

STRENGTH AND FLEXIBILITY IN GYMNASTICS TRAINING



Background

The primary focus in gymnastics is the ability to learn complex physical skills and then be able to perform them effectively under pressure in major competitions. Consequently, mastering the technicality of those skills is paramount in all gymnastics training programs.

Strength

However, technique can only be applied within the boundaries of physical fitness - be it strength, power or anaerobic capacity. The physiological demands of gymnastics competitions places a heavy burden on anaerobic fitness. While energy contributions will differ between different apparatus, this means that strength and power are more important to a gymnast than aerobic endurance.

Unfortunately, strength training in sport is often misunderstood. Bodybuilding and weight training purely for aesthetic purposes bears little resemblance to strength training for gymnastics. In fact, the wrong type of strength training can actually be detrimental to performance. Bodybuilders train muscle groups - athletes must train muscle movements. This is especially true for gymnasts who usually perform movements that require every major muscle group in the body to work in synergy.

Performing more gymnastics does not guarantee even a minimum level of strength to perform the skill correctly. Instead, conditioning is required so that the athlete can learn the skill correctly the first time. Re-learning a skill can be time consuming, frustrating and inefficient. Of course the principle of specificity still holds true and conditioning should match the movement patterns of the events as closely as possible.

Stretching

Stretching exercises should form an integral part of any conditioning program. Performed consistently, the stretching exercises below can help to do the following:

1. Increase the range of motion about a joint reducing the risk of muscle and tendon tears during competitive activity.
2. Relieve muscle tightness and stiffness.
3. Improve postural imbalances and help to reduce chronic back pain.
4. Increase localized blood flow to the muscles being stretched.
5. Possibly relieve muscle soreness after intense physical activity and help to reduce the severity of DOMS (Delayed Onset Muscle Soreness).

Often seen as secondary to strength and endurance, flexibility training is neglected by many athletes. Yet stretching, both through shorter term performance enhancement and longer term injury prevention, is well worth the small amount of effort it requires.

Stretching exercises can easily be integrated into a cool down following a training session. It saves the athlete time and range of motion is increased more readily when the body is warm.

The Benefits of Flexibility Training

By increasing this joint range of motion, performance may be enhanced and the risk of injury reduced. The rationale for this is that a limb can move further before an injury occurs.

Tight neck muscles for example, may restrict how far you can turn your head. If, during a simple move like a roundoff on floor, your head is forced beyond this range of movement it will place strain on the neck muscles and tendons.

Ironically, static stretching **just prior** an event may actually be detrimental to performance and offer no protection from injury. The emphasis is on "may" however, as a closer examination of the scientific literature shows that effects are often minimal and by no means conclusive.

Muscle tightness, which has been associated with an increased risk of muscle tears, can be reduced before training or competing with dynamic stretching. For this reason many coaches now favor dynamic stretches over static stretches as part of the warm up.

Competitive sport can have quite an unbalancing effect on the body. For example, gymnasts do thousands of round offs the same way over and over again. One side of the body is placed under different types and levels of stress compared to the other. A flexibility training program can help to correct these disparities preventing chronic, over-use injury.

Of course, a more flexible athlete is a more mobile athlete. It allows enhanced movement around the court or field with greater ease and dexterity. Some other benefits may include an increase in body awareness and a promotion of relaxation in the muscle groups stretched - both of which may have positive implications for skill acquisition and performance.

Definitions of Flexibility

Flexibility is the state related to the muscles of the body after they have been stretched. The types of flexibility and methods of stretching to become flexible are also directly related

1. **Dynamic flexibility** -- the ability to perform dynamic movements within the full range of motion in the joint. Common examples include, twisting from side to side or kicking an imaginary ball. Dynamic flexibility is generally more sport-specific than other forms of mobility.
2. **Static Active flexibility** -- this refers to the ability to stretch an antagonist muscle using only the tension in the agonist muscle. An example is holding one leg out in front of you as high as possible. The hamstring (antagonist) is being stretched while the quadriceps and hip flexors (agonists) are holding the leg up.
3. **Static Passive flexibility** -- the ability to hold a stretch using body weight or some other external force. Using the example above, hold your leg out in front of you and resting it on a chair. The quadriceps are not required to hold the extended position.

