

Introduction

This section includes several resources incorporating different approaches for teaching bones, muscles and the different types of joint. The ICT resources (an animated walking/running person and a bones naming exercise) could be effectively used with a projector/interactive white board forming a focus for class discussion.

Running the Activities**Walking/Running person**

This illustrates the movements of the joints and the purpose of the skeleton. The interactive animation shows a person running or walking and the moving "x ray" box reveals the bones and their movements at that part of the body. The moving box could be stopped to show one particular joint (for example the knee) as a basis for discussion about its movement. Focussing on feet and lower legs can lead to consideration of the bones taking the greatest impact during running (leading to possible injury).

Bone naming

This recaps on Key Stage 2 ideas so could be used to introduce the subject. The resource could be used with a digital projector or computer in discussing the functions of movement, protection and body structure. Detailed knowledge of bone names does not need to be learnt, but some understanding may help when studying other processes in the body (e.g. the rib cage's movement in respiration). The naming game could also be used by students independently as an extra activity.

Making a Model Arm

This can be done by the students, with the template worksheet photocopied (or stuck) onto thick card. Elastic bands (of an appropriate length) and butterfly fasteners will be required. A prototype is recommended! Tension and relaxation of antagonistic muscles can be identified and compared to their own arms.

Glossary

This provides a teachers' reference list and may link with possible student research activities.

Extension Activities

- Making models of the joints (see pictures below for ideas)
- Examining the structure of fresh joints (chicken wings) or shoulder joints.
- Chicken bones if placed in dilute acid for several days and washed, will show the difference made without calcium – distinguishable by feel and can be seen to bend.
- Research into: Jobs (physiotherapy, radiographer, osteopath)
Sports and other injuries (tendonitis, torn ligaments)
Diseases (osteoarthritis, osteoporosis)
First aid and injuries
Technological advances

More Ideas

Collect pictures of people doing different activities using their bones and muscles. Drawing in bones on outlines of the activity pictures can provide a useful starter/plenary assessment of students' understanding.

Health issues should be introduced through discussion. For example:

- Factors affecting bone building cells – smoking, heavy drinking, excess caffeine intake.
- An individual has responsibility over diet and exercise to optimise bone mass which increases up to 25 years old.
- Hormones concerned with reproduction affect growth and development of healthy bones; consequently if menstruation stops due to anorexia or other causes it affects bones.
- Relationship between a balanced (calcium rich) diet and maintenance of strong bones.

Prior Learning

At Key Stage 2 - the skeleton providing support and movement for the body. Familiarisation with bone names (though a detailed knowledge is not required).

Learning Outcomes

Students develop an understanding of :

- the purpose of bones and the skeleton.
- the different ways in which joints can move.
- the action of antagonistic muscles
- some possible health and diet effects on bones and their strength.

Activities selected may take account of:

- Visual learners (looking at the animations, diagrams and information)
- Auditory learners (discussion of actual bones, sounding vocabulary, discussing interactive computer material, describing and identifying students' own bones)
- Kinaesthetic learners (making a model arm, feeling/handling bones and joint models).

Vocalisation and group interaction involved in this work enhances learning. ICT interactive activities develop hand eye coordination (when independently operated).

Where the activities fit in (NC in England)

Unit 9L – levers in the body, how antagonistic muscles produce turning effects at skeleton joints.

Unit 9B – how simple joints function and that inappropriate exercise or too much exercise can be harmful to muscles and weaken or damages joints. The function of the skeleton and the way in which diet, smoking, alcohol and exercise can affect fitness and health.

Safety and Sensitivity

Dry bones need to be sterilised.

Fresh bones may be best examined wearing disposal gloves.

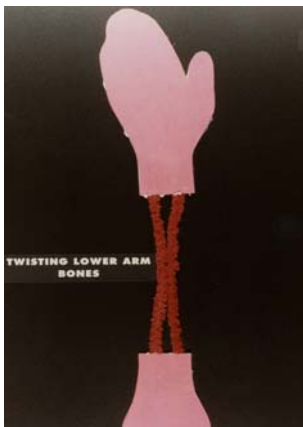
Examples should involve a variety of ethnic and physical variations – there are some excellent role models of success with some disability.

