Types of Stretching

Just as there are different types of flexibility, there are also different types of stretching. Stretches are either dynamic (meaning they involve motion) or static (meaning they involve no motion). Dynamic stretches affect dynamic flexibility and static stretches affect static flexibility (and dynamic flexibility to some degree).
The different types of stretching are:

1. ballistic stretching
2. dynamic stretching
3. active stretching
4. passive (or relaxed) stretching
5. static stretching
6. isometric stretching
7. PNF stretching

Ballistic Stretching

Ballistic stretching uses the momentum of a moving body or a limb in an attempt to force it beyond its normal range of motion. This is stretching, or "warming up", by bouncing into (or out of) a stretched position, using the stretched muscles as a spring which pulls you out of the stretched position. (e.g. bouncing down repeatedly to touch your toes.) This type of stretching is not considered useful and can lead to injury. It does not allow your muscles to adjust to, and relax in, the stretched position. It may instead cause them to tighten up by repeatedly activating the stretch reflex

Dynamic Stretching

Dynamic stretching, according to *Kurz*, "involves moving parts of your body and gradually increasing reach, speed of movement, or both." Do not confuse dynamic stretching with ballistic stretching! Dynamic stretching consists of controlled leg and arm swings that take you (gently!) to the limits of your range of motion. Ballistic stretches involve trying to force a part of the body *beyond* its range of motion. In dynamic stretches, there are no bounces or "jerky" movements. An example of dynamic stretching would be slow, controlled leg swings, arm swings, or torso twists.
Dynamic stretching improves dynamic flexibility and is quite useful as part of your warm-up for an active or aerobic workout (such as a dance or martial-arts class)..
According to *Kurz*, dynamic stretching exercises should be performed in sets of 8-12 repetitions:

> Perform your exercises (leg raises, arm swings) in sets of eight to twelve repetitions. If after a few sets you feel tired -- stop. Tired muscles are less elastic, which causes a decrease in the amplitude of your movements. Do only the

number of repetitions that you can do without decreasing your range of motion. More repetitions will only set the nervous regulation of the muscles' length at the level of these less than best repetitions and may cause you to lose some of your flexibility. What you repeat more times or with a greater effort will leave a deeper trace in your [kinaesthetic] memory! After reaching the maximal range of motion in a joint in any direction of movement, you should not do many more repetitions of this movement in a given workout. Even if you can maintain a maximal range of motion over many repetitions, you will set an unnecessarily solid memory of the range of these movements. You will then have to overcome these memories in order to make further progress.

Active Stretching

Active stretching is also referred to as *static-active stretching*. An active stretch is one where you assume a position and then hold it there with no assistance other than using the strength of your agonist muscles For example, bringing your leg up high and then holding it there without anything (other than your leg muscles themselves) to keep the leg in that extended position. The tension of the agonists in an active stretch helps to relax the muscles being stretched (the antagonists) by reciprocal inhibition
Active stretching increases active flexibility and strengthens the agonistic muscles.
Active stretches are usually quite difficult to hold and maintain for more than 10 seconds and rarely need to be held any longer than 15 seconds.
Many of the movements (or stretches) found in various forms of yoga are active stretches.

Passive Stretching

Passive stretching is also referred to as *relaxed stretching*, and as *static-passive stretching*. A passive stretch is one where you assume a position and hold it with some other part of your body, or with the assistance of a partner or some other apparatus. For example, bringing your leg up high and then holding it there with your hand. The splits is an example of a passive stretch (in this case the floor is the "apparatus" that you use to maintain your extended position).
Slow, relaxed stretching is useful in relieving spasms in muscles that are healing after an injury. Obviously, you should check with your doctor first to see if it is okay to attempt to stretch the injured muscles).
Relaxed stretching is also very good for "cooling down" after a workout and helps reduce post-workout muscle fatigue, and soreness..

Static Stretching

Many people use the term "passive stretching" and "static stretching" interchangeably. However, there are a number of people who make a distinction between the two. According to *M. Alter*:

Static stretching involves holding a position. That is, you stretch to the farthest point and hold the stretch ...

Passive stretching is a technique in which you are relaxed and make no contribution to the range of motion. Instead, an external force is created by an outside agent, either manually or mechanically.

Notice that the definition of passive stretching given in the previous section encompasses *both* of the above definitions. Throughout this document, when the term *static stretching* or *passive stretching* is used, its intended meaning is the definition of passive stretching as described in the previous section. You should be aware of these alternative meanings, however, when looking at other references on stretching.