Types of Stretching

A flexibility training program can and should be made up of a combination of these different types of stretching:

1. Dynamic stretching;
 - a. Ballistic stretching;
2. Static stretching;
 - a. Static Active Stretching;
 - b. Static Passive Stretching;
3. Isometric stretching; and
 - a. PNF stretching.

As a general rule, dynamic stretches are used as part of a warm up and static stretches or PNF flexibility training is used for increasing range of motion.

Key Points For Effective Stretching

Evidence suggests that static stretching should be avoided immediately before competition in favor of a general warm up and dynamic stretching.

1. To increase flexibility and range of motion, perform stretching exercises when the body is warm. This can be at the end of a training session or following 10 minutes of light aerobic exercise.
2. Complete a range of stretching exercises for different muscle groups. Pay particular attention to the muscle groups that are involved most in your sport.
3. Hold each stretch for 10 - 20 seconds. Initial tightness should gradually diminish as you hold the stretch.
4. Repeat each of the stretching exercises 2 - 3 times in succession.
5. Perform stretching exercises at least 3 times a week and ideally 5 times per week.
6. Ease slowly in and out of the stretch. Breathe out as you stretch and continue to breathe as you hold it.
7. If you feel any pain, release the stretch immediately.

Dynamic Stretching

Dynamic stretching uses speed of movement, momentum and active muscular effort to bring about a stretch. Unlike static stretching the end position is not held. Dynamic stretching avoids bouncing motions and tends to incorporate more sport-specific movements.

Arms circles, exaggerating a kicking action and walking lunges (without weights) are examples of dynamic stretches. A walking lunge dynamically stretches the hip flexors by emphasizing hip extension and can reduce muscle tightness around the hip joint necessary for competition.

Dynamic stretching is useful before competition and has been shown to reduce muscle tightness. Muscle tightness is one factor associated with an increase occurrence of soft connective muscle tissue tears. More recent scientific studies seem to suggest that dynamic stretches before competition are preferably to static stretches. This is particularly true for strength and power athletes, such as gymnasts.

As part of a warm up routine, incorporate dynamic stretches, which can help reduce muscle tightness and reduce the risk of injury.

Ballistic Stretching

Ballistic stretching involves active muscular effort similar to dynamic stretching. However, ballistic stretching bounces or jerks the already stretched muscle to increase the stretch.

Ballistic stretching is effective at increasing range of motion but has been associated with injury, particularly where there have been previous injuries. As a result, ballistic stretches are not recommended as they often activate the muscle spindles to trigger the stretch-reflex.

An example ballistic stretch is bent over toe touching with a bouncing movement. On each movement, the athlete attempts to touch the ground using gravity and bodyweight to assist in the stretch.

Static Stretching

Static stretching is simply the opposite of dynamic stretching. The muscle groups are stretched without moving the limb itself; it is slow and constant and the end position is held for up to 30 seconds.

The difference between active and passive stretching can be shown by holding one leg outstretched with the heel on the floor to stretch the hamstrings. Both floor and bodyweight act as the external forces to bring about the stretch in this muscle group. Lying flat on the back face up with one leg held extended at right angles to the body (hamstring stretch) is a static **active** stretch. If a partner holds the leg in that position it becomes a static **passive** stretch.

Static Active Stretching

Static **active** stretching requires the strength of the opposing muscle **groups** to hold the limb in position for the stretch. For example, standing on one leg and holding the opposite leg out directly in front of you is classed as a static active stretch. The quadriceps actively hold the stretched limb up in position.

Static active stretching is an effective way to increase active flexibility. A martial artist raising her leg up to an opponent's head and holding it there is a good demonstration of static active flexibility. Being able to simply kick to head height is an example of dynamic flexibility.

A static active stretch should be held for 10 - 30 seconds for 1 - 2 stretches per muscle group. As with other forms of stretching, static active stretching is not recommended before a sporting event. It may impair balance and reaction time and reduce power output and without any of the benefits of injury prevention.

Static Passive Stretching

Static passive stretching (more commonly referred to as just static stretching) has been used by coaches and athletes for years without question.

Static **passive** stretching uses an external force to hold the stretch in position. No muscle groups are statically contracted to hold the limb in position - as they are with static active stretching.