Size sensitivity – variations in height and weight are normal.

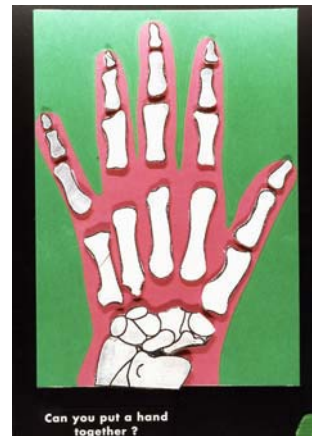
Ideas for modelling joints and bones



A roll-on deodorant bottle used with a golf tee and some card makes a good ball and socket joint.



Pipe cleaners show the twisting of bones in the arm. (This is not a joint).



A velcro card model gives a tactile approach for students to position the bones in the correct places.

Glossary – for teachers

Arthritis

Results from damage to a joint. It may come from infection, injury, disease or wear and tear over the years.

Bones

The body has a total of 206 bones. They are made of calcium, phosphorus, other minerals and a protein fibre – collagen. They are living, with new bone being made and old bone being lost throughout life. The spongy centre of a bone has bone marrow, which makes red blood cells and contains much of the bodies' stored fat.

Brittle Bone disease

A rare inherited connective tissue abnormality, resulting in frequent fractures. It is not caused by the lack of calcium in the diet or bone structure.

Calcium

An important mineral in the diet, required for the development of strong bones and teeth and for the normal functioning of nerves and muscles.

Cartilage

A hard but supple substance forming part of the skeleton. The ends of bones are covered with a very smooth cartilage so that they cannot injure each other; also called gristle.

Double jointed

When ligaments are very flexible a joint may have an unusually wide range of movement.

Joints

Occur where two or more bones meet. Most joints allow bones to move, but some are fixed such as in the skull.

Ball and socket: a joint made by a round knob moving freely in a cupped shaped holder. It allows movement in all directions e.g. shoulders and hip joints.

Fused joint: bones that have grown together so tightly that they allow no movement at all e.g. the skull.

Gliding joint: a joint where two flat surfaces move over one another e.g. in the wrist.

Hinge joint: a joint where movement is only backwards and forwards i.e. in one plane only e.g. in the elbow and the knee.

Pivot joint: a joint where one bone twists against another e.g. in the neck.

Ligament

A strip of strong rubbery material which holds together the two bones which make up a joint or supporting an organ, fascia or muscle.

Marrow

The soft spongy material inside the largest bones of the body. New blood cells are produced in the bone marrow.

Muscle

Allows movement of a bone or organ by contracting and relaxing. Muscles work in pairs, one relaxing whilst the other contracts (antagonistic). Muscles consume four to five as much energy as they produce. Their efficiency can increase with training. There are about 640 muscles in the body and there are three types: striated (striped or skeletal), smooth (or visceral) and cardiac.

Osteoarthritis

Disease caused by wear and tear of the joints, although metabolic, genetic and other factors may contribute.

Osteoporosis

The internal meshwork of the bone is partially lost as a result of the amount of calcium salts being reduced. This causes holes or pores in the bone, so the bones become brittle and break easily.

Rheumatoid arthritis

Inflammatory joint diseases caused by the bodies' own immune system acting against and damaging joints and surrounding tissues.

Rickets

A childhood disease caused by an inadequate intake of vitamin D. As a result, insufficient calcium is absorbed from food leading to poor bone development. Rickets is characterised by bowing of the legs.

Skeleton

The framework of bones or shell which supports and protects the body of a person.

Vertebral column (spine)

The column of 26 bones (vertebrae) placed on top of each other (and the ones at the base of the back are fused). This forms part of the skeleton that supports the upper part of the body and protects the spinal cord.

Synovial joint

When adjacent bones are separated by a cavity containing fluid. The synovial fluid provides lubrication and reduces the friction.

Sprain

The result of forcing a joint beyond the limits of the ligaments causing it to tear.

Tendon

A band of tough inelastic fibrous tissue which connects a muscle with its bone attachment, called a sinew.

Vertebrae

Individual bones which form the spine.