Isometric Stretching

Isometric stretching is a type of static stretching (meaning it does not use motion) which involves the resistance of muscle groups through isometric contractions (tensing) of the stretched
. The use of isometric stretching is one of the fastest ways to develop increased static-passive flexibility and is much more effective than either passive stretching or active stretching alone. Isometric stretches also help to develop strength in the "tensed" muscles (which helps to develop static-active flexibility), and seems to decrease the amount of pain usually associated with stretching.
The most common ways to provide the needed resistance for an isometric stretch are to apply resistance manually to one's own limbs, to have a partner apply the resistance, or to use an apparatus such as a wall (or the floor) to provide resistance.
An example of manual resistance would be holding onto the ball of your foot to keep it from flexing while you are using the muscles of your calf to try and straighten your instep so that the toes are pointed.
An example of using a partner to provide resistance would be having a partner hold your leg up high (and keep it there) while you attempt to force your leg back down to the ground.
An example of using the wall to provide resistance would be the well known "push-the-wall" calf-stretch where you are actively attempting to move the wall (even though you know you can't).
Isometric stretching is *not* recommended for children and adolescents whose bones are still growing. These people are usually already flexible enough that the strong stretches produced by the isometric contraction have a much higher risk of damaging tendons and connective tissue. *Kurz* strongly recommends preceding any isometric stretch of a muscle with dynamic strength training for the muscle to be stretched. A full session of isometric stretching makes a lot of demands on the muscles being stretched and should not be performed more than once per day for a given group of muscles (ideally, no more than once every 36 hours).
The proper way to perform an isometric stretch is as follows:

1. Assume the position of a passive stretch for the desired muscle.
2. Next, tense the stretched muscle for 7-15 seconds (resisting against some force that will not move, like the floor or a partner).
3. Finally, relax the muscle for at least 20 seconds.

Some people seem to recommend holding the isometric contraction for longer than 15 seconds, but according to *Syner Stretch* (the videotape), research has shown that this is not necessary. So you might as well make your stretching routine less time consuming.

How Isometric Stretching Works

Recall from our previous discussion that there is no such thing as a partially contracted muscle fibre: when a muscle is contracted, some of the fibres contract and some remain at rest (more fibres are recruited as the load on the muscle increases). Similarly, when a muscle is stretched, some of the fibres are elongated and some remain at rest (During an isometric contraction, some of the resting fibres are being pulled upon from both ends by the muscles that are contracting. The result is that some of those resting fibres stretch!

Normally, the handful of fibres that stretch during an isometric contraction are not very significant. The true effectiveness of the isometric contraction occurs when a muscle that is already in a stretched position is subjected to an isometric contraction. In this case, some of the muscle fibres are already stretched before the contraction, and, if held long enough, the initial passive stretch overcomes the stretch reflex and triggers the lengthening reaction inhibiting the stretched fibres from contracting. At this point, according to *Syner Stretch*:

> When you isometrically contracted, some of the resting fibres would contract, many of the resting fibres would stretch, and many of the already stretched fibres, which are being prevented from contracting by the inverse myotatic reflex [the lengthening reaction], would stretch even more. When the isometric contraction was relaxed and the contracting fibres returned to their resting length, the stretched fibres would retain their ability to stretch beyond their normal limit. ... the whole muscle would be able to stretch beyond its initial maximum, and you would have increased flexibility ...

The reason that the stretched fibres develop and retain the ability to stretch beyond their normal limit during an isometric stretch has to do with the muscle spindles. The signal which tells the muscle to contract voluntarily, also tells the muscle spindle's (intra fusal) muscle fibres to shorten, increasing sensitivity of the stretch reflex.

This mechanism normally maintains the sensitivity of the muscle spindle as the muscle shortens during contraction. This allows the muscle spindles to habituate (become accustomed) to an even further-lengthened position.

PNF Stretching

PNF stretching is currently the fastest and most effective way known to increase static-passive flexibility. PNF is an acronym for *proprioceptive neuromuscular facilitation*. It is not really a type of stretching but is a technique of combining passive stretching and isometric stretching in order to achieve maximum static flexibility. Actually, the term PNF stretching is itself a misnomer. PNF was initially developed as a method of rehabilitating stroke victims. PNF refers to any of several *post-isometric relaxation* stretching techniques in which a muscle group is passively stretched, then contracts isometrically against resistance while in the stretched position, and then is passively stretched again through the resulting increased range of motion. PNF stretching usually employs the use of a partner to provide resistance against the isometric contraction and then later to passively take the joint through its increased range of motion. It may be performed, however, without a partner, although it is usually more effective with a partner's assistance.

