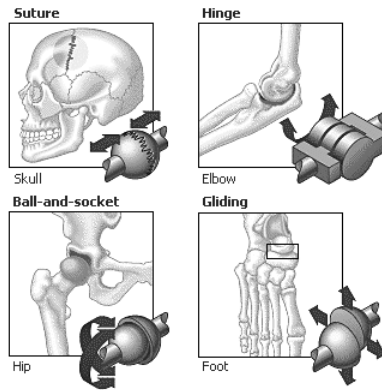


FLEXIBILITY

FLEXIBILITY is defined as the ability to move joints freely through their full range of motion. The full range of motion is determined in part by the shapes and positions of the bones that make up the joint and in part by the composition and arrangement of muscles and tendons around the joint. There are 4 types of joints in the human body: 1) *Sutures* (ex. skull) allow for growth but have little range of motion; 2) *Hinge* (ex. elbow and knee) allow for movement in one plane; 3) *Ball-and-socket* (ex. hip and shoulder) allow for the greatest range of motion as this joint can rotate in a complete circle; 4) *Gliding* (ex. wrist and foot) provide for limited movement as two flat-surfaced bones slide over one another.



Although flexibility varies among individuals due to differences in body structure, it is not a fixed property. The range of motion of most joints can be increased with proper training techniques or can decline with lack of use. Flexibility is joint-specific: a lot of flexibility in one joint does not necessarily mean flexibility in all joints.

BENEFITS OF FLEXIBILITY: Increased joint mobility; resistance to muscle injury; prevention of low back problems (most back pain is due to misalignment of the vertebral column and pelvic girdle caused by lack of flexibility); efficient body movement; improved posture and personal appearance.

STRUCTURAL LIMITATIONS TO MOVEMENT

Five factors contribute to the limits of movement: bone; muscle, connective tissue within the joint capsule (ligaments that hold bones together and cartilage which cushions the ends of the bones); tendons (connects muscle to bones and surrounding connective tissue); skin. Exercise aimed at improving flexibility does not change the structure of bone, but it alters the soft tissue (muscle, connective tissue and tendons). Exercises aimed at improving flexibility must alter one of these three factors in order to increase the range of motion around a joint. Muscles and tendons are soft tissues that lengthen over time. Stretching exercises increase the range of motion in the joint by reducing the resistance to movement caused by tight muscles and tendons.

STRETCHING AND THE STRETCH REFLEX

Muscles contain special receptors called *muscle spindles* that are sensitive to stretch. (Remember when the doctor tapped your knee with a rubber hammer and your leg involuntarily snapped forward? The stretch reflex was at work keeping the muscle from stretching too far too fast!) The stretch reflex protects against potential injury to the joint or muscles. If muscle spindles are stretched suddenly, they respond by initiating the stretch reflex that causes the muscle to contract and shorten. However, the stretch reflex can be avoided when muscles and tendons are stretched very slowly. In fact, if a muscle stretch is held for several seconds, the muscle spindles allow the muscle being stretched to further relax and permit an even greater stretch.

FLEXIBILITY AND LOWER BACK HEALTH

Lower back pain is very often associated with lack of exercise. Potential contributors to the problem are lack of flexibility in the low back lumbar region, hamstrings and hip flexors along with lack of strength in the abdominal and back extensor muscles. Long-term heavy backpack use can contribute to misalignment in the lower back.

DESIGNING A FLEXIBILITY TRAINING PROGRAM

Three kinds of stretching techniques are commonly used to increase flexibility:

- **Dynamic stretching**
 - Different from ballistic stretching, this involves controlled movement of parts of your body, gradually increasing reach, speed of movement or both.
 - Controlled leg and arm swings that take the body *through* the limits of its range of motion, rather than *beyond* (*ballistic) its range of motion. (ex. Slow, controlled leg or arm swings, torso twists)
 - Dynamic stretching improves dynamic flexibility and is quite useful as part of a warm up for an active or aerobic workout (i.e. dance or martial-arts).
- **Static stretching**
 - This style of stretching is very effective for improving flexibility.
 - Slowly lengthens a muscle to a point at which further movement is limited (slight discomfort is felt) and requires holding this position for a fixed period of time. Holding the stretch for 20-30 seconds, repeated 3 to 4 times, results in improved flexibility.
 - When proper technique is used, the risk of injury when using static stretching is minimal.
 - Static stretching during the general warm up can prepare the body for a more effective workout.
 - The use of static stretching as part of the cool down period may reduce the muscle stiffness associated with some workout routines.
- **Proprioceptive neuromuscular facilitation (PNF)**
 - This technique combines stretching with alternation contraction and relaxation of a muscle. There are two types of PNF stretching: CR (Contract-Relax) and CRAC (Contract-relax/antagonist contract).
 - The PNF technique has been shown to be safer and more effective than ballistic stretching. It has been shown to be equal to static stretching for improving flexibility.
 - The disadvantage of PNF is that some of the stretches require a partner to assist.

*Ballistic stretching involves bobbing, bouncing and rebounding types of movement that takes the joint through and *beyond* its range of motion. Although sometimes useful for athletes who perform ballistic movements in their sports, it is not generally recommended for the average person seeking improved flexibility for fitness, or warming up for or cooling down from a workout. This type of stretching can activate the stretch reflex and increase the potential for injury to the muscles and tendons

Stretching for a More Effective Workout

- Use static and dynamic stretching as part of a general warm up to prepare the body to work out.
- Use static stretching after completing a workout to help prevent muscle stiffness and soreness.

EXERCISE PRESCRIPTION FOR IMPROVING FLEXIBILITY

For safety reasons, all flexibility programs should consist of static, dynamic or PNF stretching exercises. Stretching exercises should be performed 2 to 5 days per week for 10 to 30 minutes each day. Begin with one 5-minute stretching session and increase gradually to 20-30-minute sessions. The intensity of a stretch is considered to be maximal when “mild discomfort” is felt. In time, you will see increased range of motion. To improve overall flexibility, all major muscle groups should be stretched. Maintain a lifetime of stretching. Do stretching exercises anywhere and anytime you can during your day. Keep a record of your stretching workouts so you can monitor your improvement.

- To prevent injury that can result from improperly stretching, avoid breath holding, full flexion of knee or neck, full extension of the knee, neck or back, stretching a joint to the point of pain, or forceful extension and flexion of the spine.
- The best time to stretch, whether as part of a general warm up or part of a flexibility workout is when the muscles are warm. Precede stretching exercises with a few minutes of low intensity cardio exercise.