

Flexibility and Low-Back Health

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Abstract

Flexibility is the ability of a joint to move through its full range of motion (ROM). It plays an important part in the preparation of athletes by developing a range of movement to allow technical development and assisting in the prevention of injury and low-back pain. All athletes require a basic level of general all round flexibility to allow them to benefit from other forms of training. In addition, athletes will need to develop specific flexibility for those joint actions involved in the techniques of their events or sports. The various techniques of stretching may be grouped as Static, Ballistic, Dynamic, Active, Passive, Isometric and Assisted. Proprioceptive Neuromuscular Facilitation (PNF) involves the use of muscle contraction before the stretch in an attempt to achieve maximum muscle relaxation. When conducting flexibility exercises it is recommended to perform them in the following order - Static, Assisted and then Dynamic. An exercise program designed to increase flexibility and strengthen the legs, abdomen, and lower back can help prevent low back pain. It is therefore imperative to maintain muscle flexibility as an important component of overall fitness.

Introduction

Flexibility training, or stretching, is used in varying forms by practically every coach, athlete and physiotherapist on a regular basis. That is to say, a form of stretching is likely to take place at some point in every training or therapy session. In spite of this, flexibility training is probably the least understood of all the fitness components, in terms of its scientific basis.

What is flexibility?

The ability of a joint to move through its full range of motion (ROM). Flexibility, mobility and suppleness all mean the range of limb movement around joints. In any movement there are two groups of muscles at work:

- antagonistic muscles which cause the movement to take place and
- opposing the movement and determining the amount of flexibility are the antagonistic muscles

The objective of flexibility training is to improve the range of movement of the antagonistic muscles.

Benefits of Flexibility and Stretching Exercises

Flexibility plays an important part in the preparation of athletes by developing a range of movement to allow technical development and assisting in the prevention of injury and low-back pain.

- Other potential benefits:
 - Temporary reduction of post exercise muscle soreness, known as delayed-onset muscle soreness (DOMS)
 - Relief of aches and pains and muscle cramps

- Improved body position and strength for sports
- Maintenance of good posture and balance
- Relaxation
- Lifetime wellness benefits
 - Assessment Issues

What Determines Flexibility?

- Joint structure—joints vary in direction and range of movement
 - Joint capsules = semi elastic structures that give joints strength and stability but limit movement
- Muscle elasticity and length
 - Collagen = white fibers that provide structure and support
 - Elastin = yellow fibers that are elastic and flexible
 - Titin = muscle filament with elastic properties

Nervous System Activity

- Stretch receptors control muscle length
- If a muscle is stretched, receptors send a message to the spinal cord, which then sends a signal back to the muscle telling it to contract
- A strong muscle contraction produces an opposite reflex that causes the muscle to relax
- Proprioceptive neuromuscular facilitation (PNF) = a technique for stretching muscles that relies on neuromuscular reflexes to stimulate training effects

Creating a Successful Program to Develop Flexibility

All athletes require a basic level of general all round flexibility to allow them to benefit from other forms of training. In addition, athletes will need to develop specific flexibility for those joint actions involved in the techniques of their events or sports.

- Applying the FITT principle
 - Frequency—how often to stretch
 - Intensity—how far to stretch
 - Time—how long to stretch
 - Type—which stretching exercises to perform

Frequency of Exercise

- The American College of Sports Medicine (ACSM) recommends that stretching exercises be performed a minimum of 2–3 days per week
- Stretch when muscles are warm, either after a workout or after the active part of a warm-up
- Do not stretch before a high-performance activity

Intensity and Time (Duration) of Exercise

- Stretch to the point of slight tension or mild discomfort
- Hold each stretch for 10–30 seconds
- Do at least 4 repetitions of each exercise

- Rest for 30–60 seconds between stretches

Types of Stretching Techniques

The various techniques of stretching may be grouped as Static, Ballistic, Dynamic, Active, Passive, Isometric and Assisted.

Static stretching

Static stretching (isometric contractions) involves gradually easing into the stretch position and holding the position. The amount of time a static stretch is held depends on your objectives. If it is part of your cool down then stretches should be held for 10 seconds, if it is to improve your range of mobility then hold the stretch for 30 seconds. Often in static stretching, you are advised to move further into the stretch position as the stretch sensation subsides.

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.

