



# STRETCHING



# DEFINITION

- ▶ Stretching is a general term used to describe any therapeutic maneuver designed to increase the extensibility of soft tissues, thereby improving flexibility by elongating (lengthening) structures that have adaptively shortened and have become hypomobile over time



# ANATOMIC FACTORS AFFECTING FLEXIBILITY

- ▶ Muscles
- ▶ Connective tissue
- ▶ Bony factors
- ▶ Fat
- ▶ Skin
- ▶ Neural tissue



- ▶ **Muscles, tendons and their surrounding fascial sheaths**
- ▶ Stretching attempts to take advantage of highly elastic properties of muscle.
- ▶ Overtime it is possible to increase elasticity , or the length a given muscle can be stretched.



## **Connective tissue (ligaments and joint capsule)**

- ▶ Become shortened and stiff during periods of immobilization
- ▶ People can also be loose jointed from slack or increased laxity in connective tissue
- ▶ Creates some instability



## **Bony structures**

- ▶ Restrict end point in the range of motion
- ▶ Good for stability
- ▶ After fracture excess calcium can develop which interferes with normal range

## **Fat**

- ▶ Excess fatty tissue can restrict range of motion
- ▶ For example; excess abdominal fat can restrict trunk movement



## Skin

- ▶ Inelastic scar tissue can develop after surgery or injury •
- ▶ Incapable of stretching with joint movement
- ▶ Overtime can improve elasticity to varying degrees through stretching



## Neural tissue

- ▶ Tightness develops in neural tissues from acute compression, chronic repetitive microtrauma, muscle imbalances, joint dysfunctions, or poor posture
- ▶ Can create structural changes in tissue that can cause pain
- ▶ Pain can cause muscle guarding and spasm
- ▶ Can eventually lead to neural fibrosis or scarring





# NEUROPHYSIOLOGIC BASIS OF STRETCHING

## **Mechanoreceptors in muscle**

- ▶ 2 of these are important in the stretch reflex
- ▶ Muscle spindle and the Golgi tendon organ (GTO)
- ▶ Sensitive to changes in muscle length
- ▶ GTO also sensitive to change in muscle tension



- ▶ Muscle spindle initially sends sensory impulse to spinal cord which then sends a message back to muscle spindle causing the muscle to reflexively contract
- ▶ If stretch last longer than 6 seconds, impulses from GTO begin to override muscle spindle
- ▶ autogenic inhibition, or a reflex relaxation of the antagonist muscle .Protective mechanism to allow stretch to avoid damage to muscle fibers



## Reciprocal inhibition

- ▶ Contraction of agonist causes a reflex relaxation in the antagonist muscle
- ▶ Allows antagonist to stretch and protects from injury.



## **Autogenic Inhibition:**

- ▶ Relaxation in the same muscle that is experiencing increased tension.
- ▶ Tension built up during the active contraction stimulates the GTO, causing a reflexive relaxation of the muscle during the subsequent passive stretch.



## Reciprocal Inhibition:

- ▶ Relaxation that occurs in the opposing muscle experiencing increased tension.
- ▶ This is accomplished by simultaneously contracting the muscle opposing the muscle being passively stretched.
- ▶ The tension in the contracting muscle stimulates the GTO and causes simultaneous reflexive relaxation of the stretched muscle



# STRETCHING PROTOCOLS

- ▶ **Alignment:** positioning a limb or the body such that the stretch force is directed to the appropriate muscle group
- ▶ **Stabilization:** fixation of one site of attachment of the muscle as the stretch force is applied to the other bony attachment
- ▶ **Intensity of stretch:** magnitude of the stretch force applied
- ▶ **Duration of stretch:** length of time the stretch force is applied during a stretch cycle



# STRETCHING PROTOCOLS

- ▶ **Speed of stretch:** speed of initial application of the stretch force
- ▶ **Frequency of stretch:** number of stretching sessions per day or per week •
- ▶ **Mode of stretch:** form or manner in which the stretch force is applied (static, ballistic, cyclic); degree of patient participation (passive, assisted, active); or the source of the stretch force (manual, mechanical, self)



