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## Anatomy of Stretching

by Lisa A. Workman, MA, CSEP-CEP, AFLCA Instructor

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. It is important for joint health and for body position in certain sporting activities, and it assists in strength development. Flexibility can be improved by conducting appropriate stretching exercises.

To pick an appropriate stretching exercise for your participants, you must first be knowledgeable about the osteokinetic movements of the body. The five primary types of movement are flexion, extension, abduction, adduction, and rotation. Each stretching exercise moves one or more joints through a range of motion. Each joint has its own range of motion, which 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 keep in mind when deciding what to stretch. If you want your participants to stretch their pectoral muscle, for example, first identify the bone(s) the muscle attaches to, and then 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 them to complete the stretching exercises properly.

Antagonist muscles work in opposition to one another during a stretch. In choosing a specific stretching exercise, consider one that uses the antagonist muscle group to guide body movement. For example, extension at the hip will cause the hip extensors (gluteals) to contract while simultaneously stretching the hip flexors (iliopsoas). (See Table 1 for additional examples.)

### Points to consider when stretching

#### Structural limitations

After picking an appropriate stretching exercise, it is essential to be aware of the structural limitations of flexibility. Bony structures,

muscle elasticity, ligaments, and other structures associated with the joint capsule, as well as 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 are also important to consider when stretching. If the position of the body is incorrect, the muscles you intend 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, their back becomes rounded. They are no longer stretching the hamstring in the most efficient way; rather, they are putting their upper extremities into improper posture and putting their neck in a compromising position. Second, when their hips are not in alignment (i.e., the top of the femur is not in the joint and/or the hips are slightly rotated), participants cannot stretch the muscle group to its maximum length, making the hamstring stretch less effective.

#### Contraindicated stretches

The use of contraindicated stretches is still all too common. Caution is given on these stretching exercises because they put the joint and associated tissues into a compromising position, which may cause damage and injury to the joint complex. Some contraindicated stretching exercises 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 effects 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 being stretched. As the stretch continues up to 30 seconds, the tendons, ligaments, and fascia become involved. Since tendons, ligaments, and fascia are largely responsible for range of motion and flexibility, holding a stretch for 30 seconds is ideal.

Table 1: Examples of joint movements and their associated muscle reaction

Joint	Movement	Muscles Contracted	Muscles Lengthened
Hip	Extension	Gluteals	Hip flexors
Knee	Flexion	Quadriceps	Hamstrings
Elbow	Extension	Triceps	Biceps
Shoulder	Horizontal adduction	Pectorals	Rhomboids
Ankle	Dorsi-flexion	Tibialis anterior	Gastrocnemius

If 30 seconds of stretching is going to show improvements in flexibility and range of motion, do longer durations, such as 60 seconds or more, provide greater results? Researchers, looking specifically at the hamstring muscle group, found 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.

## Stretching myths

### 1. Stretching decreases the chance of injury.

A systematic review of the literature found insufficient 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-ups prevent 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 upward of 15 minutes. This is called the “stretch lag” period or “tendon slack.”

### 3. An individual's level of total body flexibility can be measured at 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 athletes to be flexible (e.g., synchronized swimming, gymnastics), whereas others do not require a high level of flexibility for athletes to be competitive (e.g., baseball, football).

*The following exam is based on Lisa A. Workman's article "Anatomy of Stretching." These ongoing exams are offered to AFLCA-certified leaders in each issue of the Fitness Informer as an opportunity to gain Continuing Education Credits. Exams can also be downloaded from [www.provincialfitnessunit.ca](http://www.provincialfitnessunit.ca). Submission deadline: November 30, 2008.*

Please be aware that questions may involve application of the information from the article and not simply recall. This exam is worth 1.0 AFLCA Credit.

CEC Multiple Choice Exam: Circle your answers. Mail this exam and your logbook (which will be returned to you) to the AFLCA. Good luck, and be sure to include your name and return address.

Name: \_\_\_\_\_ Address: \_\_\_\_\_

1. Which of the following factors is important 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 and b
  - e) All of the above
2. Flexibility is joint specific.
  - a) True
  - b) False
3. Hip flexion stretches which of the following muscles?
  - a) Iliopsoas
  - b) Tibialis anterior
  - c) Gluteals
  - d) All of the above
4. Structural limitations of flexibility include
  - a) joint capsule, muscle fibre type, skin, tendons and connective tissues, bony structures
  - b) skin, bony structures, muscle fibre type, joint capsule, synovial fluid
  - c) bony structures, muscle elasticity, ligaments and joint capsule, tendons and connective tissues, skin
  - d) ligaments and joint capsule, bony structures, muscle elasticity, synovial fluid, skin
5. Stretching, not warm-up, decreases the chance of injury.
  - a) True
  - b) False
6. Plantar flexion stretches which of the following muscles?
  - a) Iliopsoas
  - b) Tibialis anterior
  - c) Gluteals
  - d) All of the above
7. Resistance at the joint is caused primarily by the
  - a) skin
  - b) bone
  - c) tendons and connective tissue
  - d) joint capsule
8. Elbow extension stretches which of the following muscles?
  - 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 look uncomfortable
  - b) they put the joint and associated tissues into a compromising position
  - c) they may make the muscles too long and stretched out
  - d) they are appropriate for older adults only
10. The ideal duration to hold a stretch to improve range of motion and flexibility is
  - a) < 10 seconds
  - b) 30 seconds
  - c) 30–60 seconds
  - d) > 60 seconds