Static Stretches Before Competition

While dynamic stretches may be more suitable as part of a warm up, static stretching is more effective at increasing range of motion.

Once a staple part of the warm up, many strength and conditioning coaches are now suggesting that static stretches should be avoided just prior to competition. Their advice is based on a number of studies that have linked detrimental performance in power, maximal voluntary contraction, balance and reaction time tests with a static stretching routine shortly before competition.

However, before disregarding static stretching from being a component of the warm up, it's important to take a closer look at the research. By no means have all studies found static stretches to have a negative effect on power performance and in many of those studies that have found a negative association, the effects are often minimal.

Remember that this debate relates to an acute bout of static stretching prior to exercise. It is still considered important and beneficial to athletes away from competition to bring about a long-term increase in range of motion...

Isometric Stretching

One of most effective methods for improving static **passive** flexibility is through the use of isometric stretching. An advanced form of flexibility training that must be prescribed with caution, it is useful for developing extreme range of motion associated with martial arts for example.

Placing an outstretched leg on a chair and using your bodyweight to bring about a stretch is an example of static **passive** stretching. If, during the stretch, the hamstrings are contracted (i.e. trying to bend knee by pressing the heel into the chair) the activity becomes an isometric stretch.

An isometric or static contraction occurs when tension is created in the muscle group without a change in its length. A chair, wall, the floor or a partner can act as the resistance to bring about a static contraction and isometric stretch.

Aside from increasing range of motion, a second purpose of isometric stretching is to develop strength in stretched positions.

If someone with weak hip adductors attempts to see how far they can do a side split, there will come a point where their legs start to slide further and further apart. They simply don't possess the strength to hold themselves in position.

How Isometric Stretching Works

When a muscle is stretched, some muscle fibres are elongated while others will remain at rest. This is similar to the "all or none" principle of muscle contraction. The greater the stretch, the more individual fibres are stretched fully (rather than all fibres being stretched to a greater extent).

When a muscle that is already in a stretched position is subjected to an isometric contraction, additional fibres are stretched that would have otherwise remained at rest. Those resting fibres are pulled on from both ends by the muscle groups that are contracting. Fibres already in a stretched position (before the onset of the isometric contraction) are prevented from contracting by the **inverse myotatic reflex** and stretch to greater extent.

Isometric Stretching Guidelines

Here are the general guidelines that must be followed if isometric stretching is to be beneficial:

1. Leave 48 hours between isometric stretching routines.
2. Perform only one exercise per muscle group in a session.
3. For each muscle group complete 2 - 5 sets of the chosen exercise.
4. Each set should consist of one stretch held for 10 - 15 seconds.
5. Isometric stretching is not recommended for anyone under the age of 18 years of age.
6. If isometric stretching is to be performed as a separate exercise session, a thorough warm up consisting of 5-10 minutes of light aerobic exercise and some dynamic stretches must precede it.
7. Do not perform isometric stretching as part of a warm up or on the morning of competition. It is too intense and may adversely affect power performance. Stick to dynamic stretches.

A static stretching program effectively increases range of motion over time. This chronic adaptation may reduce the risk of injury as it increases the safe range through which a joint can be taken without injury occurring to surrounding muscles and ligaments.

Perhaps most importantly, from the athlete's perspective, regular stretching improves force production, speed and jumping ability.

PNF Stretching

PNF stretching (or proprioceptive muscular facilitation) is one of the most effective forms of flexibility training for increasing range of motion. PNF techniques can be either **passive** (no associated muscular contraction) or **active** (voluntary muscle contraction). While there are several variations of PNF stretching, they all have one thing in common - they facilitate **muscular inhibition**. It is believed that this is why PNF is superior to other forms of flexibility training.

Both isometric and concentric muscle actions completed immediately **before** the passive stretch help to achieve autogenic inhibition - a reflex relaxation that occurs in the same muscle where the golgi tendon organ is stimulated. Often the isometric contraction is referred to as 'hold' and the concentric muscle contraction is referred to as 'contract'.

A similar technique involves concentrically contracting the opposing muscle group to that being stretched in order to achieve **reciprocal inhibition** - a reflex muscular relaxation that occurs in the muscle that is opposite the muscle where the golgi tendon organ is stimulated.

