat largely from a certain food group (e.g. high protein diets). This means the diet is not balanced. They seemingly work in the beginning because by cutting out a large number of foods you will be restricting calories anyway.
   - the initial weight-loss is usually water (as is the case with high protein diets.)
   - once you resume normal eating you often regain the weight you lost.
   - trying to maintain such a restrictive way of eating often leads to frustration, binges and yo-yo dieting.
   - vital foods needed by the body for their vitamin or mineral content are neglected leading to ill health.
   - these diets can be anti-social – you find yourself unable to eat with your family, or to eat out with friends.

b) The **best commercial diets** are ones that endorse a **balanced diet** with sufficient calories and room for variety and versatility such as Weigh Less or Weight Watchers.

c) The essential ingredient in weight-loss is that **energy in = energy out**! This means that you need to use an equal amount of fuel as you are consuming to maintain weight. To lose weight you need to burn more fuel than you take in. Keep in mind that your body needs fuel for its basic functions (even when you are asleep) so reducing your intake too much will harm your health.

d) **Vegetarians** have to be very careful to ensure a sufficient intake of protein, amino acids and B vitamins by combining different types of proteins.
e) Losing weight too quickly can lead to loss of water and lean muscle tissue; slowing of the metabolism; reactive weight gain once off the diet; fatigue and ill health.

6.3 Eating Disorders

Traditionally the ideal body type in the dance world has been one that is lean and almost childlike. This originates from the so called 'waif'-like physique so desired by ballet dancers and choreographers. This ideal is based on cultural stereotypes (e.g. African dancers are not expected to be so thin) as well as the physical demands of the art-form. A heavy dancer's body has to work much harder to lift their body weight against gravity. This does not mean everyone has to look the same, however. Finding the best weight for your unique, genetically determined body shape must be balanced with the need to follow a balanced diet that meets your energy and health needs.

Dancers are often high achievers, faced with a competitive environment, which can affect their feelings of self-esteem. It is all these factors that contribute to the high percentage of dancers that suffer from eating disorders. The most common disorders among dancers that are covered here are Anorexia and Builimia. Although less common, some dancers may even suffer from BED (Binge Eating Disorder) or overeating, and may alternate between periods of overeating and dieting.

6.3.1 Anorexia Nervosa

'Anorexia' means loss of appetite and 'nervosa' means of nervous origin. This definition is deceptive because anorexics do not lose their appetite, they do not allow themselves to satisfy it. There is no one particular type of person who becomes anorexic, nor is there a type of family that influences it, but they do usually have one or more of the following personality traits and family circumstances:

Anorexics may:

- be high achievers educationally and in other chosen activities (e.g. sport or dance)
- be perfectionists who set themselves high standards
- have low self esteem and be very self-critical
- have high levels of will power and self control
- be very obsessive

They may come from families where:

- there are high expectations about behaviour and educational success
- appearance is highly valued and the mother may be preoccupied with weight and diet
- the parents are very involved in their children's lives and are over protective
- conflicts are covered up rather than dealt with openly

Anorexia often starts like a slimming diet but anorexics take their food deprivation too far, starving their bodies and becoming very thin. The following criteria are used to define anorexia nervosa:

- Deliberate weight loss (to 85% or less of the healthy minimum for the person's age and height) and/or deliberate refusal to gain weight at a healthy rate.
- A distorted body image, measuring their value as a person in terms of their shape or weight
- Intense desire to be thin, or intense fear of becoming fat
- Can be coupled with the use of vomiting, laxatives or exercise to get rid of food/

calories
- Females may suffer from amenorrhea (stop getting their monthly periods)

Besides extreme weight loss, anorexics suffer the following effects on the body:
- Little energy, fatigue, weakness
- Dizziness and fainting spells
- Sometimes have spells of furious activity e.g. cleaning their room, studying for hours etc
- Stomach pains, bloated stomach and constipation (due to insufficient fibre in the diet)
- Swollen face and ankles (due to water retention)
- Sometimes fine, downy hair called lunago grows on the body (body's response to not having enough fat deposits to keep warm)
- Hair loss
- Amenorrhea (loss of periods in girls) due to lack of Oestrogen
- May get Osteoporosis (thinning of the bones) and struggle to have children later on due to hormonal imbalances
- Dangerous loss of minerals (electrolytes) in the body fluids from starvation, dehydration and vomiting
- Irregular heartbeat and cardiac arrest due to loss of minerals (calcium, magnesium and potassium)

