OCR Cambridge Technical Level 3

Sport and Physical Activity

Single Award

Transition Pack 2023

Name……

Course Breakdown and Introduction

For the single award you will complete a total of **5/6 units**. For each, you will achieve either a pass, merit or distinction grade.

Similar to CNAT Sport these units are broken down into different topic areas and are all worth different amounts.

A combination of the results across these units will make up your final grade. Consequently, you will need to be motivated to maximise your performance in EVERY unit.

Assessment

You are assessed in a range of different ways across your units including exams, coursework and video evidence.

Year 12 Units:

Unit 1: Body systems and the effects of physical activity (Exam)

Unit 17: Sports injuries and rehabilitation (Coursework and Practical Assessment)

Unit 19: Sport and exercise psychology (Coursework)

Unit 18: Practical skills in sport and physical activity (Practical)

Year 13 Units:

Unit 1: Body systems and the effects of physical activity (Re-sit exam)

Unit 2: Sports coaching and activity leadership (Practical Assessment and Coursework)

Unit 3: Sports organisation and development (Exam)

Staffing

Throughout the course you will be taught by a range of different staff. You will have a consistent member of staff for each unit so it is important that you stay on top of your work for each individual teacher and unit.

Note: To be completed summer 2023

Read through the enclosed resources and complete the tasks / questions where necessary.

At the beginning of the year 12 course you will be assessed on your knowledge and understanding of these areas via past exam questions and written tasks to replicate how you will be assessed on the course.

The mark that you achieve within this piece of coursework will act as an indicator as to your suitability to the Cambridge Technical in Sport course.

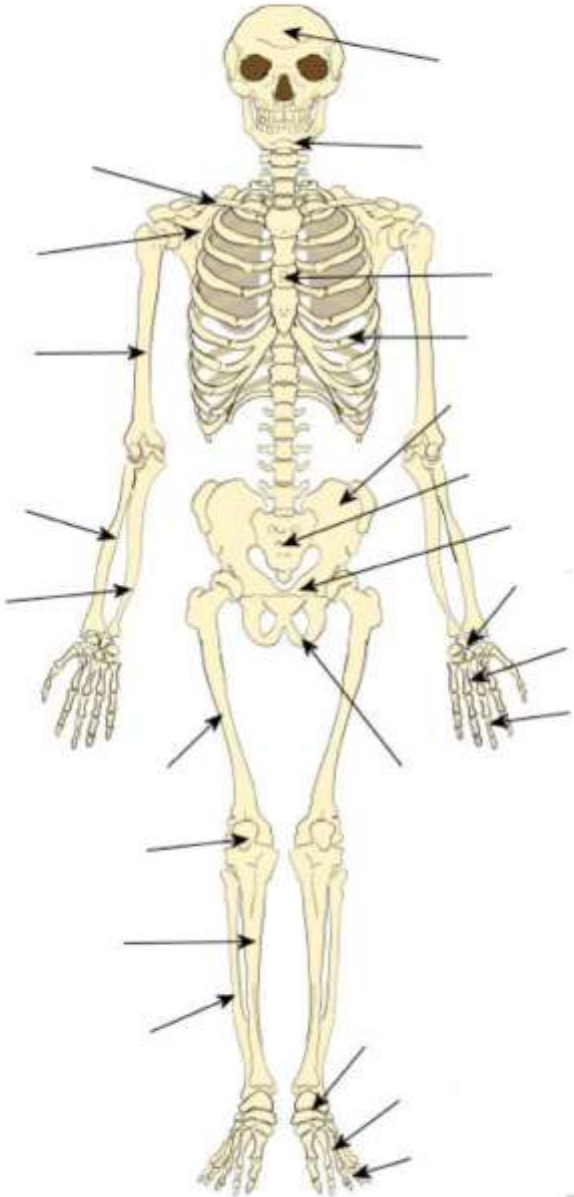
All work must be completed ready for your first CTEC Sport lesson in September

Please Email Miss Cox if you have any questions (Lauren.Cox@st-georges-academy.org)

Unit 1: Body Systems and the effects of physical activity

Objectives	
• Be aware of the bones that make up the skeletal system • To know the sections of the vertebral column • Understand the functions of the skeletal system • Understand what articulating bones are • To be able to identify the main muscles that make up the muscular system • To be able to understand and apply basic terminology in relation to muscle movement and contraction. • To gain some basic understanding of the structure and function of muscle fibre types	

Test yourself! Name as many of the bones as you can in one colour and then check your answers by writing in the correct anatomical name with another coloured pen.