Using these techniques of 'contracting', 'holding' and passive stretching (often referred to as 'relax') results in three PNF stretching techniques. Each technique, although slightly different, involves starting with a passive stretch held for about 10 seconds.

For clarity and to compare each technique, think of a hamstring stretch in the supine (on back, face up) position for each example. The athlete places one leg extended, flat on the floor and the other extended in the air as close to right angles to the body as possible.

Hold-Relax

1. A partner moves the athlete's extended leg to a point of mild discomfort. This passive stretch is held for 10 seconds.
2. On instruction, the athlete isometrically contracts the hamstrings by pushing their extended leg against their partner's hand. The partner should apply just enough force so that the leg remains static. This is the 'hold' phase and lasts for 6 – 8 seconds.
3. The athlete is then instructed to 'relax' and the partner completes a second passive stretch held for 30 seconds. The athlete's extended leg should move further than before (greater hip flexion) due to autogenic inhibition activated in the hamstrings.

Contract-Relax

1. A partner moves the athlete's extended leg to a point of mild discomfort. This passive stretch is held for 10 seconds.
2. On instruction, the athlete concentrically contracts the hamstrings by pushing their extended leg against their partner's hand. The partner should apply enough force so that there is resistance while allowing the athlete to push their leg to the floor (i.e. through the full range of motion). This is the 'contract' phase.
3. The athlete is then instructed to 'relax' and the partner completes a second passive stretch held for 30 seconds. The athlete's extended leg should move further than before (greater hip flexion) due to autogenic inhibition activated in the hamstrings.

Hold-Relax with Opposing Muscle Contraction

1. A partner moves the athlete's extended leg to a point of mild discomfort. This passive stretch is held for 10 seconds.
2. On instruction, the athlete isometrically contracts the hamstrings by pushing their extended leg against their partner's hand. The partner should apply just enough force so that the leg remains static. This is the 'hold' phase and lasts for 6 - 8 seconds. This initiates autogenic inhibition.

3. The partner completes a second passive stretch held for 30 seconds, however the athlete is instructed to flex the hip (i.e. pull the leg in the same direction as it is being pushed). This initiates reciprocal inhibition allowing the final stretch to be greater.

General Guidelines for PNF Stretching

Here are some other general guidelines when completing PNF stretching:

1. Leave 48 hours between PNF stretching routines.
2. Perform only one exercise per muscle group in a session.
3. For each muscle group complete 2-5 sets of the chosen exercise.
4. Each set should consist of one stretch held for up to 30 seconds after the contracting phase.
5. PNF stretching is not recommended for anyone under the age of 18.
6. If PNF stretching is to be performed as a separate exercise session, a thorough warm up consisting of 5-10 minutes of light aerobic exercise and some dynamic stretches must precede it.
7. Avoid PNF immediately before, or on the morning of competition.

STATIC STRETCHING EXERCISES FOR UPPER AND LOWER BODY



Shoulder Stretch

Interlock your fingers and reach above your head. Your lower back should be flat or slightly arched inwards.

You can perform this exercise sitting or standing.



Triceps Stretch

Place your left hand behind your head and reach as far down your back as possible.

With your right hand grasp your left elbow and gently pull it behind the back of your head.

You can perform this exercise sitting or standing.

Repeat with the other arm.



Chest Stretch

Clasp your hands behind your back.

Gently straighten your elbows and raise your arms as high as comfortably possible.

You can perform this exercise sitting or standing.



Lower Back Stretch

Lying flat on your back place the sole of your right foot on your left thigh.

Grasp your right knee with your left hand and gently roll it to the left.

Try to get your knee as close to the floor as possible **without** your right shoulder leaving the floor.



Groin Stretch

Stand with your feet about 2 meters apart, toes pointing forward.

Gradually shift all your weight to your right leg by bending your right knee.

Your left leg stays straight.

Place both your hands on your right knee for support.

You can increase the starting distance between your feet for a greater stretch.

STATIC STRETCHING EXERCISES FOR UPPER AND LOWER BODY - 2



Groin Stretch

Sit down and place the soles of your feet together.

Clasp your ankles with your hands so that your elbows rest on your knees.

