الجامعة التقنية الشمالية
كلية التقنيات الصحية و الطبية الدور
قسم تقنيات العلاج الطبيعي

التمارين العلاجية المتقدمة

Resisted exercises

Dr.Fawzi Hammadi

is defined as movement using body weight or external resistance that improves muscular strength, power, endurance and it may positively impact mobility, function and independence

Benefits of resisted exercise:

1-Improves muscle strength and tone

2-Maintain flexibility and balance

3-Weight management and increased muscle to fat ratio

4-May help to prevent or reduce cognitive decline in older people

5-Greater stamina (people will not tire as easily due to improved body strength)

6-Prevention or control of chronic conditions eg (back pain, heart disease, arthritis, obesity &depression)

7-Pain management

8-Improves posture and 9-decreases the risk of injury

10-Increases bone density

Decreases risk of osteoporosis

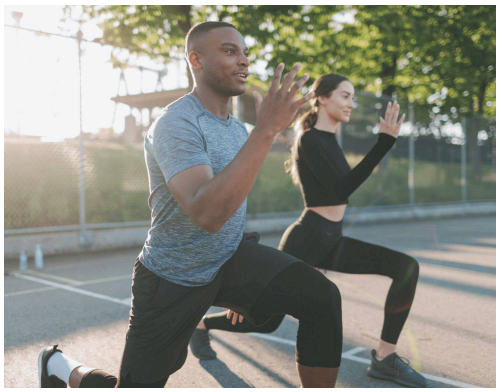
11-Improves sense of wellbeing, boosts confidence and self-esteem

Types of resisted exercises:

Either static or dynamic When it comes to getting in shape or healing from a recent injury, there are a plethora of exercise options. We provide our patients with the education, tools, exercises and goal-planning systems to help take you to the next level. Combining isometric and isotonic exercises is one approach for optimal, functional fitness and is an essential part of your injury prevention plan. When it comes to rehabilitation and help for your ailments, find relief with the right treatments and exercises today!

With both static and dynamic exercises, little or no special equipment is needed. The difference between the two is the length the muscle is moved as well as the joint. When it comes to patients with arthritis, we may use a series of static exercises. This will allow the patient to hold a position in set intervals of time that can maintain their muscle mass without risk of injury. The body performs little to no movement, but yet, the muscles fibers are still being worked. Static exercises are perfect

for patients who are injured or who have limited flexibility and range-of-motion. This is because the joint does not have to move during the exercise and neither does the muscle, yet both are strengthened.




Resistive Exercise Band
PCR
Light
Medium
Heavy
Extra Heavy
Hard
Professional Quality

RESISTANCE EXERCISE TOOLKIT

What to Assess Prior to Recommending Resistance Exercise: Considerations and Flags

Prior to beginning exercise, liaise with the patient's physician regarding your treatment plan, and discuss any signs or symptoms to monitor. Use your clinical judgement with each patient.

The American College of Sports Medicine (ACSM) Screening Guidelines flow chart

First, use the ACSM or **PARQ+ (2020 version)** screening guidelines to determine whether REx is an appropriate treatment for your patient. https://bit.ly/3eup5kH

Physical Activity History Tools

Physical Activity Vital Sign (PAVS)
- https://bit.ly/3vfbS4V

Rapid Assessment of Physical Activity (RAPA)
- https://bit.ly/38xSp5R

Physical Activity Screening for the Elderly
- https://bit.ly/3cthsbE

(R) Use the SAFEMOB Guidelines to Determine Any Precautions to Mobility[1]

https://med-fom-clone-pt.sites.olt.ubc.ca/files/2012/05/SAFEMOB_Final18673.pdf

(R) Hematological Considerations

- **Hemoglobin (Hgb):** Withhold mobilization for patients with hemoglobin (Hgb) levels lower than 70 g/L[2]; monitor the following symptoms and potential adverse effects: chest pain, pallor, leg cramps, dizziness, arrhythmias, shortness of breath, and respiratory distress[4]
- **Blood pressure (BP)**
- **Heart rate (HR)**
- **Oxygen saturation (SpO_2)**
- **Platelets:** please refer to the table in the cancer section under Special Populations for platelet considerations

Appropriate gear and injury prevention are important considerations for avoiding injury[4]

(R) Musculoskeletal Considerations[3]

- Musculoskeletal limitations
- Joint pain or instability, from arthritis or other causes (these conditions require alternative ways to train the same muscle groups; consider different exercises)

(R) Cardiovascular Considerations[3]

- Major risk factors for Coronary Artery Disease
- Uncontrolled hypertension (systolic blood pressure 160 mm Hg and/or diastolic blood pressure >100 mm Hg)
- Individuals who have implanted pacemakers or defibrillators

Sequence

(R) Other Considerations[3]

- Diabetes at any age

Equipment Considerations[1]

- Lines
- Aids (eyewear, hearing aids, gait aids)
- Body weight as resistance
- External resistance

Patient Considerations[1]

- Patient's chart (co-morbidities and medication)
- Activity orders (based on acuity/stability)
- Oxygen saturation/requirements, if applicable
- Need for supervision
- Pain (timing of pain medication)
- Fatigue management (endurance considerations)
- Strength
- Condition
- Function
- Barriers
- Ability to learn
- Mobility assessment

(A) Cardiovascular Changes[3]

- **Cardiac conditions:** unstable coronary heart disease (CHD); decompensated heart failure; acute myocarditis, endocarditis, or pericarditis
- **HR:** uncontrolled arrhythmias
- **BP:** uncontrolled hypertension (>180/110 mm Hg); severe pulmonary hypertension (mean pulmonary arterial pressure >55 mm Hg)
- **Aortic dissection:** genetic conditions associated with thoracic aortic aneurysm and/or dissection include: Marfan syndrome, vascular Ehlers-Danlos syndrome, Loeys-Dietz aneurysm syndrome, bicuspid aortic valve, Turner syndrome, and familial TAA/D syndrome. Prior cardiac surgery (particularly aortic valve replacement and aortic manipulation, including angiography and stenting), is also a risk factor for aortic dissection[5]
- **Blood flow:** severe and symptomatic aortic stenosis, untreated deep vein thrombi (DVTs), and untreated pulmonary emboli (PE)

(A) Other Considerations[3]

- High-intensity resistance training (80–100% of 1RM) in patients with active proliferative retinopathy, or moderate or worsening non-proliferative diabetic retinopathy

(R) **Relative** Contraindications

(A) **Absolute** Contraindications

RESISTANCE EXERCISE TOOLKIT

Exercise Physiology Foundations

2 Regeneration of Injured Skeletal Muscle[8]

If the patient has sustained an injury to skeletal muscle, the following information regarding types of muscle injuries and phases of muscle healing may be helpful in planning the progression of resisted exercise.