Give a definition of the following term: **articulating bones.**

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Can you identify **articulating bones** (these are bones that meet to create movement at a joint)? Try the following:

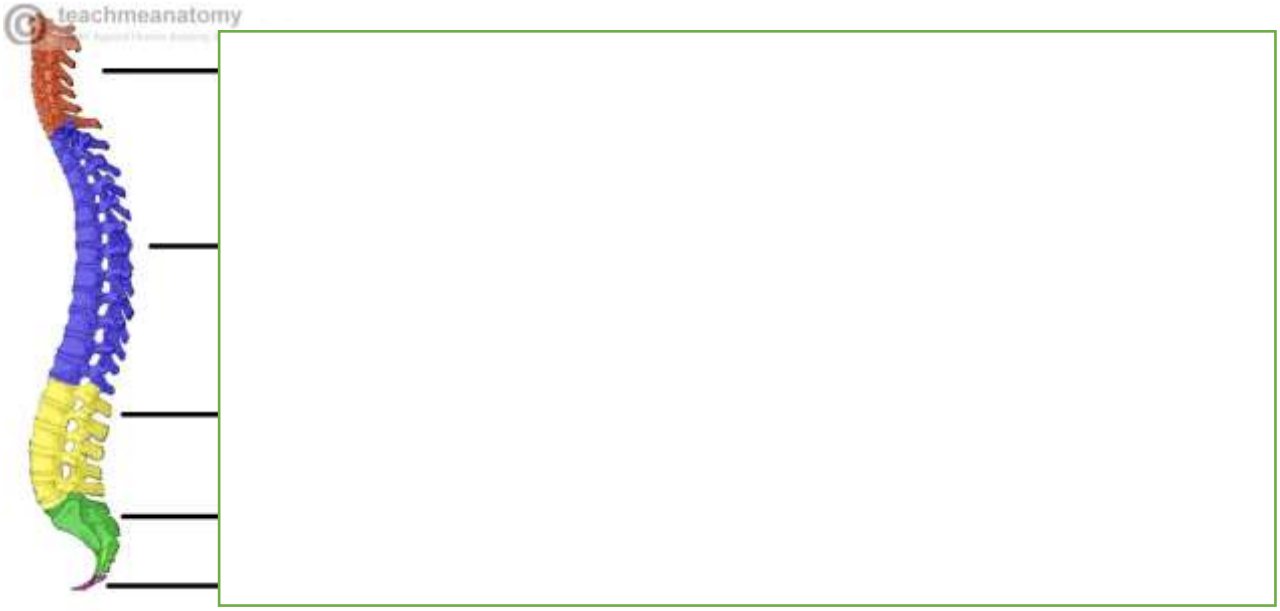
Elbow……

Shoulder……

Knee……

Hip……

Identify the sections of the vertebral column.



Can you name how many vertebrae make up each section? Research/revise the following spinal disorders: **KYPHOSIS; LORDOSIS** and **SCOLIOSIS.** Identify what part of the spine these disorders affect.