# ALIGNMENT

- ▶ Proper alignment or positioning of the patient and the specific muscles and joints to be stretched is necessary for patient comfort and stability during stretching.
- ▶ Alignment influences the amount of tension present in soft tissue and consequently affects the ROM available in joints. • For eg: to stretch the rectus femoris (a muscle that crosses two joints) effectively, as the knee is flexed and the hip extended, the lumbar spine and pelvis should be aligned in a neutral position.
- ▶ The pelvis should not tilt anteriorly nor should the low back hyperextend





# STABILIZATION

- ▶ To achieve an effective stretch of a specific muscle or muscle group and associated periarticular structures, it is imperative to stabilize (fixate) either the proximal or distal attachment site of the muscle-tendon unit being elongated. •
- ▶ Example: when stretching the iliopsoas, the pelvis and lumbar spine must maintain a neutral position as the hip is extended to avoid stress to the low back region. Sources of stabilization include manual contacts, body weight, or a firm surface such as a table, wall



# INTENSITY

- ▶ The intensity (magnitude) of a stretch force is determined by the load placed on soft tissue to elongate it.
- ▶ Low-intensity stretching in comparison to high intensity stretching makes the stretching maneuver more comfortable for the patient and minimizes voluntary or involuntary muscle guarding so a patient can either remain relaxed or assist with the stretching maneuver



- ▶ Low-intensity stretching (coupled with a long duration of stretch) results in optimal rates of improvement in ROM
- ▶ Low-intensity stretching has also been shown to elongate dense connective tissue, a significant component of chronic contractures, more effectively and with less soft tissue damage and post-exercise soreness than a high-intensity stretch



# DURATION

- ▶ The duration of stretch refers to the period of time a stretch force is applied and shortened tissues are held in a lengthened position.
- ▶ Duration most often refers to how long a single cycle of stretch is applied.
- ▶ If more than one repetition of stretch (stretch cycle) is carried out during a treatment session, the cumulative time of all the stretch cycles is also considered an aspect of duration
- ▶ Ideal duration for a stretch cycle: 20-30 seconds



# SPEED

- ▶ To ensure optimal muscle relaxation and prevent injury to tissues, the speed of stretch should be slow.
- ▶ The stretch force should be applied and released gradually.
- ▶ Slowly applied stretch is less likely to increase tensile stresses on connective tissues or to activate the stretch reflex and increase tension in the contractile structures of the muscle being stretched
- ▶ Stretch force applied at a low velocity is also easier for the therapist or patient to control and is therefore safer than a high-velocity stretch.



# FREQUENCY

- ▶ Refers to the number of bouts (sessions) per day or per week a patient carries out a stretching regimen.
- ▶ The recommended frequency of stretching is often based on the underlying cause of impaired mobility, the quality and level of healing of tissues, the chronicity and severity of a contracture, as well as a patient's age.
- ▶ 3 to 5 repetitions per session and done 3 times a week is considered as adequate for gaining improvements in the flexibility of soft tissues.
- ▶ Frequencies are also determined by clinicians according to the impairments



# MODE OF STRETCHING

- ▶ Manual Stretching
- ▶ Self Stretching
- ▶ Mechanical Stretching
- ▶ PNF stretching techniques



# WARM UP

- ▶ Prepares your body physically and psychologically
- ▶ Increases blood flow to your muscles and increases your body temperature
- ▶ The warm-up should last about five minutes
- ▶ Slow walking is a good warm-up for a moderate-paced walk.
- ▶ Brisk walking is a good warm-up for more vigorous activity.





