### Questions

1. Where are these muscles and what job do they do?
   - a. pectorals
   - b. biceps
   - c. triceps
   - d. deltoids
   - e. hamstrings
   - f. quadriceps.

2. Imagine performing a jump shot in basketball. What muscles are used to straighten your legs as you jump?

3. Which muscle contracts when you look upwards?

4. When running what muscles are used to:
   - a. bend/flex your knee?
   - b. pull your hip back after the step?
   - c. straighten, or extend, your knee?

5. Choose a stance from your sport (like with the badminton player above) and discuss what muscles have moved your limbs into these positions.
in this unit you will learn about how muscles are attached and how they work.

A voluntary muscle usually works across a joint. It is attached to both the bones by strong cords called tendons.

When the muscle contracts, usually just one bone moves.

For example when the biceps in the arm contracts, the radius moves but the scapula does not.

When a muscle contracts, usually just one bone moves. The other is stationary. The origin is where the muscle joins the stationary bone (1 in the diagram above). The insertion is where it joins the moving bone (2). When a muscle contracts, the insertion moves towards the origin.

Muscles usually work in pairs or groups, e.g. the biceps flexes the elbow and the triceps extends it.

This is called antagonistic muscle action. The working muscle is called the prime mover or agonist. (It’s in agony!) The relaxing muscle is the antagonist. The other main pair of muscles that work together are the quadriceps and hamstrings. Imagine the picture above is a bent knee. Which muscle would be the agonist as the knee is bent (flexed) and then extended?

The prime mover is helped by other muscles called synergists. These contract at the same time as the prime mover. They hold the body in position so that the prime mover can work smoothly.

To extend the elbow, the biceps relaxes and the triceps contracts. To flex the elbow the biceps contracts and the triceps relaxes.

As mentioned previously, tendons are the cords and straps that connect muscles to bones. At the bone, the fibres of the tendon are embedded in the periosteum of the bone. This anchors the tendon strongly and spreads the force of the contraction, so the tendon won’t tear away easily.

Goal! To straighten the knee in the last stage of the kick, the quadriceps acted as agonist and the hamstrings as antagonist.

A network of muscles act as synergists to help hold her in position for this move.

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Muscle tone

Even when a muscle is relaxed, a small number of its fibres are contracted – enough to keep the muscle taut but not enough to cause movement. This state of partial contraction is called muscle tone. Without muscle tone you could not stand up straight!

Gravity tries to pull your head forward, as shown here. But partial contraction or muscle tone in the trapezius will keep it upright.

Muscle tone in the quadriceps balances the muscle tone in the hamstring to keep your legs straight at the knee.

If the muscle tone in your abdominals is poor, your spine curves in too much. This leads to poor posture.

To maintain muscle tone without getting tired, groups of muscle fibres take it in turn to contract. They work in relays. Poor muscle tone leads to poor posture. But exercise improves muscle tone. It makes the muscle fibres thicker so they contract more strongly.

1. To jump we bend our legs and then straighten them.
   a. What main pair of muscles help move the knee?
   b. What is this working in pairs called?

2. Give an example from one of your chosen sports of antagonistic muscle action.

3. What muscle is the prime mover when a doing sit-up? b doing the upwards phase of a press-up?

4. a Draw a diagram to show how the biceps works.

5. Why doesn’t the scapula move?

6. Explain how having poor muscle tone can cause bad posture.

Discussion work

Choose two movements from your sport, one using your legs and one your arms. Discuss how antagonistic muscle action helps you perform these movements.