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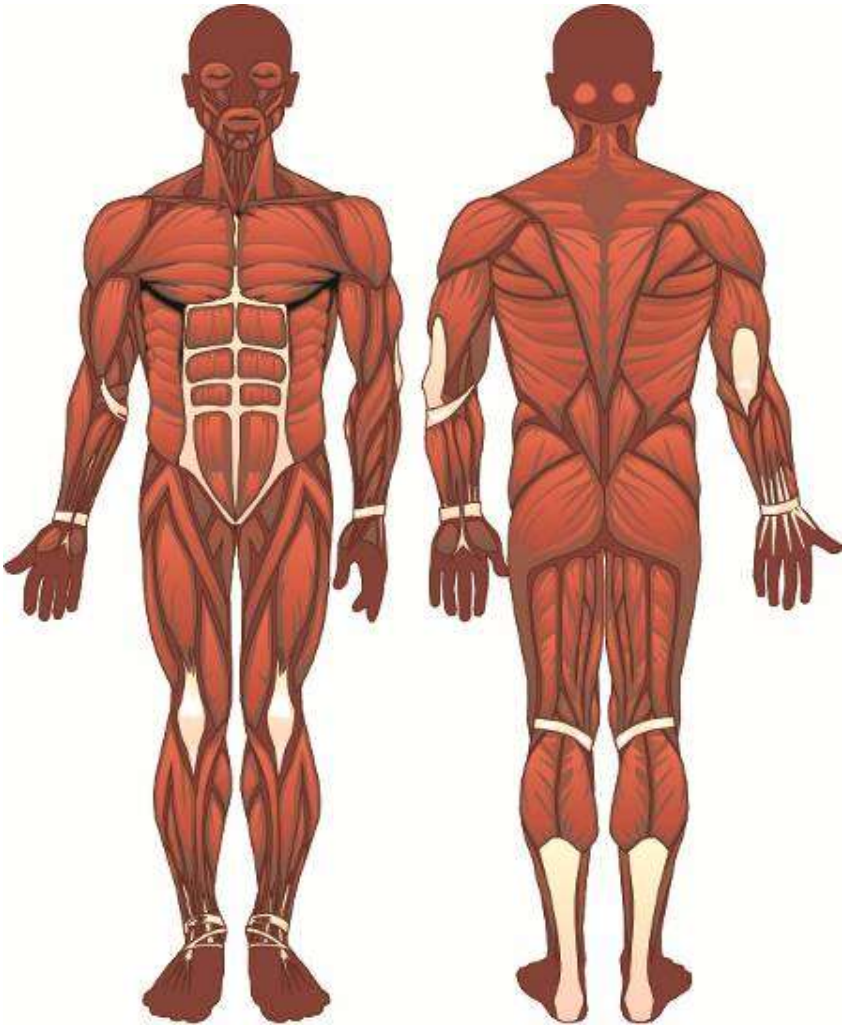
Research the Functions of the skeleton

Function	Explanation

How can you remember this? Stainfield, Believes, Preparation, Means Massive Success!!

Label the pictures with the following: Deltoids, Pectoralis major, Trapezius, Latissimus dorsi, obliques (internal and external), hamstrings (Biceps femoris, semimembranosus and semitendinosus), quadriceps (Rectus femoris, vastus lateralis, vastus intermedius and vastus medialis), abdominals, tibialis anterior, gastrocnemius, soleus, gluteus maximus, triceps, biceps, erector spinae, iliopsoas (hip flexor muscles).



Challenge task: names for the individual muscles in both the quadriceps and the hamstrings!

Quadricep-

Hamstring-

Merit

Top tip: use the key words

at the back of your booklet!

