2.2.5 Human Locomotion*

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Definition 1: ***Locomotion***
= Movement or the ability to move from one place to another.

Definition 2: ***Human locomotion***
= the ability **you** have to **move** from **one place to another** (walking from your house to a friend's)

Harvard Outreach: Leg mechanics of playing basketball:
http://outreach.mcb.harvard.edu/animations_S09.htm [1]

1 *What is used during locomotion?*

1.1 1) Bones - *body's* supporting structure

- provide the **framework**
- provide internal **core structure** for the attachment of muscles.
- Protection of human organs
- Keeps body shape

1.2 2) Joints - place in your *body* where two bones are connected

Three types of joints in your body:

1.2.1 i) Fibrous joints

- join bones where **no movement** is allowed
- An example will be the bones of your cranium (the skull).

1.2.1.1 ii) Cartilaginous joints

- allows slight, restricted movement
- for example the discs between the vertebrae of the spine

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[1]http://outreach.mcb.harvard.edu/animations_S09.htm

1.2.1.2 iii) Synovial joints

- Allow **free movement** in one or more directions to the joints of the pelvic and pectoral girdles.
- These joints facilitate movements like standing, sitting, walking and running.

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1.3 3) Ligaments – connect bone and bone.

- Hold bone in place so that they work in a coordinated manner.

1.4 4) Tendons - connect muscles to bone.

- Attachment to the skeletal muscles move your bones
- Facilitate the various positions of the body related to movement and balance.

1.5 5) Antagonistic muscles

- Antagonistic = 'opposite'
- Antagonistic movement of muscles

- at least **two sets of muscles**
- one set **contracts** and the other **relaxes**

- Contraction = stimulated muscle – becomes shorter and thicker
- Relaxation = muscle relaxes

1.5.1 Example: Biceps and triceps

- The **biceps** is an example of a **flexor muscle** (muscle whose contraction shortens a body part)
- Whereas the **triceps** is an example of an **extensor muscle** (muscle whose contraction extends or stretches a body part).
- Note that voluntary muscles are normally connected to at least two bones.

In the case of the biceps the two bones involved are the **scapula** and the **humerus**

- When the biceps muscle contracts only one of the bones moves (in this case the radius). The point of attachment to the movable bone is called the **point of insertion** and the biceps is attached to this point by a single tendon. So when the biceps contracts the forearm is lifted or bent, decreasing the angle between the forearm and humerus. and flexing your arm, Thus the biceps is a **flexor muscle**
- The biceps muscle gets its name from having two tendons attached to the scapula. The resistance. of these two tendons prevents the contractile force of the biceps from moving the scapula and therefore **there is no movement of the bone..**
- The point of attachment of a muscle to the immovable bone is called the **point of origin.**

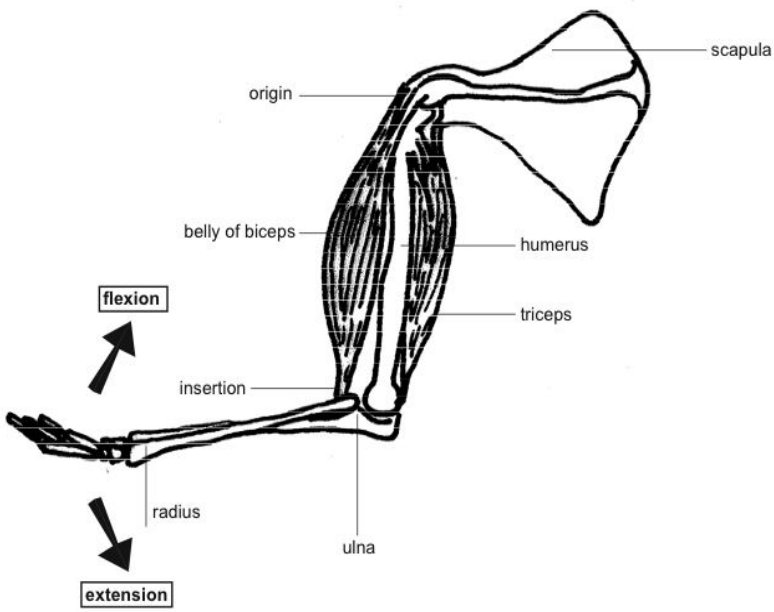


Figure 1

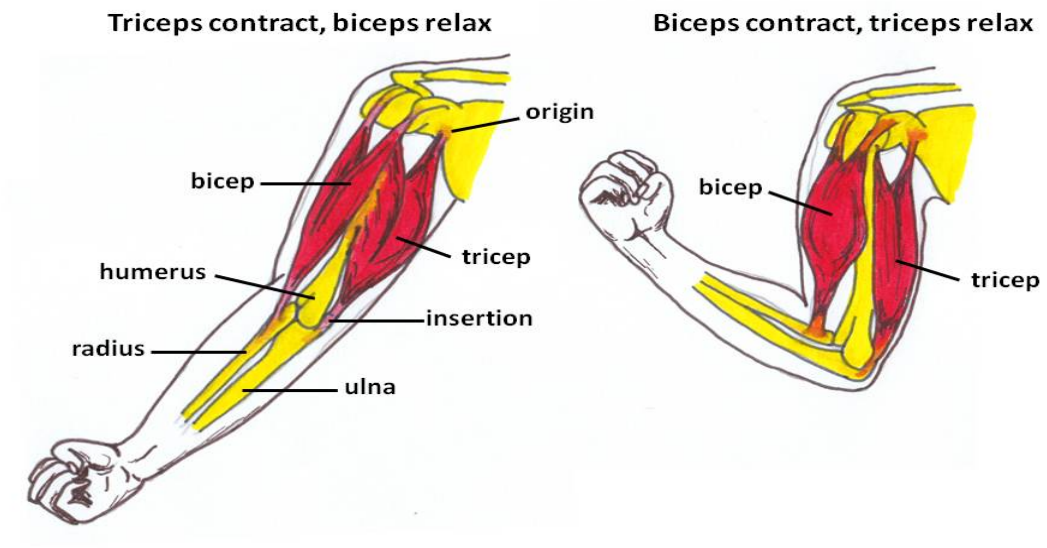
Figure 2.2.1: Illustration of the triceps (extensor muscle) and biceps muscles (flexor muscle). Found in http://commons.wikimedia.org/wiki/File:Anatomy_and_physiology_of_animals_Antagonistic_muscles,_flexion%26tensi [2]

Straightening of the forearm

[2] http://commons.wikimedia.org/wiki/File:Anatomy_and_physiology_of_animals_Antagonistic_muscles,_flexion%26tension.jpg

- When the arm is bent the biceps cannot contract as it is already in a contracted state as muscles can only cause movement by **pulling as they contract** not by pushing when they relax.
- Therefore the straightening of the arm is brought about by the contraction of the **triceps muscle** which is an **extensor** muscle as it increases the angle between forearm and humerus
- The triceps has three points of origin, two on the humerus and one on the scapula, and a single point of insertion on the ulna.

1.5.1.1 title



Video illustrating the mechanics of the antagonism within the biceps and triceps.

http://www.youtube.com/watch?v=T-ozRNVhGVg&feature=related [3]

Antagonistic muscles:

http://www.botany.uwc.ac.za/Sci_Ed/grade10/manphys/skel_mus.htm [4]

[3] http://www.youtube.com/watch?v=T-ozRNVhGVg&feature=related
[4] http://www.botany.uwc.ac.za/Sci_Ed/grade10/manphys/skel_mus.htm