# COOL DOWN

- ▶ Slow the intensity of the activity you are doing
- ▶ Gradually slow your pace down to a walk
- ▶ End the cool-down by doing some deep stretching.
- ▶ Focus on the muscles that you were using during your workout, this will help reduce the incidence of stiffness or soreness later.
- ▶ After the entire workout, stretch the whole body, focus on the muscles that were used during the workout.
- ▶ Each stretch should last 20-30 seconds and be repeated.



# TYPES OF STRETCHING

- ▶ Static / Dynamic stretching
- ▶ Static Progressive Stretching
- ▶ Proprioceptive neuromuscular facilitation stretching procedures •
- ▶ Ballistic stretching
- ▶ Cyclic/intermittent stretching
- ▶ Manual stretching
- ▶ Mechanical stretching
- ▶ Self-stretching
- ▶ Passive and Active stretching



# STATIC STRETCHING

- ▶ Stretch the muscle to the point of slight or mild discomfort (overload) •
- ▶ Hold each stretch for 10 to 30 seconds
- ▶ Repeat the stretch 4 times
- ▶ Flexibility exercise sessions should occur
- ▶ 3 to 5 times per week



# STATIC PROGRESSIVE STRETCHING

- ▶ The shortened soft tissues are comfortably held in a lengthened position until a degree of relaxation is felt by the patient or therapist.
- ▶ Then the shortened tissues are incrementally lengthened even further and again held in the new end-range position for an additional duration of time.



# DYNAMIC STRETCHING

- ▶ Most dangerous of the stretching procedures •
- ▶ Involves the use of repetitive, bouncing
- ▶ Virtually abandoned •
- ▶ May lead to soreness and muscle injury



# PNF STRETCHING

- ▶ Isometric contraction
- ▶ Contraction and relaxation phases (stretch phase)
- ▶ Normally performed with a partner
- ▶ Hold the isometric contraction 6 seconds
- ▶ Repeat 4 times each session
- ▶ 3-5 times per week



# BALLISTIC STRETCHING

- ▶ Involves active muscular effort and uses a bouncing motion in which the position is not held.
- ▶ High speed, high intensity
- ▶ Cyclic / Intermittent Stretching
- ▶ A relatively short-duration stretch force that is repeatedly but gradually applied, released, and then reapplied is described as a cyclic (intermittent) stretch
- ▶ With cyclic stretching the end-range stretch force is applied at a slow velocity, in a controlled manner, and at relatively low intensity.



# MANUAL STRETCHING

- ▶ During manual stretching a therapist or other trained practitioner applies an external force to move the involved body segment slightly beyond the point of tissue resistance and available ROM.
- ▶ The therapist manually controls the site of stabilization as well as the direction, speed, intensity, and duration of stretch.
- ▶ Remember, stretching and ROM exercises are not synonymous terms.
- ▶ Stretching takes soft tissue structures beyond their available length to increase ROM.





# MECHANICAL STRETCHING

- ▶ Mechanical stretching devices apply a very low intensity stretch force (low load) over a prolonged period of time • The equipment can be as simple as a cuff weight or weight- pulley system
- ▶ The duration of mechanical stretch reported in the literature ranges from 15 to 30 minutes
- ▶ The longer durations of stretch are required for patients with chronic contractures
- ▶ • Devices which are commonly used for mechanical stretching are weight cuffs, mechanical pulley devices with springs, CPM and orthosis such as serial casts or splints.



# SELF STRETCHING

- ▶ Self-stretching (also referred to as flexibility exercises or active stretching) is a type of stretching procedure a patient carries out independently after careful instruction and supervised practice.
- ▶ This form of stretching is often an integral component of a home exercise program and is necessary for long-term self- management
- ▶ Teaching a patient to carry out self-stretching procedures correctly and safely is fundamental for preventing re-injury or future dysfunction



# CONTRAINDICATIONS

- ▶ Joint stability
- ▶ Infection
- ▶ Acute injury
- ▶ Vascular injury
- ▶ Excessive pain when stretching
- ▶ Inflammation
- ▶ Joint effusion
- ▶ Diseases affecting the tissues when stretched