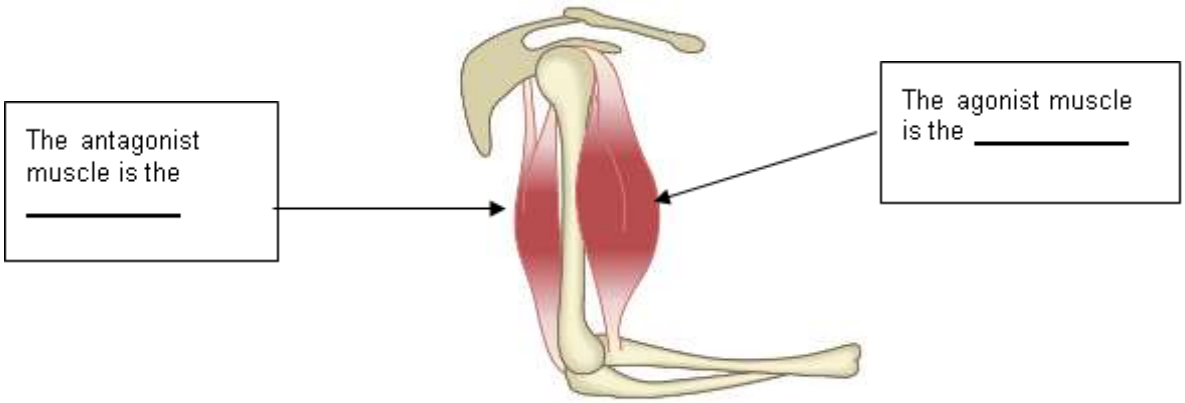
Muscle movement and contraction

This sheet is designed to help you understand **antagonist pairs** and the different types of **muscular contraction.**

Instructions:

1. Fill in the blanks.

Antagonist pairs are made up of an _____, which is also known as the **prime mover**, and an _____, which is the muscle that opposes the pull of an agonist.



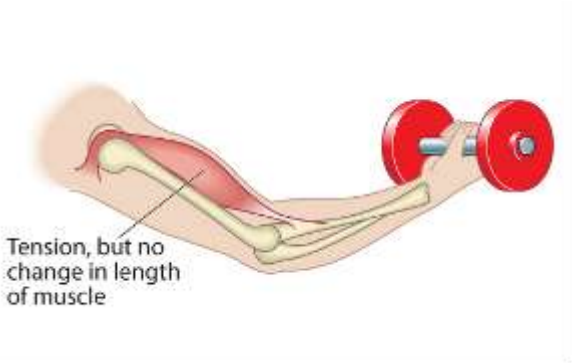
1. Complete the following antagonist pairs:

Quadricep: _____Erector spinae:_____, Pectoralis major: _____

Extension- continue to complete antagonist pairs for the following:

Gastrocnemius …… Deltoids…….. Gluteus maximus ……

1. Label the following muscle contraction types:



Extension task: Answer the questions below

1. Which muscle is the antagonist if the biceps are contracting concentrically?

2. Which muscle is the antagonist if the quadriceps are contracting eccentrically?

3. Which muscle is the agonist during a sit-up?

Apply knowledge to exam based questions

What is the name of the skull?

a) Mandible ☐
b) Humerus ☐
c) Fibia ☐
d) Cranium ☐

What are the small cube shaped bones called in the ankle?

a) Carpals ☐
b) Femur ☐
c) Talus ☐
d) Tarsals ☐

What does the skeleton **PROTECT?** Give an example of a bone/bones and what it protects.

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Name the other 5 functions of the skeleton.

S……..

S……..

M…… S……

B…… C…… P……

M……..

Which one of the following is part of the appendicular skeleton?

a) Humerus ☐
b) Cranium ☐
c) Sacrum ☐
d) Ribs ☐

Name the sections of the vertebral column.

C……..

T……..

L……

S……

C……..

Key words for muscle movement and contraction

Antagonistic pairs- Muscles that work in pairs. Whilst one is contracting the other is relaxing.

Agonist- Known as the 'prime mover' and the muscle that is under contraction.

Antagonist- The opposite muscle to the one working. Therefore, the muscle that is relaxing.

Synergist- Muscles that help to create the movement of a contraction. However they are not the prime mover.

Fixator- This helps to stabilise the origin of the agonist. For e.g. the deltoid is a fixator during the bicep curl.

Concentric- The shortening of a muscle under contraction.

Eccentric- The lengthening of a muscle under contraction

Isotonic- Isotonic contractions maintain constant tension in the muscle as the muscle changes length (shortens and lengthens). For e.g. when performing a squat the quadriceps shorten and lengthen.

Isometric- The muscle stays the same length under contraction. For e.g. during a 'wall sit' the quadriceps stays the same length.