Gently push your knees down with your elbows until you feel the stretch.



Quadriceps Stretch

Standing upright hold onto a support with one hand (a balance beam, a chair, ballet bar) for balance.

With your other hand clasp your ankle and pull your heel into your butt.

Repeat for the other leg.



Hamstring Stretch

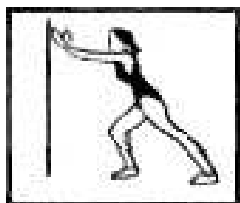
Sitting down, stretch your legs out in front of you while keeping your back flat and upright.

Bend your left leg keeping your left foot flat on the floor.

Slowly reach forward and try to touch your right toe with both hands.

Bend from your waist keeping your lower back flat and your head up.

Repeat for the other leg



Calf Stretch

Stand arms length away from a wall and with feet shoulder width apart.

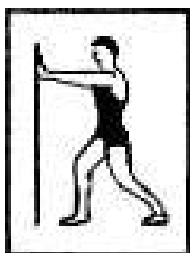
Place your right foot about 2 feet in front of your left.

Keeping both heels flat on the ground lean towards the wall by bending your right knee.

Your left leg should stay straight.

Push gently against the wall for a deeper stretch.

Repeat for the left leg.



Achilles Stretch

This is exactly the same procedure as above except as you lean towards the wall let both knees bend.

Rather than leaning forward you should feel like you are lowering yourself straight down.

Remember to keep both heels flat on the floor.

Repeat for the other leg.

DYNAMIC STRETCHES

Arm Swings

1. Stand tall and hold arms out to your side.
2. Slowly swing your arms back and forth across the front of your body.
3. Repeat this continuous motion for 30 seconds.



Side Bends

1. Stand with a shoulder width stance. Place a toning bar on your shoulders (optional).
2. Lean to one side keeping your torso straight. Do not bend forward or backwards.
3. Hold for a count of 2 and then repeat to the other side.
4. Complete 10 stretches each side.

Trunk Rotations

1. Stand with a shoulder width stance. Place hands on hips.
2. With knees slightly bent, turn from side to side keeping feet firmly on the floor.
3. Hold for a count of 2 and then repeat to the other side.
4. Complete a total of 15-20 full swings.



Full Back Stretch

1. Lie on your back and bring both your knees to your chest with hands clasped under back of knees.
2. Roll forwards until your feet touch the floor and then immediately roll back until just before your head touches the floor.
3. Continue until you complete 10-15 full rolls.

Abdominal Stretch

1. Start by lying on your back on the stability ball holding a toning bar at your chest (the toning bar is optional).
2. Push back with your feet and simultaneously push the bar over and behind your head.
3. Your legs should be straight and your arms outstretched.
4. Return to the starting position and repeat for 10-15 reps.



DYNAMIC STRETCHES - 2

Hamstring Stretch

1. Lie on your back and place a piece of exercise tubing (or rolled up towel) around the bottom of one of your feet.
2. Pull the tubing and raise your leg at the same time until a comfortable stretch is felt. Return to the starting position and repeat for 10-15 repetitions.
3. Repeat with other leg.



Groin Stretch

1. Start by placing your right knee on top of a stability ball and maintain your balance.
2. Slowly spread your leg out to the side until you feel a stretch on the inside of your thigh.
3. Return to the start and repeat for 10-12 repetitions before changing to the other leg.

Alternate Toe Touches

1. Start by standing with your feet spread as far apart as comfortably possible.
2. Lean forward toward one leg and try to reach your foot or until a **comfortable** stretch is felt in your low back and hamstrings.
3. Now try to touch the other foot with the opposite arm. This motion should be continuous alternately touching each foot (as close as possible) with the opposite hand.



Important: skip this stretch you are prone to low back pain or if it causes you any discomfort.

Leg Swings

1. Start by standing with your feet shoulder width apart. You can hold on to the ballet bat, a balance Beam or the side of the trampoline.
2. Keeping your upper body perpendicular to the ground swing one leg forward and backward.
3. Do not swing your leg so hard that you cannot keep your upper body from moving.
4. Repeat for 10 full swings and repeat on other leg.
5. You can also swing your leg across your body stretching the abductors and adductors.