Types of Muscle Injuries

1. **Shearing type**
   - Caused by contusion, strain or laceration
   - Muscle fibers, their basal lamina, mysial sheaths, and nearby capillaries, all rupture
2. **Insitu necrosis (rhabdomyolysis)**
   - Myofibers are partially necrotized while basal lamina, mysial sheaths and blood vessels remain intact

3 Phases of Muscle Strain Healing Process

1. **Destruction Phase**
   a. Ruptured myofiber becomes necrotized over a short distance (contained by a contraction band that forms within a couple of hours)
   b. Rupture is sealed by a new sarcolemma
   c. Damaged myofibers contract and the gap between stumps is filled by a hematoma
   d. Inflammatory cell reaction
2. **Repair Phase**
   a. Phagocytosis of necrotized tissue by monocytes
   b. Satellite cells (myogenic reserve cells) are activated and begin to repair damaged myofibers
   c. Committed satellite cells start to differentiate into myoblasts
   d. Undifferentiated stem satellite cells start to proliferate by 24 hours, and undergo asymmetric cell division for future regeneration
   e. Activation, proliferation, and differentiation of satellite cells can be improved by exercise
   f. Myoblasts from satellite cells fuse to form myotubes within a couple of days
   g. Within 5-6 days the necrotized part of the damaged myofiber inside the remaining old basal lamina is replaced by the regenerating myofiber
   h. Injury site is revascularized by ingrowing capillaries with first capillary sprouts within 3 days after the injury
3. **Remodeling Phase**
   a. Maturation of regenerating myofibers
   b. Formation of a mature contractile unit and attachment of the ends of the regenerated myofibers to the scar by newly formed musculotendinous junctions
   c. Retraction of the scar pulls the ends closer to each other
   d. Contraction of scar tissue driven by fibroblasts converting to myofibroblasts that have contractile capacity

Some factors which may impact healing of muscle:[10]

- Oxygenation, infections, stress, sex hormones, diabetes, medications, obesity, alcohol, smoking, nutrition
- Age
  - With age, there are fewer satellite cells which can differentiate into any type of cell
  - Slower phagocytosis which delays healing
  - Greater fibrosis with muscle injury
  - Lower production of growth factors

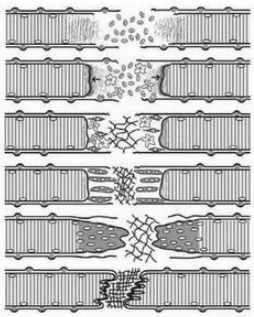


Figure 1. The regeneration of a shearing injury. (A) Torn myofiber and BL. (B) Contraction band and demarcation membrane seal the torn fiber ends. Satellite cells (SL) begin to proliferate and inflammation reaction begins. (C) SCs differentiate into myoblasts and fibroblasts begin to produce collagens and form scar tissue. (D) Myoblasts fuse into myotubes. (E) Myotubes fuse with the surviving parts of the torn fibers and start to form new MTJs. (F) Fully regenerated fiber with organized scar tissue and MTJs attached to it.

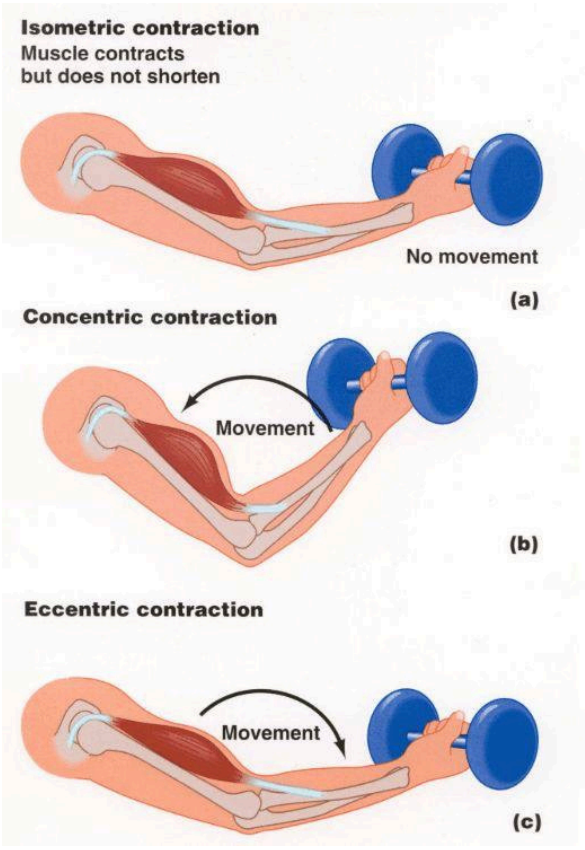
Image from: Jarvinen et al. (2013)[8]

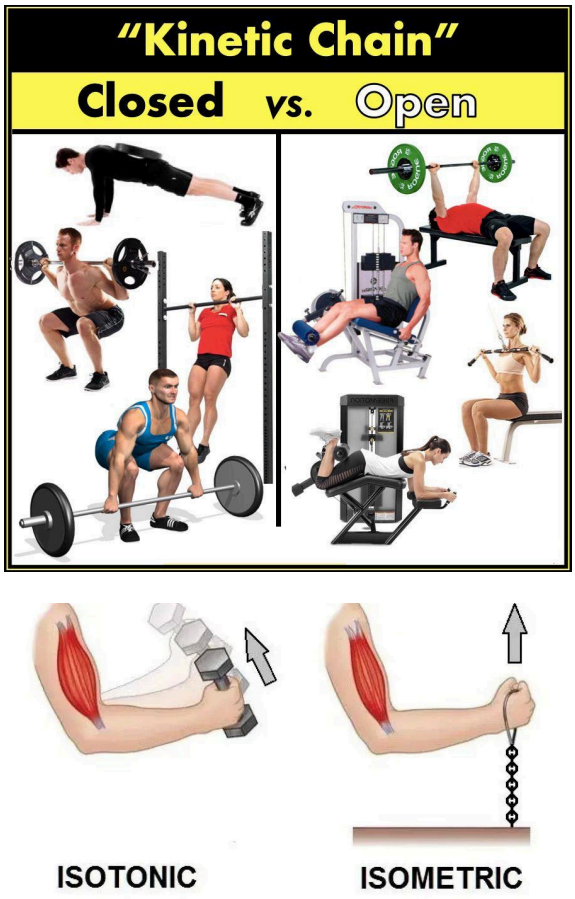
Types:

1-Isometric exercises are tightening (contractions) of a specific muscle or group of muscles. During isometric exercises, the muscle doesn't noticeably change length. The affected joint also doesn't move. Isometric exercises help maintain strength. They can also build strength, but not effectively.

2-Isotonic exercises involve muscles contracting and shortening as they overcome resistance, with movement in the attached joint. Examples include lifting weights or even carrying groceries.

3-Isokinetic exercise is a type of strength training in which the speed of the movement remains constant, but the resistance varies. People tend to use specialized exercise machines to perform these exercises.


Isometric contraction
Muscle contracts
but does not shorten
No movement
(a)
Concentric contraction
Movement
(b)
Eccentric contraction
Movement
(c)



Principles of Strength and Conditioning:

Strength and Conditioning is the selection and development of dynamic /static exercises used to improve physical performance. Whilst it originally benefited athletes it is now widely used in both the sporting world and the wider population, including older people.

Principle 1 - Individuality

Each person will have unique responses to the same training stiumulus, due to individual characteristics, such as biological age, training age, gender, genetics, body size and shape, past injuries, etc. Training should be adjusted to the individual's characteristics and needs.

Principle 2 - Specificity

Physiological adaptations to training are specific to the muscle groups trained, the intensity of the exercise, the metabolic demands of the exercise and specific movements and activities.

Principle 3 - Progressive Overload

Certain adaptations require training with greater stimulus than that to which the body is accustomed.

This could be done by increasing the intensity, duration or frequency of training. Overloading should occur at an optimal level and time frame to maximize performance.

Overloading too quickly may lead to poor technique or injury, while very slow overloading may result in little or no improvement.

To continue to gain benefits, strength training activities need to be done to the point where it is difficult to do another repetition (close to maximal force generating capacity).

Overload leads to muscle hypertrophy via activation of satellite cells.

Principle 4 - Diminishing Returns

An individual's level of training determines how much improvement in performance is achieved due to the training.