The emotional and psychological effects of anorexia include:
- Depression and moodiness
- Become anti-social and spend more time alone
- Become secretive about their eating and exercise habits and often lie to friends and families to hide their disorder
- Become anxious and panicky about eating and cut out more and more foods until left with very little that is deemed 'safe'
- May build up rituals around food e.g. cutting it in certain ways
- Thoughts about food and weight dominate their life
- Often prepare or buy food for others

6.3.2 Bulimia Nervosa

'Bulimia' comes from the Greek word meaning 'the hunger of an ox'. It is often linked to anorexia as anorexics may show bulimic symptoms and bulimics may go through anorexic-like periods of starvation. Both anorexics and bulimics attach great importance to body shape and weight, have a distorted body image and a fear of becoming fat. The difference is that the bulimic cycle is one of **binge** and **purge**. They will eat large amounts of food (binge) and then will get rid of the food (purge) either by vomiting, using laxatives or excessive exercise. They have similar personality traits to anorexics being high achievers with low self-esteem. In contrast to anorexics, they may come from families where conflicts are strongly expressed and there may be a history of neglect, rejection or even abuse (real or imagined.)

It is often hard to recognize when someone is bulimic as they are usually very secretive. They may even appear popular, confident and outgoing. Bulimics often seem to maintain a normal body weight because even though they "get rid' of the food they have eaten much of it will already have been digested. The reason they do not normally become overweight is that they diet in between binges.

The effects of bulimia on the body are:

- Vomiting related:
  - Tooth decay from the stomach acid eroding the tooth enamel
  - Irritated salivary glands which can swell up to make the face look round
  - Tears or bleeding in the oesophagus
- Laxatives, vomiting and diuretics (drugs that increase flow of urine) can cause an imbalance of mineral levels especially potassium which is needed by the heart. This can cause irregular heart beat and even death.
- Bowel can become dependant on the laxatives leading to constipation and bloating
- Diuretics can cause dehydration
- Stomach can rupture (split) when stretched by a binge (very occasionally)
- Feel tired and run down due to poor diet
- Periods can become irregular
- Weight within normal range but will fluctuate frequently

6.4 HIV/AIDS

'Estimated worldwide HIV infections: 64 423 509 on 21 September 2005'
Statistics in South Africa – **'…The first wave – new HIV infections – peaked in about 1998, at about 930 000 infections a year. Next comes the wave of total HIV infections, projected to peak in about 2006 at about 7.5 million infections.'**
These statistics are taken from the following websites: www.cathca.co.za
www.mg.co.za

HIV/AIDS is a real issue that you may be confronted with in any environment. There are many myths surrounding this issue and the best way to protect yourself from becoming infected with HIV and to avoid ostracizing those who are infected is TO BE INFORMED!

HIV is passed through body fluids. It cannot survive outside the environment of these body fluids, which is why you cannot be contaminated by touching a toilet seat or door handle that has been touched by an infected person. The body fluids it is present in are: blood, semen (sperm fluid), male pre-ejaculation fluid, vaginal fluids and breast milk. Other body fluids – tears, urine, sweat and saliva – contain little or no virus.

The possible ways you could contract HIV are:

- The virus can be passed from a mother to her unborn child or through her breast-milk.
- through unprotected sex (condoms must always be used)
- through unprotected oral sex (condoms must always be used)
- if the blood (or another body fluid) of an infected person were to enter your body via the moist linings of the vagina, penis, rectum (inside the anus), mouth and eyes or through broken skin, cuts or sores.

To avoid contracting HIV ensure the following safety measures are followed in your dance studio:

1. Immediately attend to cuts, cleaning and bandaging them.
2. Wipe up any blood on the studio floor with chlorine bleach such as jik or domestos.
3. Keep a fully stocked first aid kit in the studio at all times.

