

## **Anatomy of Stretching**

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It is the end of your fitness class and you do your regular stretching routine. Have you thought about why you do those specific stretching exercises? Are these stretches actually increasing your participants' flexibility?

### **How to Stretch Effectively**

Flexibility is defined as the range of motion around a joint or a group of joints. Flexibility is important for joint health, body position in certain sporting activities, and assists in strength development. Improving flexibility is accomplished by conducting appropriate stretching exercises.

To pick an appropriate stretching exercise for your participant, you must first have knowledge on the osteokinetic movements of the body. The five primary types of movement are flexion, extension, abduction, adduction, and rotation. Each stretching exercise requires a joint(s) to be moved through a range of motion. Each joint has its own range of motion that determines joint function. Multiple joints and joint movements may be required to stretch a particular muscle group.

Knowledge of musculoskeletal attachments is also crucial to proper stretching. Muscle attachment (origin and insertion) points are important to know when deciding to stretch. If you want your participants to stretch their pectoral muscle, for example, first decide what bone(s) the muscle attaches to and pick a stretching exercise that will create a distance or pull between the attachments (e.g., shoulder joint and sternum). Talking about muscle attachments in fitness classes will not only educate your participants about anatomy but it will also help direct the participant to complete the stretching exercise properly.

Antagonist muscles work in opposition to one another during a stretch. To help determine a specific stretching exercise, consider utilizing the antagonist muscle group to guide your body movement. For example, extension at the hip will cause the hip extensors (gluteals) to contract while simultaneously stretching the hip flexors (iliopsoas). Please refer to Table 1 for additional examples.

### **Points to Consider When Stretching**

#### *Structural Limitations*

After considering what factors are important in picking an appropriate stretching exercise, it is essential to acknowledge the structural limitations of flexibility. Bony structures, muscle elasticity, ligaments and other structures associated with the joint capsule, and tendons, connective tissue and skin elasticity will limit your participants' flexibility. The joint capsule and muscle elasticity contribute to the greatest resistance at the joint. Other factors to consider are the ability of a muscle to relax and contract, the temperature of the joint and associated tissues, and the presence of a previous injury at the joint.

## *Body Alignment and Form*

Body alignment and form is also an important factor when stretching. If the position of the body is not correct, the muscles you intended to stretch may not be getting the anticipated benefit. A common example is with the seated forward hamstring stretch. Two common body alignment problems are at the hip joint. First, when participants bend forward trying to touch their forehead to their leg, this causes a rounding of the back. The stretch is no longer stretching the hamstring in the most efficient way; rather it is putting the upper extremities into improper posture, and putting the neck in a compromising position. Second, when participants' hips are not in alignment (i.e., the top of the femur is not in the joint and/or the hips are slightly rotated). Once the alignment of the top of the femur with hip socket is out of position, the muscle group is not able to be stretched to its maximum length, thus the stretch for the hamstring is not as effective.

## *Contraindicated Stretches*

Contraindicated stretches are still all too common. Caution is given on these stretching exercises because they put the joint and associated tissues into compromising position. Contraindicated stretches may cause damage and injury to the joint complex. Some stretching exercises that are deemed contraindicated include the hurdler's stretch, seated quadriceps stretch with both knees flexed, and the yoga plough.

## **Duration of Stretching Exercises**

A number of research studies have investigated the role of stretch exercise duration on increasing flexibility. Most guidelines suggest holding a stretch for 10-30 seconds. However, during the initial 10 -15 seconds of a stretch, only the muscle belly is the main tissue being stretched. As the stretch continues up to 30 seconds, the tissue that is stretched moves from the middle of the muscle belly to the tendons, ligaments and fascia. Since tendons, ligaments and fascia are largely responsible for range of motion and flexibility, holding a stretch for 30 seconds is ideal.

If 30 seconds of stretching is going to show improvements in flexibility and range of motion, can longer durations, such as 60 seconds or more, provide greater results? Researchers, looking specifically at the hamstring muscle group, found that there was no significant difference between stretching for 30 seconds and for 60 seconds, indicating that 30 seconds of stretching is just as effective. However, additional research is required before this finding can be applied to all muscle groups.

Table 1: Examples of Joint Movements and their Associated Muscle Reaction

<b>Joint</b>	<b>Movement</b>	<b>Muscle Contracted</b>	<b>Muscle Lengthened</b>
<b>Hip</b>	Extension	Gluteals	Hip Flexors
<b>Knee</b>	Flexion	Quadriceps	Hamstrings
<b>Elbow</b>	Extension	Triceps	Biceps
<b>Shoulder</b>	Horizontal Adduction	Pectorals	Rhomboids
<b>Ankle</b>	Dorsi Flexion	Tibialis Anterior	Gastrocnemius

## **Stretching Myths**

### *#1 – Stretching decreases the chance of injury*

A systematic review of the literature found that there was not sufficient evidence to either endorse or discontinue routine stretching before or after exercise to prevent injury. Much of the confusion stems from the idea of stretching after a warm-up. Warm-up prevents injury, whereas stretching has no effect on injury.

### *#2 – Muscles become longer after stretching*

After stretching exercises, the muscles and tendons increase their **ability to stretch**. In the case of static stretching, the muscles and tendons can remain stretched and potentially weakened for upwards of 15 minutes. This is called 'stretch lag' period or 'tendon slack'.

### *#3 – An individual's level of total body flexibility can be measured by one joint*

Flexibility is joint specific. Different joints will be more flexible than others and doing stretching exercises at one joint will not transfer to other joints in the body.

### *#4 – Acute stretching improves sporting performance*

Research has found that regular stretching improves force, jump height, and speed for sporting performance; however, there is no evidence that increased flexibility is of benefit to all athletes. Some sports require the body to be flexible (e.g., synchronized swimming, gymnastics) whereas others do not require a high level of flexibility to be competitive (e.g., baseball, football).

## Anatomy of Stretching Article Multiple Choice Exam

1. Important factors to consider when picking a stretching exercise:

- a. Osteokinetic movement of the body
- b. Musculoskeletal attachments
- c. Size of the muscle being stretched
- d. A&B
- e. All of the above

2. Flexibility is joint specific.

- a. True
- b. False

3. Hip flexion will stretch which muscle:

- a. iliopsoas
- b. tibialis anterior
- c. gluteals
- d. All of the above

4. Structural limitations of flexibility include:

- a. Joint capsule, muscle fiber type, skin, tendons & connective tissues, bony structures
- b. Skin, bony structures, muscle fiber type, joint capsule, synovial fluid
- c. Bony structures, muscle elasticity, ligaments & joint capsule, tendons & connective tissues, skin
- d. Ligaments & joint capsule, bony structure, muscle elasticity, synovial fluid, skin

5. Stretching, not warm-up, decreases the chance of injury.

- c. True
- d. False

6. Plantar flexion will stretch which muscle:

- a. iliopsoas
- b. tibialis anterior
- c. gluteals
- d. All of the above

7. Resistance at the joint is caused primarily by:

- a. skin
- b. bone
- c. tendons and connective tissue

d. joint capsule

8. Elbow extension will stretch which muscle:

- a. Triceps
- b. Biceps
- c. Rhomboids
- d. All of the above

9. It is important to be cautious with contraindicated stretching exercises because:

- a. they do not look comfortable.
- b. they put the joint and associated tissues into compromising position.
- c. they may make the muscles too long and stretched out.
- d. they are only appropriate for older adults.

10. The ideal duration to hold a stretch for improved range of motion and flexibility is:

- a. less than 10 seconds
- b. 30-60 seconds
- c. more than 60 seconds
- d. 30 seconds