A novice will see large and relatively quick gains in performance when they begin training. However, the gains become smaller, and come about slower, as the individual becomes more experienced.

Principle 5 - Reversibility

The effects of training will be lost if a training stimulus is removed for an extended period of time: "Use it or lose it."

How to Increase Hypertrophy, Strength and Power:

The number of motor units is one of the most important determinants of power, strength, and muscle size. Two ways of accomplishing higher motor unit recruitment are:

1-Heavier resistance: Henneman's size principle

2-Low resistance, high reps to momentary muscle failure or near failure

standard exercise programs for specific groups:

1-Basic

Squat (leg press if unable to do squat)

Knee extension

Knee flexion (leg curl or Romanian deadlift; deadlift with caution in elderly patients with spine issues)

Chest press

Seated low row

2-Complementary

Hip adduction/abduction

Hip flexion/extension

Calf raise (standing or seated)

Elbow flexion/extension

Core/abdominals

One multi-joint exercise should be prescribed for major muscle groups although lower limbs may respond better to exercise.

Standardized Exercise Programme:

Below are some sample resistance exercise programs target general strengthening of the major muscle groups (you can select the exercises that are most appropriate for your patient):

Chest (Pectorals)

Shoulder (Deltoids, Rotator Cuff, Scapula)

Arms (Biceps, Triceps, Forearm)

Back (Latissimus Darsi, Erector Spinae)

Abdominals (Rectus Abdominus, Obliques)

Legs (Hip Flexors, Gluteals, Quadriceps, Hamstrings)

There are 2 types of isotonic contractions: concentric and eccentric. In a concentric contraction, the muscle tension rises to meet the resistance then remains stable as the muscle shortens. During eccentric contraction, the muscle lengthens as the resistance becomes greater than the force the muscle is producing.

precaution of resistance exercise:

Safety when using heavier weights

For example, keep your back straight and lift from your thighs when picking up weights from the floor. Work out with a partner. Don't lift a particularly heavy weight unless you have someone on hand to 'spot' you

Contraindications to resistance training include :

unstable angina, uncontrolled hypertension (systolic blood pressure ≥160 mm Hg and/or diastolic blood pressure ≥100 mm Hg), uncontrolled dysrhythmias, a recent history of congestive heart failure that has not been evaluated and effectively treated,

Dynamic and static resistance training is contraindicated in the presence of inflammatory neuromuscular disease. Dynamic resistance exercises are contraindicated in the presence of acute inflammation of a joint as it can irritate the joint and cause more inflammation

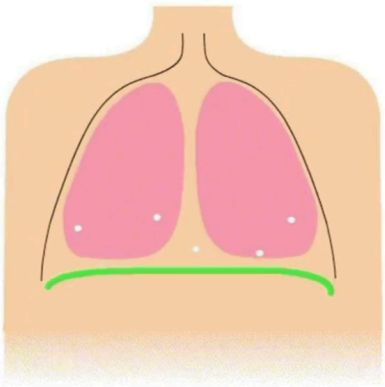
Breathing exercises

Dr.Fawzi Hammadi

Mechanism of breathing:

When the lungs inhale, the diaphragm contracts and pulls downward. At the same time, the muscles between the ribs contract and pull upward. This increases the size of the thoracic cavity and decreases the pressure inside. As a result, air rushes in and fills the lungs

-breathing usually does not require any thought, because it is controlled by the autonomic nervous system, also called the involuntary nervous system. The parasympathetic system slows your breathing rate. It causes your bronchial tubes to narrow and the pulmonary blood vessels to widen



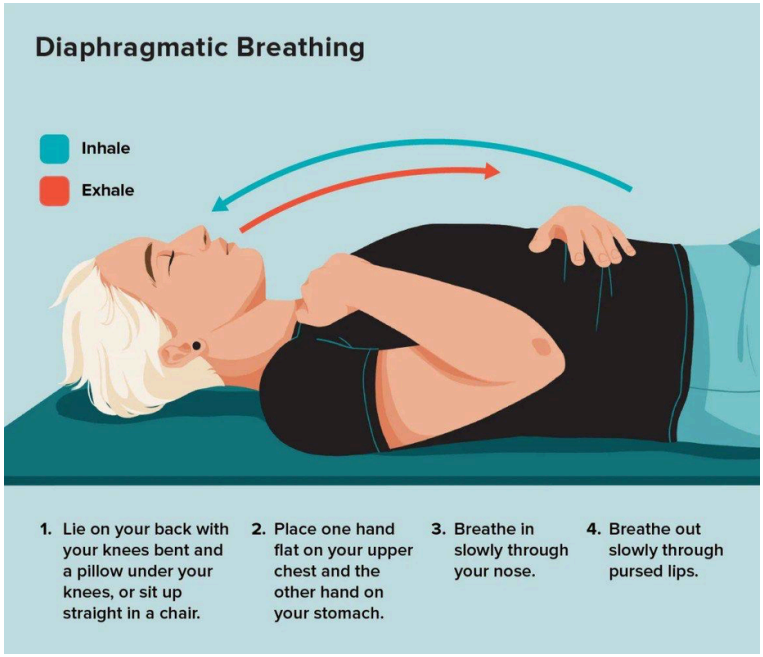
Definition:

Breathing exercises are a form of exercise which can improve the overall efficiency at which the lungs function. They can be helpful in individual with both healthy lungs as well as those with impaired lung function.

Benefits of breathing exercises :include a variety of health-related reasons. eg: to enhance the respiratory system by improving ventilation; strengthening respiratory muscles; make breathing more efficient; and for relieving stress and anxiety

Types:

1-Diaphragmatic breathing is a type of breathing exercise that helps strengthen the diaphragm, the main muscle that helps with breathing, as it represents 80% of breathing. Diaphragmatic exercises help to make people feel relaxed and rested.



This breathing exercise is also sometimes called belly breathing or abdominal breathing.

Technique:

Position patient in a gravity-assisted position eg. Semi fowler's position.

Focusing on the Diaphragm - Place one hand on the chest and the other on your stomach. Take a slow deep breath, paying attention to which hand moves. In diaphragmatic breathing, the stomach hand should move most

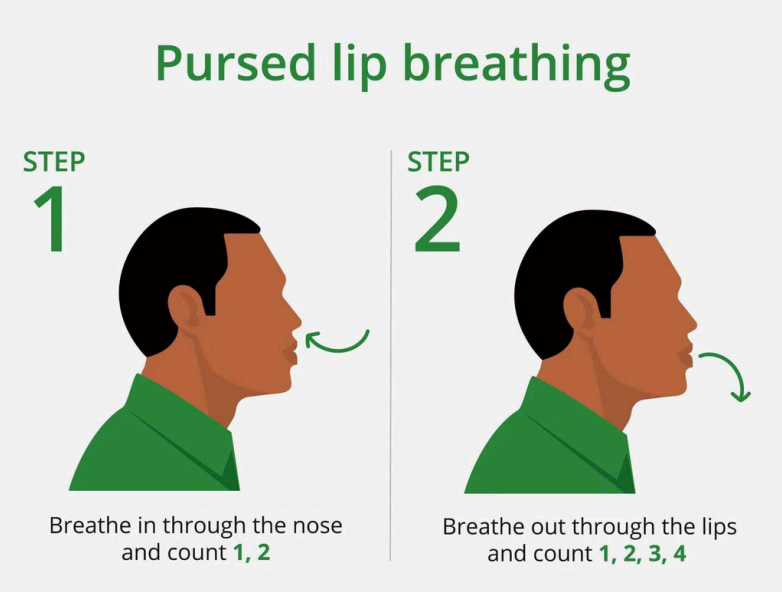
Slow the breathing - Inhale to fully inflate the lungs, then slowly exhale. Breathing out through the nose can help control exhalation rate. Pause briefly after exhaling then inhale again.