4. Keep a pair of surgical gloves in the first aid box and use when cleaning up blood or attending to another dancer's injury.
5. Keep a one way CPR mouth piece for the possibility of mouth to mouth resuscitation. A person receiving CPR may vomit.
6. All dancers should follow the ABC plan:
   A abstain
   B be faithful
   C condomise (use a condom)

6.5 Stereotyping

'Stereotyping' is grouping people according to their age, ethnic origin, nationality or even sexual orientation, body or personality type as if they were all the same and judging them on a basis of limited information or opinions. There are certain stereotypes in the dance environment that despite ongoing education and changing values tend to prevail. Stereotypes can be damaging, leading to feelings of low self-esteem and teasing by others. Here are some of the most common dance stereotypes and the reasons they are untrue:

a) Dancers must be thin	*Dancers are individuals and must be strong and healthy. The way they dance is more important than how thin they are. Different dance forms have different body type requirements.*
b) Dancing is effeminate and all male dancers are gay.	*Dancers require strength. Male dancers are often stronger and fitter than other sportsmen. Being able to express emotion through your body does not make you gay.*
c) Dance is not intellectually challenging so it is a better option for students who are 'non-academic'	*There are different types of intelligence but to do well at anything one needs to be hard working and disciplined. Dance requires discipline. Dancers are often high achievers who excel in a variety of academic areas.*

People with **disabilities** also face stereotyping and prejudice, especially with regard to their physical capabilities. Dance should be made accessible to all and through creative teaching, co-operative learning and an open-minded approach disabled people can be included in the dance environment.

In South Africa, where there is so much cultural diversity, stereotypes can create prejudice which leads to low self-esteem, teasing, aggression and even violence. These stereotypes are usually based on race and gender. Dance requires you to work very closely with and have trusting relationships with your peers. To avoid problems in your dance class caused by prejudice it is important to be aware of prevailing stereotypes, and to hold discussions about them.

6.6 Peer Pressure

Peer pressure is one of the many challenges faced by adults and adolescents alike. The pressures you face at each stage of your life will differ and during adolescence, a time of rapid physical and emotional changes, it is natural to want to be 'one of the gang.'

Most of us follow some sort of 'social rules', but these may differ from one group to another. The need to 'belong' means you may accept the unspoken 'rules' of the group you are in even if they go against the values and 'rules' determined by your family. These rules may relate to your behaviour, the way you dress or which music you listen to. As an adolescent you may be faced with some of the following pressures:

- Teasing and bullying – this can happen if you are seen as different in some way. Often bullies have their own insecurities and take them out on others. If you feel you cannot handle teasing and bullying on your own, ask for help from a teacher, school counsellor or parent.
- Drugs – you may feel pressured to take drugs because others do – e.g. cigarettes, alcohol and other 'hard' drugs. Refer to the table on the effects of drugs earlier in this chapter so that you can make informed choices when confronted with this issue.
- Sex – you may feel pressure from boyfriends or girlfriends to become sexually active. If in doubt – wait! Teenage pregnancies and sexually transmitted diseases can change the course of your life!
- Crime – petty crime such as shoplifting or vandalism of property can start off as a dare or game but can get out of hand and become a habit.

In dance, besides the normal teenage pressures, you may experience some of the following:

- Pressure to be thin – the body goes through many changes during puberty and the way you look as a teenager may not be how you look as an adult. Try to keep in mind that girls do naturally develop more body fat than boys (necessary for reproductive health) and that following a healthy diet and taking part in regular exercise will ensure you maintain a strong and healthy physique.
- Pressure to take drugs – amongst dancers this is often related to the desire to be thin.
- Competitive pressure – you may find you compare yourself to others and that this lowers your self esteem. Try to work to your individual best, setting realistic goals and judging your ability accordingly.

Peer pressure is a natural part of growing up and forming social groups can create a base of support for one another. Excessive or unwelcome peer pressure can lead to problems such as depression, drug or alcohol abuse, lack of interest in anything (sports and hobbies), crime, running away from home, skipping school and even suicide. The best way to deal with peer pressure is to become assertive and to ask for help or find someone to talk to.