Read the article below and complete the summary task:

What you need to know about muscle fibres

Elite endurance athletes have a greater proportion of slow-twitch fibres in the leg muscles

Questions on this topic usually ask you to identify the type of muscle fibre being used as type I, type IIa or type IIb and then to list some characteristics of this fibre type. You also need to make sure you can justify why a particular fibre type is used (Table 1), e.g. a 100 m sprinter uses type IIb fibres because they produce a lot of force, conduct the nerve impulse quickly etc.

Types of muscle fibre

There are three main types of muscle fibre:

■ type I (slow oxidative)

■ type IIa (fast oxidative glycolytic)

■ type IIb (fast glycolytic)

Slow-twitch fibres (type I) have a slower contraction speed than fast-twitch fibres and are better adapted to low-intensity exercise. They produce most of their energy aerobically and therefore have specific characteristics that allow them to use oxygen more effectively

Fast-twitch fibres (types IIa and IIb) have a much faster contraction speed and can generate a greater force of contraction. However, they also fatigue very quickly and

are used for short, intense bursts of effort. They produce most of their energy anaerobically. Type IIa fibres have limited endurance and are used for events such as the 1,500 m in athletics where a longer burst of energy is needed. Type IIb fibres are used for highly explosive events such as the 100 m where a quick, short burst of energy is needed.

Our skeletal muscles contain a mixture of all three types of fibre but not in equal proportions. This mix is mainly genetically determined.

Motor units

Muscle fibres are grouped into motor units. A motor unit consists of a motor neurone and its muscle fibres. Muscle fibres interact with the nervous system so that a contraction can occur. The motor neurone transmits the nerve impulse to the muscle fibre. Each motor neurone has branches that end in the neuromuscular junction on the muscle fibre.

Type I (slow twitch)	Type IIa (fast twitch)	Type IIb (fast twitch)
Jogging Long-distance swimming	Sustained power activities such as the 800 m and 1,500 m	Sprinting Power lifting

Table 1 Muscle fibre usage

Sprinters' leg muscles contain a greater proportion of fast-twitch fibres

Motor units are made up of the same type of muscle fibre, so they are either slow-twitch or fast-twitch motor units. The brain will recruit slow-twitch motor units for low-intensity activity such as jogging or long-distance swimming. If a greater force of contraction is needed, for example in activities such as sprinting or power lifting, then the brain will recruit fast-twitch motor units.

The relative proportion of each fibre type varies in the same muscles of different people. For example, an elite endurance athlete will have a greater proportion of slow-twitch fibres in the leg muscles, whereas an elite sprinter's leg muscles will contain a greater proportion of fast-twitch fibres. Postural muscles tend to have a greater proportion of slow-twitch fibres, as they are involved in maintaining body position over a long period of time.

Fibre characteristics

All three fibre types have specific characteristics that allow them to perform their roles successfully (Table 2). Each of the characteristics can be divided into two groups:

■ *Functional characteristics* involve what the muscle fibre actually does.

■ *Structural characteristics* involve the make-up of the fibre.

Exam questions sometimes ask you to identify either the structural or functional characteristics, so you need to be aware of which is which.

Characteristic	Type I	Type IIa	Type IIb
Contraction speed ($m\,s^{-1}$)	Slow (110)	Fast (50)	Fast (50)
Motor neurone size	Small	Large	Large
Force produced	Low	High	High
Fatiguability	Low	Medium	High
Sarcoplasmic reticulum development	Low	High	High
Mitochondrial density	High	Medium	Low
Myoglobin content	High	Medium	Low
Glycogen store	Low	High	High
Triglyceride store	High	Medium	Low
Capillary density	High	Medium	Low
Aerobic capacity	Very high	Medium	Low
Anaerobic capacity	Low	High	Very high
Motor unit strength	Low	High	High

Table 2 Muscle fibre characteristics

The effect of training on fibre type

Fibre type appears to be genetically determined. However, it is possible to increase the size of muscle fibres through training. This increase in size (hypertrophy) is caused by an increase in the number and size of myofibrils per fibre, with a consequent increase in the amount of proteins, especially myosin. As a result there will be greater strength in the muscle.