2-Pursed Lip Breathing:

Pursed-lip breathing is a breathing technique that consists of exhaling through tightly pressed (pursed) lips and inhaling through the nose with the mouth closed. It is an effective way of slowing down breathing and increasing exhalation time allowing more air to be released with each breath cycle.

This technique has been found to benefit people who have obstructive lung diseases

eg chronic obstructive pulmonary disease (COPD)and asthma leading to dyspnea during exertion.



3-Deep Breathing

Deep breathing helps to reexpand lungs and can be useful for improving ventilation esp following surgery where certain areas of the lungs may be underventilated due to pain. It can also be called lateral costal or umbrella breathing and can be done unilaterally or bilaterally. Deep breaths are also necessary for sputum mobilisation and form part ot the Active Cycle of Breathing Techniques mentioned below.

Technique:

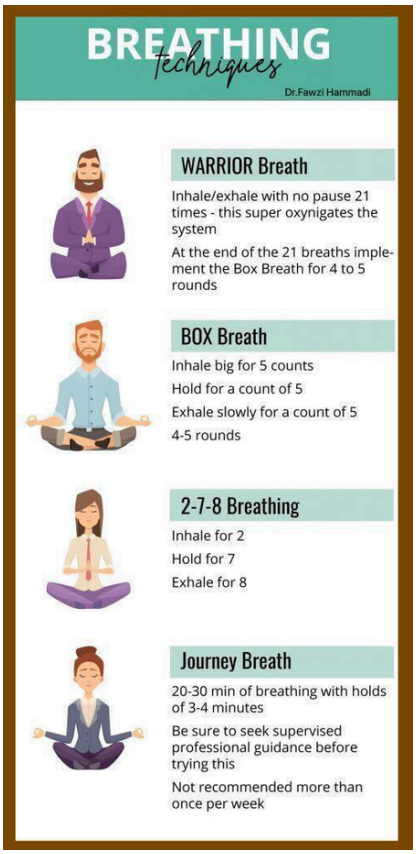
While standing or sitting, place your hands on the lower aspect of the rib cage.

Instruct patient to breathe out and apply pressure in downward and inward direction.

Shortly before instructing the patient to breathe in, apply quick stretch in the down and inward direction

With the tactile stimulation and cuing, facilitate patient to take a deep breath in

Slowly release your breath by exhaling through the nose



4-Active Cycle of Breathing Techniques

The Active Cycle of Breathing Techniques (ACBT) is an active breathing technique performed by the patient and can be used to mobilize and clear excess pulmonary secretions and to generally improve lung function. Once ACBT has been taught, the patient can be encouraged to use it independently without the supervision of a physiotherapist. This exercise does not require the use of any special equipment.

5-Box Breathing

Box breathing can be helpful with relaxation. Box breathing is a breathing exercise to assist patients with stress management and can be implemented before, during, and/or after stressful experiences.

Box breathing involves visualizing a journey around the four sides of a square, pausing while traveling horizontally, and breathing in while traveling up the square and out while traveling down it. This exercise can be implemented in many environments, not requiring a calm environment to be effective.

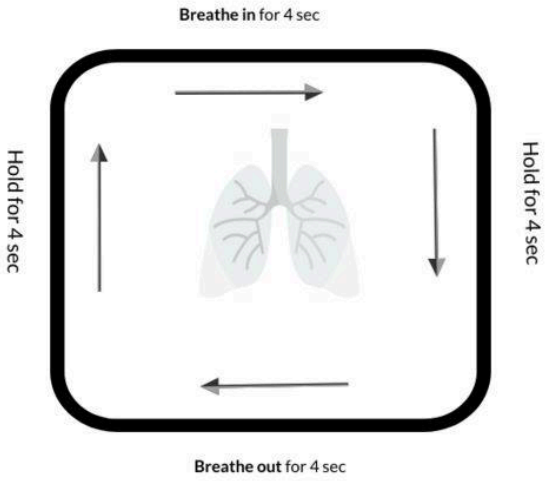
Step One: Breath in through the nose for a count of 4.

Step Two: Hold your breath for a count of 4.

Step Three: Breath out for a count of 4.

Step Four: Hold your breath for a count of 4.

Repeat



Postural drainage :

is a way to help treat respiratory problems due to inflammation and excess mucus in the airways of the lungs. Postural drainage basically “use(s) gravity to drain mucus out of your lungs by changing positions

There are 4 postural drainage techniques that you can try at home. You can perform them lying on your stomach or your sides over exercise balls, pillows or chairs.

1. On a chair

You just need a chair to try this posture. Choose a flat surface, such as the floor or the bed. Lean forward over the back of a chair at an angle of 30 degrees. Extend your legs back to support your body. Rest your elbows on the bed and fold in your arms.

Hold this posture for around five minutes to aid in mucus drainage from the posterior segment of the lungs. Inhale deeply through the nose and exhale through the mouth. Physical therapists recommend practicing postural drainage in an empty stomach to prevent nausea or vomiting.

2. On a wedge pillow

Try this technique on the bed or on a flat surface. Lie on your stomach over a wedge pillow or a bean bag and tilt your body forward such that the hips are at a higher level

than the chest. Extend your legs back for support. Keep your knees off the bed. Fold your arms under a pillow and rest your head on it.

This posture raises the lower back portion of the lungs and helps to drain out the effusion from that part. For maximum efficiency, the position must be held for 5 minutes. Take deep breaths and exhale fully keeping your cheeks puffy. Talk to your physical therapist to rule out risks of accidental injuries to the neck or back.

3. On an exercise ball

You can also choose an exercise ball to expel mucus from your lungs. Place the ball on the floor or on an exercise mat. Lie on your stomach over the exercise ball and get into a slanting position with your head and chest positioned lower than your hips. Touch the mat or the floor with your head and rest your toes on it for additional support.

With your torso following the curve of the exercise ball, your lungs are tilted forward. Mucus travels out of the lungs, unclogging the airway. The effusion can then be either coughed out or removed by suctioning. You should respire deeply to make the draining more effective. To get rid of the mucus that builds up in your lungs at night, the drainage is best performed in the morning.

4. Lying on your side

This technique requires you to lie on your side instead of your stomach. Your hips should be higher than your chest. To do this, place pillows under your hips. This posture tilts your lungs and gravity moves the mucus out. If you want to empty the lower part of your left lung, lie on your right side. Put your right arm around your waist and rest your left arm beside your head. Similarly, lie on your left side if you want to clear out the mucus from the lower part of your right lung and place your hands accordingly.

This posture can be practiced for three to five minutes after you get up in the morning. To prevent waking up at night due to lung congestion, lie down in this posture before going to bed. However, you should wait for at least two hours after a meal before attempting this technique.