Dynamic stretching

Dynamic stretching (isotonic or isokinetic contractions) consists of controlled leg and arm swings that take you gently to the limits of your range of motion. Where the event requires a dynamic movement then it is appropriate and perhaps necessary to conduct dynamic stretching exercises. Start with the movement at half speed for a couple of repetitions and then gradually work up to full speed.

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. Active stretching is also referred to as static-active stretching.

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.

Isometric stretching

Isometric stretching is a type of static stretching which involves the resistance of muscle groups through isometric contractions (tensing) of the stretched muscles.

Assisted stretching

Assisted stretching involves the assistance of a partner who must fully understand what their role is otherwise the risk of injury is high. A partner can be employed to assist with Partner stretches and Proprioceptive Neuromuscular Facilitation (PNF) techniques.

Partner stretches

Your partner assists you to maintain the stretch position or helps you ease into the stretch position as the sensation of stretch subsides. You should aim to be full relaxed and breathe easily throughout the exercise. Partner assisted stretches are best used as developmental exercises, with each stretch being held for thirty seconds.

PNF technique

Proprioceptive Neuromuscular Facilitation (PNF) involves the use of muscle contraction before the stretch in an attempt to achieve maximum muscle relaxation.

1. You move into the stretch position so that you feel the stretch sensation
2. Your partner holds the limb in this stretched position
3. You then push against your partner by contracting the antagonistic muscles for 6 to 10 seconds and then relax. During the contraction, your partner aims to resist any movement of the limb.
4. Your partner then moves the limb further into the stretch until you feel the stretch sensation
5. Go back to 2. (Repeat this procedure 3 or 4 times before the stretch is released.)

When you perform a stretch correctly, you will feel mild discomfort in the antagonistic muscles. If you feel pain or a stabbing sensation, you must STOP. The body responds best to a stretching program when it is warm and the muscles and joints have been exercised through their current range of movement.

Which method is best?

Static methods produce far fewer instances of muscle soreness, injury and damage to connective tissues than dynamic or ballistic methods. Static methods are simple to carry out and may be conducted virtually anywhere. For maximum gains in flexibility in the shortest possible time PNF technique is the most appropriate. Dynamic - slowed controlled movements through the full range of the motion - will reduce muscle stiffness. Where the sport or event requires movement then dynamic stretches should be employed as part of the warm up.

What order should the flexibility methods be used?

When conducting flexibility exercises it is recommended to perform them in the following order - Static, Assisted and then Dynamic.

When should they be performed?

Flexibility exercises could be part of

- the warm up or cool down program
- a stand alone unit of work

It is considered beneficial to conduct flexibility exercises as part of the cool down program but should not include ballistic or dynamic exercises, as the muscles are fatigued and more prone to injury. Static exercises are recommended as they relax the muscles and increase their range of movement.

Factors limiting flexibility

Internal influences

- the type of joint
- the internal resistance within a joint
- bony structures which limit movement
- the temperature of the joint and associated tissues
- the elasticity of muscle tissue, tendons, ligaments and skin
- the ability of a muscle to relax and contract to achieve the greatest range of movement

External influences

- the temperature of the place where one is training (a warmer temperature is more conducive to increased flexibility)
- the time of day (most people are more flexible in the afternoon than in the morning)
- the stage in the recovery process of a joint (or muscle) after
- age (pre-adolescents are generally more flexible than adults)
- gender (females are generally more flexible than males)
- the restrictions of any clothing or equipment
- one's ability to perform a particular exercise
- one's commitment to achieving flexibility

Low-Back Health

Function of the spine

- Provides structural support for the body
- Surrounds and protects the spinal cord
- Supports body weight
- Serves as attachment site for muscles, tendons, ligaments
- Allows movement of neck and back in all directions

Structure of the Spine

- 7 cervical vertebrae in the neck
- 12 thoracic vertebrae in the upper back
- 5 lumbar vertebrae in the lower back
- 9 vertebrae at the base of the spine fused into the sacrum and the coccyx (tailbone)

Vertebrae

- Vertebrae consist of a body, an arch, and several bony processes
- Intervertebral disks = elastic disks located between adjoining vertebrae; consist of a gel- and water-filled nucleus surrounded by fibrous rings; serve as shock absorbers
- Nerve roots = base of pairs of spinal nerves that branch off the spinal cord

Causes of Back Pain

- Any movement that causes excessive stress
- Risk factors:

