Movement

Muscles move bones by pulling on them. Muscles can never push on bones. As the muscle gets shorter the insertion bone moves toward the origin bone.

Several muscles move at once and work together to move the body in a very smooth way. There are often many muscle involved in a body movement.
**prime mover** – the muscle mainly responsible for the movement

**synergists** – all of the muscles that assist in a movement

**antagonists** – are muscles that work in the opposite direction of a movement

The antagonists must relax for the movement to occur.
Posture

**tonic contraction** – a special muscle contraction that does not move the body but maintains our body posture.

**posture** – muscle tone that maintains body position

We must have posture to maintain upright body that works against gravity.
Heat production

Contractions of muscle produce heat which keeps the body at about 98.6°F. A difference in only a couple of degrees usually means there is something wrong in the body.

hypothermia – is a decrease in body temperature below normal

Fatigue – is when a muscle is continuously contracted without a period of rest and the muscle contraction decreases

Eventually if the muscle does not get rest it will not be able to contract at all.

oxygen debt – is the term used for the body taking in oxygen to remove lactic acid build up in the muscles.
The **skeletal** system, **nervous** system, **respiratory** system, and **circulatory** system all have to be functioning properly for normal muscle movement.

**Paralysis** – a disorder in which nerves shut off impulses to certain skeletal muscles.

Before a muscle can pull on a bone it has to be stimulated by a nervous impulse.
- **motor neuron** – a nerve fiber that stimulates a muscle cell

- **neuromuscular junction** – point of contact between the nerve ending and the muscle fiber

Chemicals are released by a motor neuron and that generates a reaction that causes the muscle fiber to shorten or contract.

- **motor unit** – is the motor neuron and the muscle cell it reacts with
The Steps of a Muscle Contraction:

1) A **nerve** on each muscle cell is stimulated by the brain.

2) **Calcium** is released from the **sarcoplasmic reticulum** onto the actin and myosin sections of the muscle fibers.

3) This calcium being released causes the myosin heads to **react** with the actin binding sites.
4) The myosin heads then pull back causing the muscle to shorten or **contract**.

5) The calcium is **pumped** back into the **sarcoplasmic reticulum** and the myosin heads are released from the actin binding sites.

Energy obtained to contract muscles comes from the molecule ATP. This is obtained from the foods that we eat.
ATP is broken down using an enzyme called **ATPase**. This breaks it into ADP, a phosphate, and energy. The ATP molecule is put back together using a **creatine phosphate**. When the creatine phosphate runs out the muscles use **glucose** as a source of energy.
Energy can be obtained one of two ways:

1) **anaerobic respiration** – without oxygen. Here glucose is converted into lactic acid and energy.

2) **aerobic respiration** – with oxygen. ATP production is normal.

When oxygen levels are very low and oxygen debt occurs. This needs to be replenished at a later time. This is why you breathe heavy after exercise.

The accumulation of lactic acid in the muscles is what cause muscle fatigue.
When muscles contract they contract in a way that is described as all or none.

**all or none** – means that a muscle fiber either contracts or it doesn’t.

The reason we can lift different amounts is more or less fibers contract completely as we need them.
Types of skeletal muscle contractions:

1) **twitch contraction** – is a quick, jerky response to a stimulus. This does not occur very often.

2) **tetanic contraction** – a sustained equal muscle contraction. The contractions are said to all melt together and is a very smooth contraction.
3) **isotonic contractions** – produce movement at a joint

Example: walking, breathing, twisting, lifting

4) **isometric contraction** – occurs when there is muscle contraction but no movement

Muscles only increase in tension in these types of contractions.
- **disuse atrophy** – muscles shrink due to inactivity

- **hypertrophy** - muscles increasing in size
Two types of training

1) **strength training** – causes muscles to get bigger. Example: lifting weights

2) **endurance training** – makes muscles more efficient. This type of training increases blood vessels to the muscles and doesn’t increase their size.

Example: bicycling and running
Types of Movements:

- **flexion** – movement that makes the angle between two bones at their joint smaller than it was at the beginning of the movement.

- **extension** – movements that are opposite of flexions. They make the angle between two bones at their joint larger than it was at the beginning of the movement.

- **abduction** – moving a body part away from the midline of the body.

- **adduction** – moving a body part toward the midline of the body.
- **rotation** – is a movement around a longitudinal axis

- **supination** – hand position with the palm turned in the anterior position

- **pronation** – hand position with the palm turned to the posterior position

- **dorsiflexion** – is when the foot is elevated and the toes are pointed upward

- **plantar flexion** – is when the bottom of the foot is directed downward and the toes are pointed downward
**FACIAL MUSCLES**

- orbicularis oculi – the muscles around the eye, it closes the eye
- orbicularis oris – around the lips, closes and protrudes the lips
- masseter – on the side of the face and closes the jaw
MUSCLES OF THE NECK

- **sternocleidomastoid** – in the neck and pulls the head to the side and toward the chest

- **trapezius** – upper back and moves the scapula
**pectoralis minor** – in the chest and pulls the scapula forward and down

**pectoralis major** – in the chest and raises the upper arm and rotates the humerus
**ABDOMINAL MUSCLES**

- **Rectus abdominus** – Large muscle in abdominal region
- **External oblique** – muscles on the lateral sides of the abdomen
MUSCLES OF THE BACK

- **latissimus dorsi** – muscles in the back and moves the arms down
- **trapezius** – upper back and moves the scapula
MUSCLES OF THE ARM

**deltoid** – on the top of the shoulders and raises the arms

**biceps brachii** – on the top of the humerus and flexes the elbow

**brachialis** – assists in flexing the elbow

**triceps brachii** – back of the humerus and extends the elbow
**UPPER LEG MUSCLES (BUTT)**

- **gluteus maximus** – upper back of the leg (butt) and extends the leg

- **gluteus medius and gluteus minimus** - upper back of the leg (butt) and moves the leg back and rotates the leg
Hamstrings - back of the leg and flexes the leg

- The three hamstrings:
  1) biceps femoris
  2) semitendinosus
  3) semimembranosus
**QUADRICEPS**

- **quadriceps** – front of the leg and extends the leg
- the four quadriceps
  - 1) rectus femoris
  - 2) vastus lateralis
  - 3) vastus medialis
  - 4) vastus intermedius
LOWER LEG

- **gastrocnemius** – back of lower leg and raises (extends) the foot
- **soleus** – assists the gastrocnemius
- “Calf Muscle”