POSTURAL DRAINAGE
TECHNIQUES
1
2
3
4
IMPORTANT PLEASE SHARE
XO
PHYSICAL THERAPY

Progressive resistance training (PRT)

Dr.Fawzi Hammadi

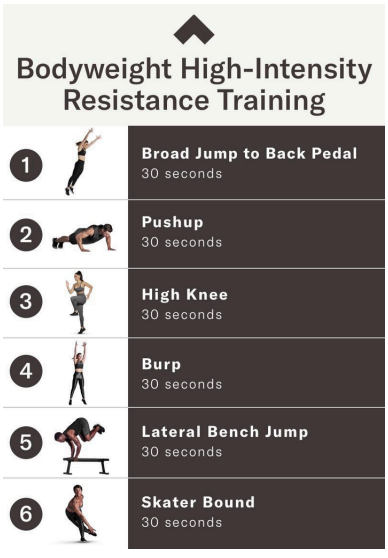
is a type of exercise where participants exercise their muscles against some type of resistance that is progressively increased as their strength improves

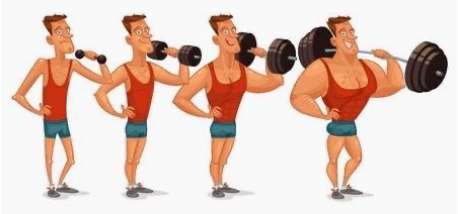
Some examples of progressive resistance exercise are: push-ups (isotonic), wall sits (isometric), and walking on a treadmill (isokinetic). The progressive resistance principle involves altering weights, changing the number of reps, and increasing the time under tension

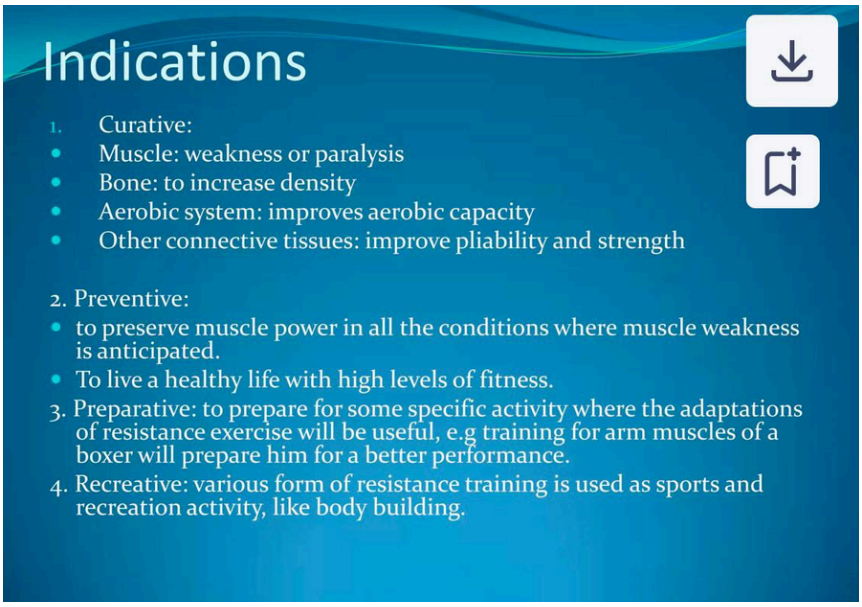
Techniques:

1-The DeLorme technique was proposed by Thomas DeLorme and involves a progressive resistance exercise (PRE) program based on 10 maximum repetitions (10RM), where subjects perform the first set of 10 repetitions at 50% 10RM, the second at 75% 10RM, and the third (final) set at the 10RM

2-Another method to strengthen muscle is the Oxford technique or the reverse pyramid technique. The Oxford technique is emphasizing training from the high load to the lighter load based on the 10 RM. It starts from the 100 % of 10 RM, 75 % of 10 RM and 50 % of 10 RM for the first, second and third set respectively

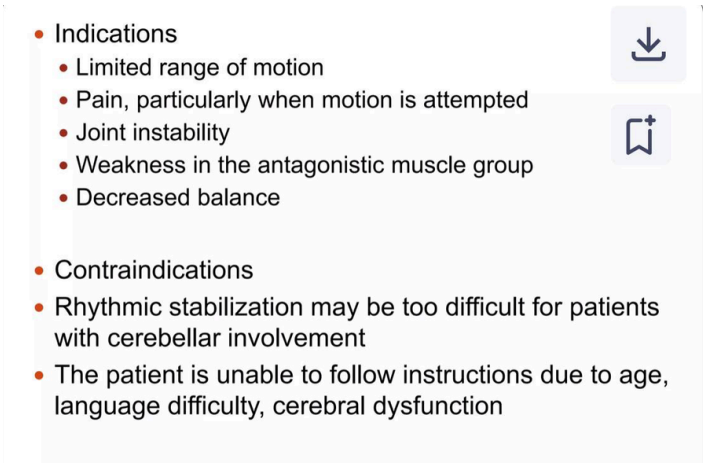






Proprioceptive Neuromuscular Facilitation (PNF)

is a stretching technique utilized to improve muscle elasticity and has been shown to have a positive effect on active and passive range of motions



Principles :

are stimuli used in practice that can be exteroceptive (e.g. tactile, verbal/auditory or visual) or proprioceptive stimuli (e.g. resistance, traction, approximation and stretching), all of which are incorporated in all PNF practice with small variations according to patients' condition and treatment goals.

1-Tactile stimulus: represented by the correct manual contact and grip for both therapist's hands on the target body part.

2-Verbal or auditory stimulus: this is represented by a therapist's command or order to guide the patient for movement and its timing. it can be preparatory or action or feedback.

3-Visual stimulus: which is persons can see and follow the movement with their eyes as much as they can. This promotes feedback, influence body and head motions and gives reflexive reinforcement or facilitation to certain muscles.

4-Resistance: optimal resistance is performed by the therapist to suit the treatment goal and the patient's ability. Different degrees or intensities of resistance results in different types of muscle contractions.

Isometric contractions occur when therapist's resistance equals the patient's ability to overcome or the patient stabilizes the position of the extremity with no resistance from the therapist.

Concentric and eccentric (Isotonic) contractions occur when therapist's resistance is less or higher than patient's ability respectively

5-Traction: is the elongation of the extremity or the trunk by the therapist, it is performed all of the movement except on reaching the possible end of pattern.

6-Approximation: is the compression of the extremity or trunk and it is mostly done near or by the end of pattern.

7-Stretching: stretch stimulus is putting the target muscle in the optimal lengthening position for facilitating muscle contractions, this explains the reason for starting with the pattern that opposes the target pattern and move towards the target pattern.

Patterns of extremities

First: Unilateral patterns

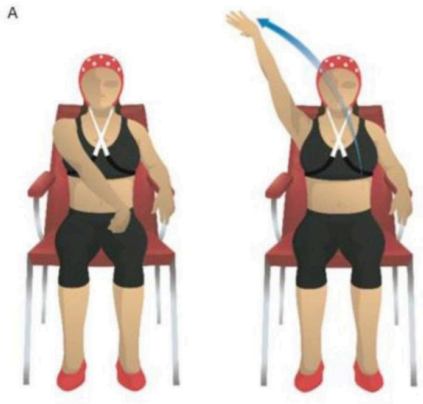
Patterns are named according to the proximal joint movement while the pattern movement starts with the most distal joints. This sequence occurs in every patterns and represents normal timing any change in this sequence is performed as timing for emphasis.

For upper extremities:

The first diagonal (D1): Flexion-adduction-external rotation pattern of the gleno-humeral joint and Extension-abduction-internal rotation pattern of the gleno-humeral joint.

The second diagonal (D2): Flexion-abduction- external rotation pattern of the gleno-humeral joint and Extension-adduction- internal rotation pattern of the gleno-humeral joint.

D1 diagonal [5]. Please note that **wrist and fingers flexion** with supination and radial deviation are done for flexion pattern while the opposite is done for extension pattern.