Test your understanding

1 Put the characteristics from Table 2 into the relevant category in the table below.

Functional characteristics	Structural characteristics

2 When jumping up for a rebound, performers will rely on their muscles to produce maximal contractions. What are the characteristics of the type of muscle fibres used to produce these maximal contractions? (4 marks)

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3 Identify the main muscle fibre type used by a marathon runner and give three structural characteristics of this fibre type. (4 marks)

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Unit 17 – Sports injuries and rehabilitation

Read the article below and complete the summary table:

Types of injury

Injuries are common in grassroots sports through to elite international competition and can happen during any sporting activity. Professionals working in sport place great emphasis on understanding the different types of injury. This helps them to maintain the fitness of athletes and to maximise performance in training and competition.

Injuries and illnesses in sport vary in type, severity, the bodily system affected and the length of absence.

Acute injuries

An acute injury is a sudden injury caused by a specific impact or traumatic event, where a sharp pain is felt immediately. Acute injuries occur as a result of sudden trauma to the body. This could be from an extrinsic force (such as a direct blow from an opponent, e.g. a tackle in rugby) or an intrinsic force (such as a ligament sprain or muscle tear).

Acute injuries can affect all the different structures in the body that make up the musculoskeletal system, such as the bones, muscles, ligaments and tendons. Signs and symptoms of an acute injury include:

- immediate pain to the area of trauma/injury
- swelling
- redness
- bruising
- deformity (especially in fractures and dislocations)
- difficulty or inability to move the limb
- excessive movement of a joint in a ligament injury

This Burnley player has suffered an acute injury

Types of acute injury

Fracture

Fractures require a significant amount of trauma. In a **closed fracture** the trauma causes the bone to break and stay inside the skin. In an **open fracture** the force of the trauma causes the bone to break and pierce the skin.

Concussion is the result of a direct impact to the head

Ligament sprain

Ligaments provide stability to the joints of the body. Anterior cruciate ligament (ACL) injuries are common in professional footballers and NFL players. The ACL restricts the amount of translation or 'give' at the knee joint. In ACL injuries, excessive force during knee valgus ('knee falling in') and twisting causes the ligament to be overstretched. If the force is big enough, it will cause the fibres of the ligament to tear and eventually rupture.

Another common site of ligament injury is the ankle, where an excessive inward twisting motion (inversion) causes damage to the ligaments on the outside of the ankle.

Muscular injuries

Muscular injuries occur when a muscle or its tendon is overstretched. The overstretching causes the fibres of the muscle to tear. Common examples are a hamstring tear while sprinting or a quadriceps tear while striking a football.

Head injury/concussion

Concussion occurs as a result of direct impact to the head and can often knock an athlete unconscious. Concussion can vary in severity from mild, where symptoms

can resolve in a matter of hours, to severe, which can cause bleeding on the brain and permanent disability.

Bruises

A direct impact to part of the body causes the blood vessels under the skin to tear or burst. When this happens to the thigh it is often referred to as a ‘dead leg’. A bruise will generally form over the next few hours and last for a few days.

Chronic injuries

Chronic injuries can also be referred to as **overuse injuries.** In contrast to acute injuries they typically develop over weeks, months or even years. As the name suggests, overuse injuries occur from overtraining or overloading the body. An example of an overloading injury is tennis elbow (lateral epicondylitis). Repetitive stress is placed on the tendons of the elbow during forehand and backhand shots. If the tendons don’t adequately repair and rest after practice they will begin to break down, causing pain and dysfunction.

In normal training the body has a balance between fatigue and repair. In chronic injuries the balance shifts more towards fatigue, with the body not fully repairing before the structures are stressed again. Over time this repeated stress and inadequate repair causes the tissues involved to break down and fail, leading to injury.

As with acute injuries, chronic injuries affect all the tissues of the musculoskeletal system and can be split into those caused by extrinsic and intrinsic factors:

■ **Extrinsic factors** include training errors such as overtraining, change in training and inadequate recovery.

