

## Characteristics of Muscle Video Transcript

Welcome to the AFLCA Exercise Theory video series supplementing Chapter 7, Basics of Anatomy.

In this video's we're discussing characteristics of muscles: Types of muscles in the body; functional properties of muscles; types of muscle action during exercise or movement; and roles that muscles assume during exercise or movement.

Types of muscles. There are three types of muscles in the body: smooth, cardiac, and skeletal muscle.

**Smooth muscle** is responsible for involuntary contractions and is found in walls of the intestines, blood vessels, and internal organs.

**Cardiac muscle** is just that, heart muscle responsible for involuntary contractions (or pumping) of the heart 24/7.

**Skeletal muscle** is the muscle that attaches to bones and pulls on bones causing movement. It is responsible for voluntary contractions. In other words, it's under our conscious control.

Functional properties of muscles.

Muscle is not just a squishy tissue hanging onto bones. It has some fascinating functional properties, specifically: Excitability, contractility, extensibility, and elasticity

**Excitability** is the ability of muscle to receive and respond to electrical stimuli from the nervous system.

**Contractility** is the ability of the muscle to generate force as a result of receiving this electrical stimuli. When we think of the term "muscle contraction", we usually think of a muscle shortening, for example as in the up phase of a bicep curl. This *is* one type of contraction. However, muscle can generate force but not shorten. It can stay the same length (for example, during a plank exercise). It can also lengthen, as what happens during the "down" phase of any exercise, such as a bicep curl. More on this shortly.

**Extensibility** is the ability of muscle to be stretched, or extended beyond its resting length.

And, **elasticity** is the ability of muscle to return to its resting length (or original shape) after shortening or lengthening.

Types of muscle action.

Let's go back to the concept of muscle contraction, again stressing that the word contraction can mean muscles shortening, but it can also mean muscles staying the same length, and muscles lengthening. Other common terms are "muscle action", "muscle force generation" or "muscle force production" instead.

There are 3 types of **muscle action**: Isotonic, which consists of concentric and eccentric phases; isometric; and isokinetic.

For isotonic, iso means same, and tonic means tension. For example, if you're lifting a 5lb dumbbell, it is the same 5lb dumbbell the entire time you are lifting it.

The concentric phase is the UP phase of an isotonic movement. During this phase, the muscle shortens, and the movement is usually AGAINST gravity. For example the up phase of a bicep curl.

The eccentric phase is the DOWN phase of an isotonic movement. During this phase, the muscle lengthens, and the movement is usually WITH gravity. For example, the down phase of a bicep curl.

For isometric, iso means same, and metric means length. For example, if you are doing a plank exercise, your muscles are generating plenty of force, but they are not shortening or lengthening. They are staying the same length.

For isokinetic, iso means same, and kinetic means speed. For example, hydraulic exercise equipment, often found in physio clinics or circuit-style facilities, are such that you can generate as much force as you can (push as hard as you can), but the equipment will move at a constant speed.

Roles of muscles.

The final concept we'll cover in this video is the different roles that muscles can play during movement. The four different roles are: Agonist (or prime mover); antagonist; synergist, and stabilizer. Note that all muscles can do all the roles; it just depends on the exercise. Sometimes a muscle may be the agonist (or prime mover); other times it is functioning as a stabilizer.

The AGONIST muscle is the prime mover, the muscle most responsible for the movement. For example, for a biceps curl, biceps brachii is the agonist.

The ANTAGONIST muscle is the muscle that is allowing the movement to happen. It is usually on the other side of the bone. It also helps protect the joint.

For example, during the biceps curl, the triceps is the antagonist. It is lengthening to allow the biceps curl to happen.

A SYNERGIST is a muscle that is helping out. It's not working as hard as the agonist. For example, two smaller biceps muscles, brachialis and brachioradialis are synergists during the biceps curl.

A STABILIZER helps secure a joint or body segment while the movement is happening. During the biceps curl, the rotator cuff muscles are stabilizing shoulder girdle and the core muscles are stabilizing the spine and pelvis.

Shall we do another example? The up phase of the squat, focusing on the hip.

AGONIST: Gluteus maximus shortening, is extending the hip

Antagonist: Iliopsoas and rectus femoris on the front of the hip are lengthening, allowing this movement to happen

SYNERGIST: Hamstring muscles are shortening, helping extend the hip

Stabilizer: core muscles are stabilizing the pelvis and spine.

In this video, we've discussed a variety of characteristics of muscles. You may need to watch this video a few times, and also download the transcript to help you digest and understand all the information. Thanks for watching.