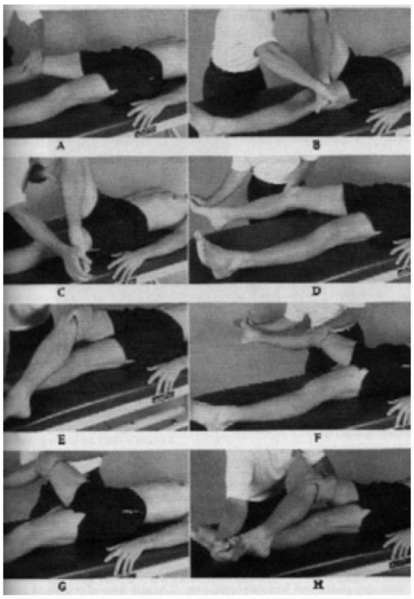
D2 diagonal[6]. Please note that **wrist and fingers extension** with supination and radial deviation are done for flexion pattern while the opposite is done for extension pattern.

For lower extremities:

The first diagonal (D1): Flexion-adduction-external rotation pattern and extension-abduction-internal rotation.

The second diagonal (D2): Flexion-abduction-internal rotation pattern and extension-adduction-external rotation.

Please note that every flexion pattern is accompanied by ankle dorsiflexion + toes extension and extension pattern is accompanied by ankle planterflexion + toes flexion. Also, subtalar movements depends on the desired pattern contains hip adduction or abduction. Subtalar eversion is associated hip abduction and subtalar inversion is associated with hip abduction.



Lower limb PNF patterns: first two images represent the two patterns of first diagonal while last two images represent the two patterns of second diagonal[8]

Patterns of scapula and pelvis

Girdles in the human body are the proximal articulations of the extremities with the trunk. Pelvic girdles are the links between lower extremities and the trunk while scapulae link upper extremities with the trunk. Girdle patterns can be performed independently or in conjunction with the upper extremity or trunk patterns.

Scapula

Scapula D1 consists of the anterior elevation pattern -in which scapula moves up towards one's ear and front (mix of upward rotation, abduction and protraction)- and posterior depression pattern in which scapula moves down and back (mix of downward rotation, adduction and retraction).

The anterior elevation occurs with Flexion-adduction-external rotation gleno-humeral pattern while posterior depression occurs with extension-abduction-internal rotation gleno-humeral pattern.

Scapula D2 constitutes the posterior elevation pattern -in which scapula moves up towards one's ear and back (mix of upward rotation, adduction and retraction)- and anterior depression pattern -in which scapula moves down and front (mix of downward rotation, abduction and protraction).

The posterior elevation occurs with Flexion-abduction-external rotation gleno-humeral pattern while anterior depression occurs with extension-adduction-internal rotation gleno-humeral pattern.

Scapula articulates with the humerus and thoracic cage, scapula muscles are attached to humerus and spine. That's why scapula movements can occur with upper trunk or upper extremities movements.

Pelvis

Pelvis D1 consists of the anterior elevation pattern in which one side of pelvis moves up and front towards trunk and posterior depression pattern in which pelvis side moves down and back.

Pelvis D2 consists of the posterior elevation pattern in which one side of pelvis moves up and front towards trunk and anterior depression pattern in which pelvis side moves down and back.

In contrast to Scapular diagonals, pelvis patterns don't correspond directly with lower extremities patterns because their motions depend on trunk muscle actions primarily not lower extremities muscles.

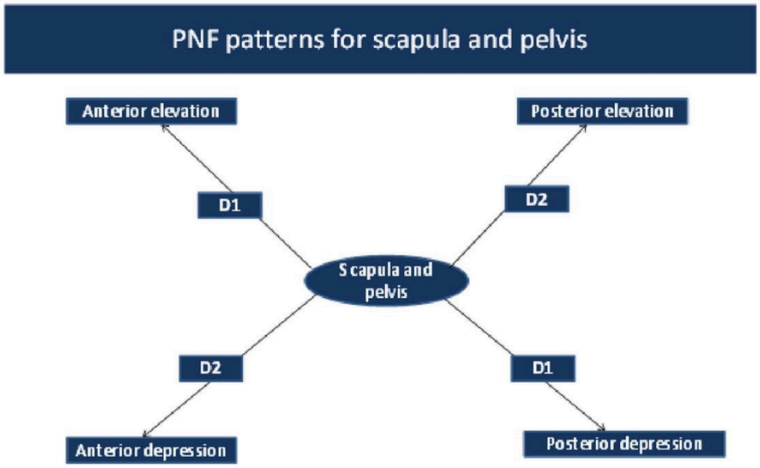


Image represents PNF patterns for scapula and pelvis[10]

Second: Bilateral patterns

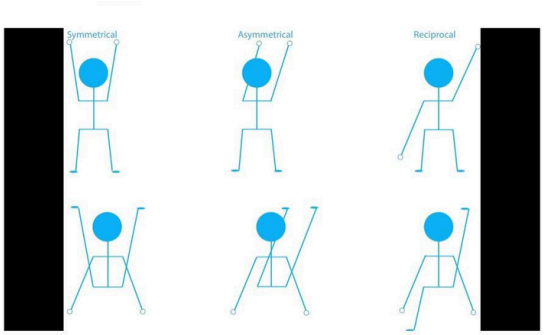
Four main combinations can be used if we want to engage both upper extremities or both lower extremities:

Symmetrical: We instruct the individual to perform same pattern on both limbs e.g. flexion-adduction-external rotation for both upper extremities.

Asymmetrical: We inform the trainee to perform a certain pattern of a diagonal at one limb and perform another pattern on the other limb in the same direction of the first from the other diagonal e.g. flexion adduction external rotation and flexion abduction external rotation.

Reciprocal symmetrical: We teach the person to do a pattern in one limb from a diagonal by one limb and do the opposite pattern of the same diagonal by the other limb e.g. flexion-adduction-internal rotation and extension-abduction-internal rotation.

Reciprocal asymmetrical: The patient do a pattern in one limb and opposes the pattern that is in the same direction of the first but from the other direction e.g. flexion -adduction-external rotation and extension-adduction-internal rotation.



The image represents three combinations in upper limbs (the upper row) and lower limb (the lower row). First column shows symmetrical pattern combination, second column illustrates asymmetrical pattern combination and third column shows reciprocal asymmetrical pattern combination.[13]

Patterns of the trunk

For trunk movements, bilateral extremities patterns are performed in asymmetrical maneuvers "Check previous section - bilateral patterns" to engage the spinal rotation. Patterns of trunk movements are exclusive into:

flexion with right rotation

extension with left rotation

flexion with left rotation

extension with right rotation

When both upper extremities move into flexion, this encourages upper trunk extension and the reverse is true while in case of movements of lower extremities into flexion, the lower trunk moves into flexion and vice versa.

PNF techniques:

1. Agonistic techniques:

Rhythmic initiation.

Repeated contractions (from the beginning or throughout the range).

Combinations of isotonics.

Replication.

2. Antagonistic techniques:

Reversals.

Rhythmic stabilization.

3. Relax techniques:

Hold - relax.

Contract - Hold relax.

Intended goals for using techniques:

Facilitating motion initiation

Rhythmic initiation

Repeated stretch from the beginning of the range.