■ **Intrinsic factors** relate more to poor biomechanics such as poor muscle flexibility, muscular imbalances or poor foot posture.

Signs and symptoms of a chronic injury include:

■ gradual onset of pain and symptoms

■ biomechanical abnormalities

■ athlete can usually continue participating in early stages

■ gradual onset of swelling

Injury	Type	Mechanism of Injury	Treatment
Lateral ankle sprain (grade III anterior talofibular ligament ATFL) and calcaneofibular ligament (CFL))	Acute	Player tackled while running with the ball, causing inversion (inwards twist) of the ankle	• RICE (rest, ice, compression, elevation) principles • Restoring full movement of the ankle joint • Restoring full strength of the lower leg • Balance and proprioception exercises • Sport specific drills • Return to training
Lumbar spine stress fracture	Chronic	Gradual onset of lower back pain and stiffness during pre-season	• Period of rest until fracture heals • Core stability exercises to strengthen 'core' and lower back • Gradual return to running, initially using hydrotherapy pool • Sport-specific on-pitch drills and fitness • Return to training
Hamstring strain (grade II — biceps femoris)	Acute	Sprinting after the ball, sudden sharp pain mid hamstring muscle group	• RICE principles • Restore normal hamstring stretch to equal unaffected side • Restore full muscle power to equal unaffected side • Return to running with on-pitch fitness • Sport-specific drills • Return to training

Table 1 Injuries experienced during a season at Burnley FC

Types of chronic injury

Bone

Stress fractures of the bone commonly occur at the tibia in long-distance runners and in the lower back of fastbowl cricketers.

Joint

Overuse can affect the articular cartilage of a joint, leading to the onset of arthritis (osteoarthritis). Over time the cartilage that lines the joint wears, causing inflammation and pain.

Muscle

Overuse injuries to muscles are due to muscular imbalances, where one muscle is stronger or less flexible than another. If an imbalance between muscles is present it will lead to abnormal muscle function and loading. Consequently, over time the muscle will not be able to cope and the fibres will tear.

Long-distance runners who increase their training loads are at risk of developing an Achilles tendon injury

Tendons

Tendons are common sites of overuse injury. This is due to tendons not being able to cope with the repetitive forces applied to them without adequate recovery. Overuse tendon injuries are known as tendinopathies. Longdistance runners who increase their training loads are at risk of developing an Achilles tendon injury (Achilles tendinopathy), as are runners with poor foot posture (flat feet).

Environmental injuries

Environmental injuries refer to injuries and illnesses caused by environmental factors or a change in the environment an athlete is training or competing in. For example, the 2014 FIFA World Cup was held in Brazil. For the England national team this posed new off–field challenges. The players selected were all based in the UK for the preceding season and during the competition had to adapt to the change in weather, time zone and varied training and match times.

Environmental injuries can be prevented with prior planning and knowledge of risk factors. Examples of environmental injuries include:

- heat stroke
- dehydration
- hypothermia
- fatigue caused by changes in time zone
- altitude

Overall, an understanding of the classification of injuries lays the foundation for the effective treatment and prevention of common sporting injuries. Table 1 shows examples of typical injuries experienced by professional footballers and how they are treated.

In professional sport it is the role of physiotherapists, such as myself at Burnley FC, as well as sports scientists, to treat and prevent injuries whenever possible.

Phil Pomeroy is head of academy sports medicine at Burnley Football Club.

Injury type	Description	Signs and symptoms	Specific examples	Treatment methods
Acute				
Chronic				

Task:

From your findings above, research 1 acute and 1 chronic injury that has occurred in a sport of your choice. Can you provide detail on the reasons for the injury, the injury itself and the treatment of the injury?

Sport: Acute injury:
Description of incident/reasons for injury:
Injury prognosis/specifics:
Treatment of injury:

Sport: Chronic injury:
Description of incident/reasons for injury:
Injury prognosis/specifics:
Treatment of injury:

Deadline – This work must be completed ready to hand in for your first CTEC lesson in September.

Any questions please email Miss Cox 😊

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