Most PNF stretching techniques employ *isometric agonist contraction/relaxation* where the stretched muscles are contracted isometrically and then relaxed. Some PNF techniques also employ *isometric antagonist contraction* where the antagonists of the stretched muscles are contracted. In all cases, it is important to note that the stretched muscle should be rested (and relaxed) for at least 20 seconds before performing another PNF technique. The most common PNF stretching techniques are:

the *hold-relax*

This technique is also called the *contract-relax*. After assuming an initial passive stretch, the muscle being stretched is isometrically contracted for 7-15 seconds, after which the muscle is briefly relaxed for 2-3 seconds, and then immediately subjected to a passive stretch which stretches the muscle even further than the initial passive stretch. This final passive stretch is held for 10-15 seconds. The muscle is then relaxed for 20 seconds before performing another PNF technique.

the *hold-relax-contract*

This technique is also called the *contract-relax-contract*, and the *contract-relax-antagonist-contract* (or *CRAC*). It involves performing two isometric contractions: first of the agonists, then, of the antagonists. The first part is similar to the hold-relax where, after assuming an initial passive stretch, the stretched muscle is isometrically contracted for 7-15 seconds. Then the muscle is relaxed while its antagonist immediately performs an isometric contraction that is held for 7-15 seconds. The muscles are then relaxed for 20 seconds before performing another PNF technique.

the *hold-relax-swing*

This technique (and a similar technique called the *hold-relax-bounce*) actually involves the use of dynamic or ballistic stretches in conjunction with static and isometric stretches. It is **very** risky, and is successfully used only by the most advanced of athletes and dancers that have managed to achieve a high level of control over their muscle stretch It is similar to the hold-relax technique except that a dynamic or ballistic stretch is employed in place of the final passive stretch.

Notice that in the hold-relax-contract, there is no final passive stretch. It is replaced by the antagonist-contraction which, via reciprocal inhibition), serves to relax and further stretch the muscle that was subjected to the initial passive stretch. Because there is no final passive stretch, this PNF technique is considered one of the safest PNF techniques to perform (it is less likely to result in torn muscle tissue). Some people like to make the technique even more intense by adding the final passive stretch after the second isometric contraction. Although this can result in greater flexibility gains, it also increases the likelihood of injury.

Even more risky are dynamic and ballistic PNF stretching techniques like the hold-relax-swing, and the hold-relax-bounce. If you are not a professional athlete or dancer, you probably have no business attempting either of these techniques (the likelihood of injury is just too great). Even professionals should not attempt these techniques without the guidance of a professional coach or training advisor. These two techniques have the greatest potential for rapid flexibility gains, but only when performed by people who have a sufficiently high level of control of the stretch reflex in the muscles that are being stretched.

Like isometric stretching, PNF stretching is also not recommended for children and people whose bones are still growing (for the same reasons. Also like isometric stretching, PNF stretching helps strengthen the muscles that are contracted and therefore is good for increasing active flexibility as well as passive flexibility. Furthermore, as with isometric stretching, PNF stretching is very strenuous and should be performed for a given muscle group no more than once per day (ideally, no more than once per 36 hour period).

The initial recommended procedure for PNF stretching is to perform the desired PNF technique 3-5 times for a given muscle group (resting 20 seconds between each repetition). However, *HFLTA* cites a 1987 study whose results suggest that performing 3-5 repetitions of a PNF technique for a given muscle group is not necessarily any more effective than performing the technique only once. As a result, in order to decrease the amount of time taken up by your stretching routine (without decreasing its effectiveness), *HFLTA* recommends performing only one PNF technique per muscle group stretched in a given stretching session.

How PNF Stretching Works

Remember that during an isometric stretch, when the muscle performing the isometric contraction is relaxed, it retains its ability to stretch beyond its initial maximum length.