- Age greater than 34 years
- Degenerative diseases
- Family or personal history of back trauma
- Sedentary lifestyle, overweight
- Low job satisfaction, certain occupations
- Low socioeconomic status
- Smoking
- Psychological stress or depression

Underlying Causes of Back Pain

- Poor muscle endurance and strength
- Poor posture
- Poor body mechanics

Preventing Low-Back Pain

- Lose weight, stop smoking, and reduce emotional stress
- Avoid sitting, standing, or working in the same position for too long
- Use a supportive seat and a medium-firm mattress
- Warm up thoroughly before exercise
- Progress gradually when improving strength and fitness

Protecting Your Back

- An exercise program designed to increase flexibility and strengthen the legs, abdomen, and lower back can help prevent low back pain.
- Sit with your lower back slightly rounded, knees bent, and feet flat on the floor. Alternate crossing your legs or use a footrest to keep your knees higher than your hips.
- Lie on your side with your knees and hips bent. If you lie on your back, place a pillow under your knees.
- Stand with your weight mainly on your heels, with one or both knees slightly bent. Try to keep your lower back flat (not arched) by placing one foot on a stool.
- Walk with your toes pointed straight ahead. Keep your back flat, head up, and chin in.
- To lift, bend at the knees and hips rather than at the waist and lift gradually using your leg muscle

Managing Acute Back Pain

- Sudden back pain usually involves tissue injury
- Symptoms: Pain, muscle spasms, stiffness, inflammation
- Treatment:
 - Ice, then heat
 - OTC medication (ibuprofen or naproxen)
 - Moderate exercise

Managing Chronic Back Pain

- Considered chronic if lasts longer than 3 months
- Symptoms: Stabbing or shooting pain, steady ache accompanied by stiffness, pain that is localized or that radiates to other parts of the body
- Treatment: Many options, including medication, exercise, physical therapy, massage, acupuncture, education, and surgery

Exercises for the Prevention and Management of Low-Back Pain

- Do low-back exercises at least 3 days per week
- Emphasize muscular endurance
- Do not do full range of motion spine exercises early in the morning
- Engage in regular endurance exercise
- Be patient and stick with your program

Conclusion

Flexibility plays an important part in the preparation of athletes by developing a range of movement to allow technical development and assisting in the prevention of injury and low-back pain. Muscles lose their natural suppleness and flexibility and can become prone to tears, aches, and pains are being inactive. If the situation is not remedied in time, loss of flexibility could lead to permanent changes in posture and normal muscle function. It is therefore imperative to maintain muscle flexibility as an important component of overall fitness.

References

Atler MJ., 'Science of Flexibility', Human Kinetics 2004

Behm, DG et al, 'Effect of Acute Static Stretching on Force, Balance, Reaction Time, and Movement Time' Med Sci Sports Exerc, 36(8), (2004), 1397-1402

Boyle M, 'Linear and Lateral Warm-up', Functional Training For Sports. 29-53 2004; Champaign II, Human Kinetics

Brucker JB et al 'An 18-Day Stretching Regimen, With or Without Pulsed, Shortwave Diathermy, and Ankle Dorsiflexion After 3 Weeks' Journal of Athletic Training 2005;40(4):276-280

Castella R, Clews , Smart Sport: The Ultimate Reference Manual For Sports People, 1996; RWM Publishing

Feland, JB and Marin, HN, 'Effect of sub-maximal contraction intensity in contract-relax proprioceptive neuromuscular facilitation stretching' Br J Sports Med, (2004), 38

Power, K et al, 'An Acute Bout of Static Stretching: Effects on Force and Jumping Performance' Med Sci Sports Exerc, 36(8), (2004), 1389-1396

Ross SE et al 'Single-Leg Jump-Landing Stabilization Times in Subjects With Functionally Unstable Ankles' Journal of Athletic Training 2005;40(4):298-304

Young WB, Behm DG, 'Effects of running, static stretching and practice jumps on explosive force production and jumping performance', Journal of Sports Medicine and Physical Fitness. 2003; 43: 21-27

Zachazewski JE, 'Flexibility for sports', In Sports Physical Therapy ed B Sanders, 201-238.1990; Norwalk CT. Appleton and Lange

<http://www.brianmac.co.uk/mobility.htm>

<http://www.pponline.co.uk/encyc/flexibility-training-the-role-of-stretching-in-sports-performance-711>