Learning a motion

Rhythmic initiation

Combination of isotonics

Repeated contractions

Replication

Changing rate of motion

Rhythmic initiation

Reversals

Repeated contractions

Increasing strength

Combination of isotonics

Reversals

Rhythmic stabilization

Repeated contractions

Increasing stability

Combination of isotonics

Reversals

Rhythmic stabilization

Increase coordination and control

Combination of isotonics

Rhythmic initiation

Reversals

Rhythmic stabilization

Repeated contractions

Replication

Increase endurance

Reversals

Rhythmic stabilization

Repeated contractions

Increase ROM

Reversals

Rhythmic stabilization

Repeated contractions

Contract–relax

Hold–relax

Relaxation

Rhythmic initiation

Rhythmic stabilization

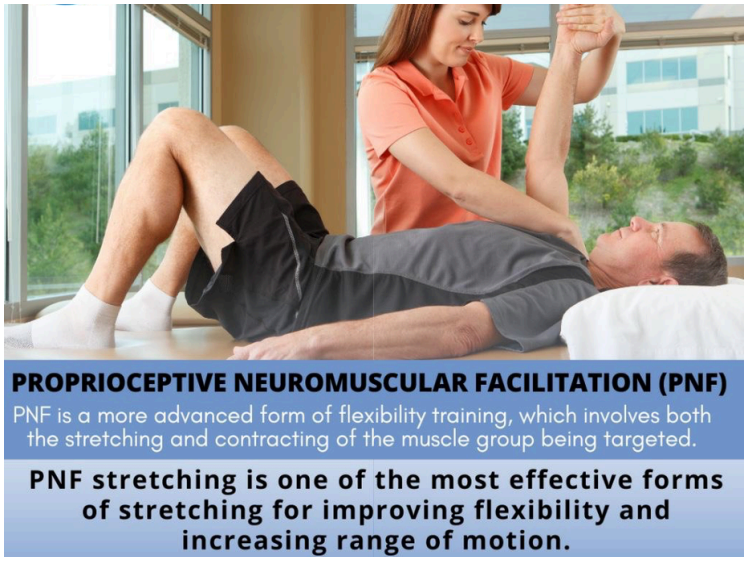
Hold–relax

Decrease pain

Rhythmic stabilization

Reversals

Hold–relax



PNF-Stretch: Hold-Relax with agonist contraction

Passive Stretch
10 seconds

Isometric Hold
6 seconds

Concentric contraction
of quadriceps

Autogenic Inhibition
Reciprocal Inhibition

to increase ROM in hamstrings activation of thigh and hip flexors will inhibit hamstrings more (reciprocal inhibition) and when relaxation occurs ROM will increase at the end

The Free exercises

Dr-Fawzi Hammadi

Definition

are those which are performed by the patient's own muscular efforts without the assistance or resistance of any external force, other than that of gravity

Classification of free exercises:

Free exercises may be classified according to the extent of the area involved, they may be

a-Localized: Localized exercises are designed primarily to produce some local and specific effects, e.g. to mobilize aparticular joint or to strengthen particular muscle groups Movement is localized to one or more joints, either by the use of suitable starting position or by voluntary fixation of other areas by the patient's own muscular effort.

b-General exercises: It usually involves the uses of many joints and muscles all over the body and the effect is widespread e.g.running

Therapeutic effects

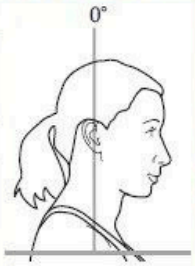
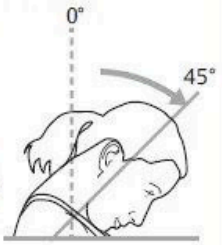
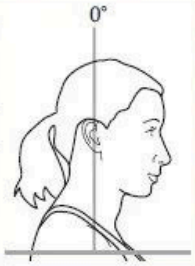
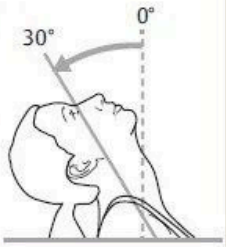
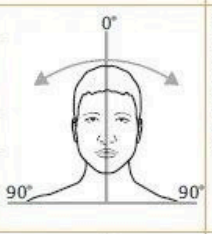
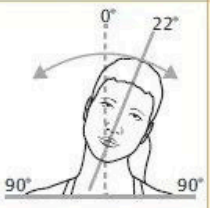
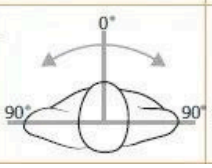
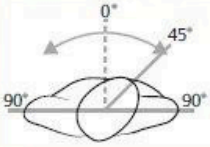
free exercise provides relaxation, joint mobility, neuromuscular coordination, and improves circulation and respiration. Assisted exercise is useful when muscle strength or coordination is inadequate, by applying an external force to augment weak muscular action in the direction of muscle movement.

Mobilisation technique : involves applying targeted forces on a painful, stiff, or otherwise compromised joint in order to improve its overall function. While not appropriate in all situations, joint mobilizations may help improve your range of motion, reduce your pain, and minimize the stiffness.

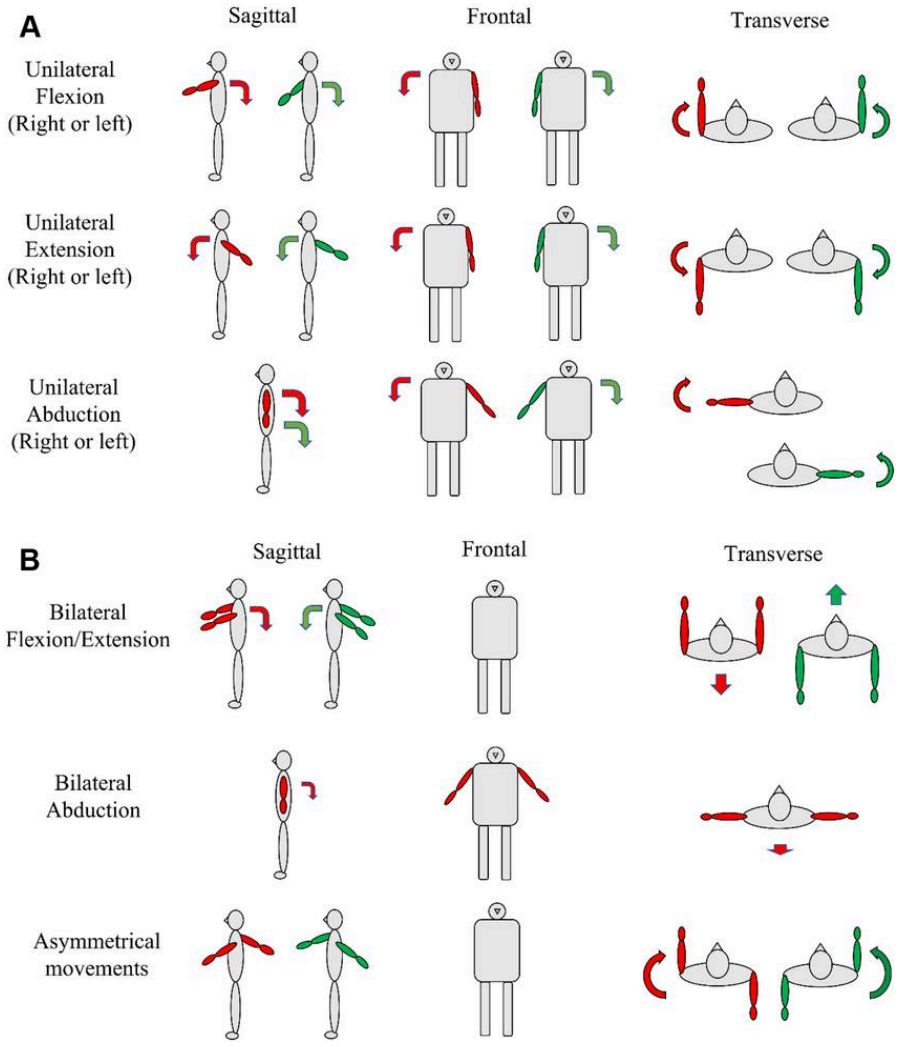
The hip joint movement

The hip joint is a multiaxial joint and permits a wide range of motion; flexion, extension, abduction, adduction, external rotation, internal rotation and circumduction.