Well, PNF tries to take immediate advantage of this increased range of motion by immediately subjecting the contracted muscle to a passive stretch.
The isometric contraction of the stretched muscle accomplishes several things:

1. As explained previously, it helps to train the stretch receptors of the muscle spindle to immediately accommodate a greater muscle length.
2. The intense muscle contraction, and the fact that it is maintained for a period of time, serves to fatigue many of the fast-twitch fibres of the contracting muscles. This makes it harder for the fatigued muscle fibres to contract in resistance to a subsequent stretch.
3. The tension generated by the contraction activates the golgi tendon organ, which inhibits contraction of the muscle via the lengthening reaction (see section .
4. Voluntary contraction during a stretch increases tension on the muscle, activating the golgi tendon organs more than the stretch alone. So, when the voluntary contraction is stopped, the muscle is even more inhibited from contracting against a subsequent stretch.

PNF stretching techniques take advantage of the sudden "vulnerability" of the muscle and its increased range of motion by using the period of time immediately following the isometric contraction to train the stretch receptors to get used to this new, increased, range of muscle length. This is what the final passive (or in some cases, dynamic) stretch accomplishes.

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Dynamic Stretching Exercises

The following are examples of dynamic stretching and mobility exercises, which could form part of the warm up program in a training session. The dynamic exercises you incorporate into your warm up program should be appropriate to the movements you would experience in your sport/event. In all the exercises breathe easily whilst performing them.
Current research work detailed in Medicine & Science in Sport and Exercise 33(3), pp354-358 and Journal of Strength and Conditioning Research, vol 15 (1): 98-101 suggests that the use of dynamic stretches - slow controlled movements through the full range of motion - are the most appropriate exercises for the warm up. By contrast, static stretches are more appropriate for the cool down.

The Exercises

Joint Rotations

From a standing position with your arms hanging loosely at you sides, flex, extend, and rotate each of the following joints:

- Fingers
- Wrist
- Elbows
- Shoulders
- Neck
- Trunk and shoulder blades
- Hips
- Knees
- Ankles
- Feet and toes

Neck Mobility

- Flexion/Extension - Tuck your chin into your chest, and then lift your chin upward as far as possible. 6 to 10 repetitions
- Lateral Flexion - lower your left ear toward your left shoulder and then your right ear to your right shoulder. 6 to 10 repetitions
- Rotation - Turn your chin laterally toward your left shoulder and then rotate it toward your right shoulder. 6 to 10 repetitions

Shoulder Circles

- Stand tall, feet slightly wider than shoulder-width apart, knees slightly bent
- Raise your right shoulder towards your right ear, take it backwards, down and then up again to the ear in a smooth action
- Repeat with the other shoulder

Arm Swings

- Stand tall, feet slightly wider than shoulder-width apart, knees slightly bent
- Keep the back straight at all times
- Overhead/Down and back - Swing both arms continuously to an overhead position and then forward, down, and backwards. 6 to 10 repetitions
- Side/Front Crossover - Swing both arms out to your sides and then cross them in front of your chest. 6 to 10 repetitions

Side Bends

- Stand tall with good posture, feet slightly wider than shoulder-width apart, knees slightly bent, hands resting on hips
- Lift your trunk up and away from your hips and bend smoothly first to one side, then the other, avoiding the tendency to lean either forwards or backwards

- Repeat the whole sequence sixteen times with a slow rhythm, breathing out as you bend to the side, and in as you return to the centre

Hip circles and twists

- Circles - With your hands on your hips and feet spread wider than your shoulders, make circles with your hips in a clockwise direction for 10 to 12 repetitions. Then repeat in a counter clockwise direction

Twists - Extend your arms out to your sides, and twist

Static Stretching Exercises

The following are examples of general static stretching and mobility exercises which could form part of the cool down program at the end of a training session. The aim is to relax the muscles and facilitate an improvement in maximum range of motion. In all exercises breathe easily whilst performing them and hold the static stretches for 20 seconds.

Current research work detailed in Medicine & Science in Sport and Exercise 33(3), pp354-358 and Journal of Strength and Conditioning Research, vol 15 (1): 98-101 suggests that the use of dynamic stretches - slow controlled movements through the full range of motion - are the most appropriate exercises for warming up. By contrast, static stretches are more appropriate for the cool down.

