

WARM-UP/COOL-DOWN/FLEXIBILITY

Both the warm-up and the cool-down are an essential part of any exercise program.

WARM-UP

A warm-up should consist of 5 – 10 minutes of fairly low intensity, rhythmic exercise of larger muscle groups done before an activity which provides the body with a period of adjustment between rest and the performance of that activity. The purpose of the warm-up is to prepare the body for more vigorous activity and to reduce the chance of injury.

A warm-up gradually warms tissues, increasing blood flow and nutrients to active areas. This preparation of the soft tissue structures for the flexibility necessary for a particular activity will help prevent injury. It also fine-tunes the central nervous system receptors to improve kinesthetic awareness (an individual's sense of his/her position and movement in space during activity). This kinesthetic awareness helps prepare the body for activity so that the individual gains a certain amount of protection and psychological readiness necessary for reducing potential injuries.

A WARM-UP MAY CONSIST OF THREE PARTS:

1. **A graduated aerobic warm-up activity.** This period of the warm-up is designed to raise the internal temperature. Walking, jogging, rope jumping, calisthenics are examples of activities that could be done to accomplish this goal.
2. **Flexibility (stretching) exercises.** Since a warm muscle is stretched more easily than a cold muscle, the flexibility component of the warm-up should follow the low-level aerobic activity. Additional information regarding flexibility and stretching will follow.
3. **Activity specific exercises.** Movement in the warm-up should specifically prepare the body for the movements to be used in the activity/exercise session. Specificity not only ensures that the

appropriate muscles are warmed up, but it also provides a rehearsal effect. The neuromuscular system has a chance to practice or rehearse muscular patterns similar to those that will be used later. The warm-up activity mimics the actual movements but at reduced levels of intensity. Throwing a softball/ baseball with a partner before a game is an example of a specific warm-up. This rehearsal may enhance performance and reduce injury.

The goal of an effective warm-up should be to elevate the core body temperature one to two degrees so that sweating occurs. For each degree of temperature elevation, the metabolic rate of the cells increases by about 13%. In addition, at higher body temperatures, blood flow to the working muscles increases as does the release of oxygen to the muscles. These effects allow more efficient energy production to fuel muscle contraction.

Increase in temperature has other effects that are beneficial as well. Many of the physiological benefits that are listed may reduce the risk of injury because they have the potential to increase neuromuscular coordination, delay fatigue, or make the tissues less susceptible to damage.

PHYSIOLOGICAL BENEFITS OF A WARM-UP

- Higher metabolic rate.
- Increased blood flow to the muscles.
- Higher rate of oxygen exchange between blood and muscles.
- More oxygen released within the muscles.
- Increased muscle elasticity.
- Increased flexibility of the tendons and ligaments.
- Increased speed and force of muscle contraction.
- Decreased muscle relaxation time following contraction.
- Rehearsal effect (the body practices muscular patterns to be used later).
- Faster nerve impulse transmission.
- Decreased potential of cardiac problems (warm-up helps to avoid the build-up of lactic acid and prevents excess oxygen debt).

OTHER FACTORS PERTAINING TO

WARM-UP:

1. Warm-up is individually specific. The amount, intensity, and length varies between individuals.
2. A well-conditioned athlete may require a longer, more intense warm-up than a less conditioned person.
3. Care must be taken not to warm up too long or intensely as to cause fatigue or negatively affect performance.

COOL-DOWN

A cool-down is a period following moderate to heavy exercise during which activity tapers off and the heart rate and body temperature gradually return to resting levels. Stopping exercise abruptly after a period of vigorous activity may trap a large quantity of blood in the muscles or lower parts of the body. As a result, an insufficient amount of blood circulates back to the brain or heart, which may cause dizziness or faintness. A proper cool-down ensures adequate circulation to the skeletal muscles, heart, and the brain. It also aids in the removal of accumulated lactic acid and may prevent cardiac arrhythmias following strenuous exercise.

The length of the cool-down phase should be proportional to the intensity and length of the conditioning phase. Generally, a 5 – 10 minute cool-down is adequate. It is best to perform a series of movements that allow the muscles and cardiovascular system to reduce their elevated levels of activity gradually. Low-level exercise similar to that of the conditioning exercise is recommended (walking, slow jogging, cycling with little resistance, etc.). When heart rates are near resting levels, muscle stretching and limbering exercises should again be performed to reduce the risk of developing delayed muscle soreness.