GLOSSARY

Dance Terminology, Anatomy and Health Care

Term	Description
Abduction	Latin: *ab* = from + *ducum* = led Movement of the limb away from the medial plane
Adduction	Latin: *ad* = to + *ducum* = led Movement of the limb toward the medial plane
Abdomen	Latin: *abdomen* = the belly. The part of the trunk between thorax and the perineum
Agonist	Greek: *agonistes* = rival, hence a muscle in apparent contest with another These muscles cause the movement to occur. They create the normal range of movement in a joint by contracting. Agonists are also referred to as prime movers since they are the muscles that are primarily responsible for generating the movement.
Antagonist	Greek: *anti* = against + *agonistes* = rival, hence a muscle which may oppose an agonist. These muscles act in opposition to the movement generated by the agonists and are responsible for returning a limb to its initial position. They relax while the agonist works.
Alignment	The relationship of the skeleton to the line of gravity and the base of support
Anterior	Latin: *ante* = before. In front
Arch	The part of the sole between ball and heel. This is the part of the foot that bends when it is pointed.
Articulation	Latin: *artes* = joint. Articulate is to form a joint
Achilles tendon	The large tendon above the heel. The flexibility of this tendon is important for a dancer.
Atrophy	Greek: *a* = negative + *trophe* = food. Atrophy is the progressive loss of muscle mass, or wasting, resulting from disease or lack of use
Ballistic stretch	Uses the momentum of a moving body or a limb in an attempt to force it beyond its normal range of motion.
Body image	Self-esteem concerning one's physical appearance. It is how someone views their body, whether it be positive or negative.
Bursa	Greek: *bursa* = a purse A flattened sac containing a film of lubricating fluid
Bunion	A painful, inflamed swelling of the bursa at the first joint of the big toe

Bursitis	When joint overused or when stays under pressure or tension for extended periods of time, nearby bursa can become inflamed. Found especially in shoulder, elbow or knee joint.
Calcaneous	Greek: *calx* = heel. The bone of the heel.
Cartilage	Latin: *cartilage* = gristle. Tough, elastic substance which joins surfaces when resilience is needed E.g. on the ends of bones
Centre of gravity	The point around which the weight is evenly placed/distributed
Cervical spine	Latin: *cervix* = neck. The part of the spine that is located in the neck
Coccyx	Greek: *coccyx* = cuckoo, whose bill the coccyx resembles. Tail bone The small triangular bone forming the lower end of the spinal column
Concentric	Muscle shortens. e.g. lifting a weight up
Contraction	The shortening and thickening of tissue, whereby a muscle pulls, compresses, contracts or otherwise moves in some part of the body
Cramp	Muscle cramps are involuntary and often painful contractions of the muscles which produce a hard, bulging muscle. May be stopped by stretching the affected muscle.
Disc	Between each pair of vertebrae in spine lies a shock-absorbing cushion called an inter-vertebral disc
Dorsal	Toward the top or closer to the top of the head, back or body
Dorsi-flexion	Latin: *dorsi* = the back. Movement at the ankle as the dorsum of the foot is elevated (foot flexed toward shin)
Eccentric	Muscle lengthens e.g. lowering a weight down in a slow, controlled fashion
Elevation	The body's propulsion into the air, away from the floor e.g. leap, hop or jump. Also the upwards movement of a body part e.g. shoulders.
Endurance	The ability to last; the power to endure physical pain
Energy	Muscular tension used to move; ability to produce action or effect The force and quality of movement defined by the degree of impetus and effort
Eversion	Lifting lateral edge of foot
Extension	Increasing the angle of the joint; stretching out from bent to straight
Femur	Thigh bone
Flexibility	Flexible quality of muscles; degree of muscle pliability
Flexion	Decreasing the angle of a joint
Force	Active power or strength; any cause that produces, changes or stops motion
Hammer toe	A deformity of the toe in which it is bent downward. Normally it affects the second toe. One common cause is flat feet. In normal feet with adequate arch support, the arch acts as a "spring" in the heel to toe stepping action while walking. Without this spring, the toes flex