The Exercises

Chest Stretch

- Stand tall, feet slightly wider than shoulder-width apart, knees slightly bent
- Hold you arms out to the side parallel with the ground and the palms of the hand facing forward
- Stretch the arms back as far as possible
- You should feel the stretch across your chest

Biceps Stretch

- Stand tall, feet slightly wider than shoulder-width apart, knees slightly bent
- Hold you arms out to the side parallel with the ground and the palms of the hand facing forward
- Rotate the hands so the palms face to the rear
- Stretch the arms back as far as possible
- You should feel the stretch across your chest and in the biceps

Upper Back Stretch

- Stand tall, feet slightly wider than shoulder-width apart, knees slightly bent
- Interlock your fingers and push your hands as far away from your chest as possible, allowing your upper back to relax
- You should feel the stretch between your shoulder blades

Shoulder Stretch

- Stand tall, feet slightly wider than shoulder-width apart, knees slightly bent
- Place your right arm, parallel with the ground across the front of your chest
- Bend the left arm up and use the left forearm to ease the right arm closer to you chest
- You will feel the stretch in the shoulder
- Repeat with the other arm

Shoulder and Triceps Stretch

- Stand tall, feet slightly wider than shoulder-width apart, knees slightly bent
- Place both hands above your head and then slide both of your hands down the middle of your spine
- You will feel the stretch in the shoulders and the triceps

Side Bends

- Stand tall, feet slightly wider than shoulder-width apart, knees slightly bent, hands resting on the hips
- Bend slowly to one side, come back to the vertical position and then bend to the other side
- Do not lean forwards or backwards

Abdominal and lower back muscles

- Lie face down on the ground in a prone position

- Lift your body off the ground so that you are supported only by your forearms and toes. The elbows should be on the ground and should be almost directly below your shoulders. Your forearms and hands should be resting on the ground, pointed straight ahead, toes and feet should be shoulder width apart and your head in line with your spine

- Contract your gluteus (bum) muscles gently. Hold for ten seconds
- Lift your right arm off the ground, straighten it and point it straight ahead, holding it in the air for 10 seconds
- Return to the starting position
- Repeat with the left arm
- Return to starting position
- Lift your right leg off the ground and hold it there for ten seconds (keep back straight).
- Return to starting position
- Repeat with left leg
- Return to starting position
- lift your right arm and left leg simultaneously and hold them in position for ten seconds

- Return to starting position
- Lift your left arm and right leg simultaneously and hold them in position for ten seconds
- Return to the starting position

Hamstring Stretch

- Sit on the ground with both legs straight out in front of you
- Bend the left leg and place the sole of the left foot alongside the knee of the right leg
- Allow the left leg to lie relaxed on the ground
- Bend forward keeping the back straight
- You will feel the stretch in the hamstring of the right leg
- Repeat with the other leg

Calf Stretch

- Stand tall with one leg in front of the other, hands flat and at shoulder height against a wall.
- Ease your back leg further away from the wall, keeping it straight and press the heel firmly into the floor
- Keep your hips facing the wall and the rear leg and spine in a straight line
- You will feel the stretch in the calf of the rear leg
- Repeat with the other leg

Hip and Thigh Stretch

- Stand tall with you feet approximately two shoulder widths apart
- Turn the feet and face to the right
- Bend the right leg so that the right thigh is parallel with the ground and the right lower leg is vertical
- Gradually lower the body
- Keep you back straight and use the arms to balance
- You will feel the stretch along the front of the left thigh and along the hamstrings of the right leg
- Repeat by turning and facing to the left

Adductor Stretch

- Stand tall with you feet approximately two shoulder widths apart
- Bend the right leg and lower the body
- Keep you back straight and use the arms to balance
- You will feel the stretch in the left leg adductor
- Repeat with the left leg

Groin Stretch

- Sit with tall posture

- Ease both of your feet up towards your body and place the soles of your feet together, allowing your knees to come up and out to the side
- Resting your hands on your lower legs or ankles and ease both knees towards the ground
- You will feel the stretch along the inside of your thighs and groin

Front of Trunk Stretch

- Lie face down on the floor, fully outstretched
- Bring your hands to the sides of your shoulders and ease your chest off the floor, keeping your hips firmly pressed into the ground
- You will feel the stretch in the front of the trunk

Iliotibial Band Stretch

- Sitting tall with legs stretched out in front of you
- Bend the right knee and place the right foot on the ground to the left side of the left knee
- Turn your shoulders so that you are facing to the right
- Using your left arm against your right knee to help ease you further round
- Use your right arm on the floor for support
- You will feel the stretch along the length of the spine and in the muscles around the right hip

Quadriceps Stretch

- Lie face down on the floor, resting your fore-head on your right hand
- Press your hips firmly into the floor and bring your left foot up towards your buttocks
- Take hold of the left foot with the left hand and ease the foot closer to you buttocks
- Repeat with the right leg
- You will feel the stretch along the front of the thigh