FLEXIBILITY

Flexibility is a joint's ability to move freely in every direction, or more specifically, through a full and normal range of motion (ROM). Within each joint, and for each activity, there is an optimum ROM essential to peak performance.

Flexibility training minimizes the factors that limit flexibility and helps balance muscle groups. Some of the factors that can limit joint mobility include: genetic inheritance; the bony structure of the joint itself; the ligamentous structure of the joint; connective tissue elasticity within muscles, tendons, or skin surrounding the joint; and neuromuscular coordination. The bony structure of a joint cannot be changed. In addition, a joint ligament (the fibrous band connecting bones) or joint capsule should never be stretched because to do so would lead to an unstable joint and an increased risk of joint injury. So, the only desirable way that range of motion can be altered is by gently stretching the muscles and tendons that control the movement of the joint.

Flexibility can be enhanced by using a variety of stretching methods. It is accomplished by applying a force (stretch or tension) to the involved limb in order to overcome a resistance within the joint. By doing this the range of motion is increased. Stretch refers to the process of elongation. There are three basic techniques of stretching that are used to increase flexibility: static stretching, ballistic (dynamic) stretching, and proprioceptive neuromuscular facilitation (PNF) stretching. Of these, the static stretching method is recommended as the most effective in achieving results and the least likely to cause injury.

STATIC STRETCHING

Static stretching involves a slow, gradual, and controlled elongation through a full range of motion. It involves holding a static (non-moving) position so that the specified joint is immobilized in a position that places the desired muscles and connective tissues passively at their greatest possible length. A static stretch position is typically held for 10 – 30 seconds. It is best characterized as low-intensity, long-duration stretching. It has been shown to produce good results with little muscle soreness. In fact, static stretching is commonly used to prevent/reduce muscle soreness. Little risk of physical injury exists if static stretching is performed properly.

Stretching in this manner physiologically suppresses the stretch reflex, which is the body's automatic protective mechanism against injury/abuse. Whenever a muscle is stretched quickly and with force, a reflex is initiated which causes the stretched muscle to contract to protect and prevent injury.

BALLISTIC STRETCHING

Ballistic stretching is characterized by rapid, uncontrolled, bouncing or bobbing motions. This technique uses high-intensity, short-duration movements. These movements evoke the stretch reflexes that oppose the desired stretching. This reflex results in the suddenly stretched muscle responding with a corresponding contraction. Ballistic stretching ends up increasing muscle tension, the opposite of the physiological response that is desired. This method of stretching is not recommended because of the increased risk of injury.

PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION – PNF

A third type of stretching, proprioceptive neuromuscular facilitation or PNF, is a relatively new technique. PNF involves statically stretching a muscle immediately after maximally contracting it. It is based on the principle of reciprocal inhibition. There is an initial isometric contraction against maximum resistance at the end of the limb's range of motion for approximately six seconds, followed by relaxation and a slow, passive stretch to the point of limitation. This sequence is usually repeated several times. It is often referred to as a contract/relax method of stretching.

GENERAL PRINCIPLES REGARDING FLEXIBILITY

1. A very easy general warm-up should precede stretching exercises to increase blood flow to the area.
2. Stretching exercises should be performed without bouncing or jerking, which may injure connective tissues and stimulate the stretch reflex.
3. Attempts to stretch a muscle/muscle group beyond the normal range of motion should never be made.
4. Excessive resistance should never be used. All stretching should be done gently – muscle tension may be felt but not muscle pain.

BENEFITS OF FLEXIBILITY – A FULL RANGE OF MOTION

- Increased physical efficiency and performance.
- Decreased risk of injury.
- Increased blood supply and nutrients to joint structures.
- Increased quality and quantity of joint synovial fluid.
- Increased neuromuscular coordination.
- Reduced muscular soreness.
- Improved muscular balance and posture.
- Decreased risk of low-back pain.
- Reduced stress – promotes muscular relaxation.
- Enjoyment of training program.

FACTORS AFFECTING FLEXIBILITY

- Age
- Inactivity
- Gender
- Body type
- Strength training