	forward in an attempt to "grab" the ground and after time, they bend forward permanently.
Hamstrings	A group of muscles found along back of leg
Hyperextension	The over-extension of a joint. If not corrected can cause mal-alignment and injury.
Inversion	Lifting medial edge of foot; Inward sickle
Instep	The upper surface of the arch of the foot
Isolation	Exercising one specific part of the body exclusive of others to focus effort on or protect certain muscle groups.
Isometric	This is a contraction in which no movement takes place, because the load on the muscle exceeds the tension generated by the contracting muscle. This occurs when a muscle attempts to push or pull an immovable object.
Joint	The area where two or more bones are joined together along with their associated structures, such as ligaments. A joint is also called an articulation.
Kinesiology	The study of anatomy in relation to human movement
Lateral	Latin: *latus* = side The position of a structure that is further away from the midline of the midline, trunk or head
Ligament	Latin: *ligamentum* = bandage. Strong, flexible white tissue that connects bones and supports muscle.
Lumbar	Latin: *lumbus*. The part of the back between the ribs and the hip bone, also known as the lower back.
March fracture	The march fracture is a type of stress fracture. It occurs in one of the metatarsals. The name refers to military recruits who developed stress fractures after long marches
Medial	Latin: *medius* = middle. The position of a structure that is closer to the midline of the limb, trunk or head
Metabolism	Means change or transformation. Relates to various processes within body that convert food and other substances into energy and other metabolic by-products used by the body. It is a necessary function that allows our bodies to use food and other resources to maintain the working parts, repair damage, heal injury and rid the body of toxins.
Muscle	Composed of contractile tissue with elastic properties. Contracts in response to nerve stimuli.
Nerve	Bundles of fibres which conduct impulses from and to the central nervous system
Nervous system	The system of nerve fibres, nerve cells and other nerve tissue by means of which impulses are sent, received and interpreted. Composed of brain, spinal cord, peripheral nerves and sensory organs.

Orthopaedist	An orthopaedic surgeon is a doctor who corrects congenital or functional abnormalities of bones with surgery, casting and bracing. Orthopaedists also treat injuries to the bones.
Osteoporosis	A condition that is characterised by a decrease in bone mass and density leading to increased porousness and vulnerability to fracture
Patella	Latin: *patella* = a small pan. The knee cap.
Physiotherapy	The therapeutic use of physical means, such as massage, exercise, heat or electricity to restore movement after an injury, operation or accident. Also called Physical Therapy.
Pelvic floor	A group of muscles that reach from the pubic bone back to the sacrum. One function of the pelvic floor is to support the internal organs.
Plantarflexion	Latin: *planta* = the sole of the foot. Flexion at the ankle joint moving the toes away from the shin.
Podiatrist	A person who tends disorders of the foot
Posterior	Latin: *post* = behind (in place or time) Behind
Pronation	A rotational movement of the forearm in which the palm of the hand is turned posteriorly In the hands = turning palm downwards. In the foot, rolling inwards.
Quadriceps	Latin: *quadri* = fourt + *caput* = head, hence a four-headed muscle The group of large muscles of the front of the thigh
Reciprocal	When an agonist contracts, in order to cause the desired motion, it usually forces antagonists to relax. A reciprocal stretch refers to mutual stretching by inducing the antagonists to relax during the stretch due to the contraction of the agonists.
Rhythm	Movement with a regular repetition of a beat, accent, rise and fall
Rotation	Turning in a circle around an axis
Scoliosis	Abnormal lateral curvature of the spine
Shin splints	Shin splints (medial tibial stress syndrome) is an exercise-related pain that occurs along or just behind the medial edge of the tibia. It is a common term used for many lower leg problems.
Sickle	Supination of the medial edge of the foot. This position is undesirable and should be avoided at all times.
Skeleton	The hard structure (bones and cartilages) that provides a frame for the body. It supports muscles and organs of the body and protects soft internal organs.
Sprain	To wrench or twist or tear a ligament or muscle, usually in a joint.
Supination	Rotation of the forearm so that the palm is directed forward or anteriorly; the opposite of pronation: In the hands, turning palm upwards. In the foot, sickling.
Synovial	Greek: *syn* = with + *ovum* = egg, hence, the fluid in freely movable joints resembling egg-white. Synovial fluid is a thick, stringy fluid

	found in the cavities of synovial joints. With its egg-like consistency, it reduces friction between the articular cartilage in joints to lubricate and cushion them during movement.
Talus	Latin: ankle-bone The ankle-bone is the tortoise-shaped tarsal of the ankle joint
Technique	Refined physical skills pertaining to a particular style of dance
Tendon	Latin: *tendo* = I stretch out Tough, inelastic, fibrous band of tissue that attaches muscle to bone
Tendonitis	An inflammation in a tendon or the tendon covering. It is caused by a series of small stresses that repeatedly aggravate the tendon rather than just a single injury.
Tension	The physical condition of being stretched or strained
Thoracic	Greek: *thorax* = the chest. Pertaining to the chest, vertebrae or spinal cord segments between the cervical and lumbar areas.
Turn-out	The characteristic that most distinguishes ballet from other forms of dance. Another term for rotation, the ability of the dancer to turn his/her feet and legs out from the hip joints.
Vertebrae	The individual bones that make up the vertebral column.

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