The neck movement :

Normal Range of Movement		
Range of movement	**Neutral position**	**Example**
Flexion This could be measured in 0–90 degrees from the neutral position. Norm = about 38 degrees Or, it could be measured crudely in terms of how many centimeters (or inches) the subject's chin is from their sternum.		This person has about 45 degrees of flexion. Their chin is less than 1 cm from their sternum. They would appear to have a greater degree of cervical flexion than most people. 
Extension This could be measured in 0–90 degrees from the neutral position. Norm = about 38 degrees Or, it could be measured crudely in terms of how many centimeters (or inches) the subject's chin is from their sternum.		This person has about 30 degrees of extension. Their chin is about 22.5 cm from their chest. This appears to be slightly less than a normal range. 
Lateral flexion This could be measured in 0–90 degrees from the neutral position. Norm = about 43 degrees Or, you could measure crudely how far the client's ear is from their shoulder.		In this example, our subject has about 22 degrees of left lateral flexion, less than the norm. 
Rotation This could be measured in 0–90 degrees from the neutral position. Norm = about 45 degrees		

Shoulder movement :



Aerobic Exercise

Dr.Fawzi Hammadi

Aerobic exercise is a physical activity that uses your body's large muscle groups, is rhythmic and repetitive. It increases your heart rate and how much oxygen your body uses. Examples of aerobic exercises include walking, cycling and swimming. It reduces your risk of heart disease, diabetes, high blood pressure and high cholesterol.

Aerobic exercise is a physical activity that uses large muscle groups in your body. This type of exercise is usually rhythmic and repetitive. You can adjust the intensity of your workout, which is how hard your body works during this type of exercise.

What is the difference between aerobic and anaerobic exercises?

Aerobic and anaerobic are terms that define how your body produces energy.

Aerobic means "with oxygen." When you participate in a continuous activity that increases your heart rate, your cells use oxygen to produce energy. An example of aerobic exercise is walking.

Anaerobic means "without oxygen." When you engage in a quick, high-intensity activity, your cells aren't using oxygen to produce energy. An example of an anaerobic exercise is lifting weights

The benefits of aerobic exercise include:

1-Building stronger bones.

2-Improving your muscle strength, endurance and flexibility.

3-Improving your balance.

Increasing your mental function.

4-Assisting in weight management and/or weight loss.

5-In addition, aerobic exercise can:

-Reduce your risk of developing heart disease, hypertension, stroke or diabetes.

-Improve your lung function.

-Lower your blood pressure.

-Increase HDL or "good" cholesterol.

-Help to better manage your blood sugar

***Preventing aerobic exercise injury**

You can take steps to prevent the problem of injury during aerobic exercise by:

-Talking to your healthcare provider before starting regular physical activity.

-Learning how to use exercise equipment safely.

-Using good techniques and performing the exercise as instructed.

Wearing proper gear or clothing.

-Being aware of your surroundings.

-Warming up and stretching.

-If you develop symptoms during exercise including, but not limited to, unusual shortness of breath; tightness in the chest; chest, shoulder or jaw pain; lightheadedness; dizziness; confusion or joint pain, you should stop exercising immediately and contact your healthcare provider.

-How often should I do aerobic exercises?

You should get about 150 minutes of physical activity each week. The amount per week equals about 30 minutes a day, five days a week. This is the recommended minimum guideline for reducing your risk of heart disease, diabetes, hypertension and high cholesterol.

-steps:

A warmup period.

Progression of the exercise.

A cooldown period.

-There are three ways to progress an aerobic exercise:

Increase speed.

Increase resistance.

Increase duration (time).

Any of these methods, or a combination of these methods, will improve aerobic fitness. Increasing intensity should be done very gradually. You should challenge yourself for only a few minutes at a time.

-Home exercises:

You can do the following aerobic exercises at home:

Walking.

Dancing.

Riding a bicycle.

Mowing the lawn (with a push mower).

If you like using specialized cardio equipment like an elliptical or treadmill, you may choose to go to a gym to do aerobic exercises.

-talk test?”

If you’re starting a new type of aerobic exercise, you can perform the “talk test” to see if an activity is too strenuous. While performing the activity, try to carry on a conversation or speak clearly during your exercise. If talking is challenging, you may be performing an activity that’s too intense. Over time, once you build strength and stamina, you can try this test again and you might get different results.

Aerobic exercises

Dr.Fawzi Hammadi

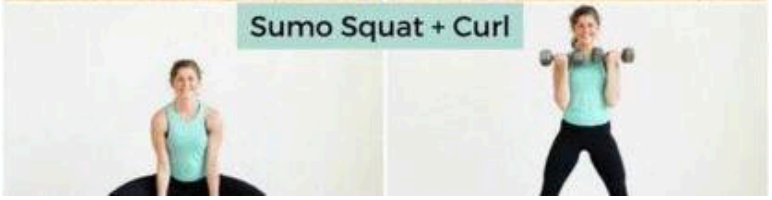
Perform each exercise for 45 seconds, followed by 15 seconds of rest. Repeat all eight exercises x 3 sets.

Single Arm Snatch + Overhead Reverse Lunge {right/left}

Split Jumps

Push Ups

Sumo Squat + Curl




Plyo Squat Jack
Tricep Kick + Glute Bridge
Total Body Roll Up
Chest to Floor Burpees

Co ordination and balance

Dr.Fawzi Hammadi

Definition:

Coordination is understood, in general as the ability of the human body to unify in a synchronised manner the work of various muscles in the execution of an intentional action.

Balance :is defined as the capacity that allows us to maintain a position in space, regardless of the movement performed.

*The relation between them:

In this way, one and the other complement each other to achieve the effectiveness of the movement in any part of the body especially in these skills:

-They promote greater performance in sport and in almost all activities.

-They correct postural problems, as balance encompasses postural dominance.

-They prevent the occurrence of falls, due to greater control of movements and awareness of our body.

-They improve reflexes.

-They complement other abilities, such as strength, flexibility, speed.

-They contribute to the body acting together and efficiently.

Physiology:

balance is mediated by the vestibular nuclei in the brain stem

the labyrinth (a part of the inner ear), is a major organ of our vestibular (balance) system

the three semi-circular canals of the labyrinth is associated with sensing rotary motion

the brain senses the direction and speed of rotation of the head by the movement of fluid in the semi-circular canals

balance is maintained by the interactions between the labyrinth and other systems in the body, such as the visual and skeletal systems

the main inputs into the balance system are the:

vestibular labyrinths

visual system (eyes)

somatosensory system, especially proprioception

the main outputs from the vestibular nuclei are:

vestibulo-ocular:

permitting reflex eye movements related to posture

vestibulo-spinal which supply:

anti-gravity muscles in the lower limbs

reflex arcs which control gait

Types of coordination

Coordination can be classified according to the body parts involved in the movement, as follows:

1-Dynamic Coordination: is characterised by extensive muscular involvement.

2-Oculo-Segmental Coordination: links the visual field and the motor skills of any segment of the body. We have the

3-Oculo-manual : referring to the ability to use the hands according to what we perceive with the eyes, associated with fine motor skills.

4-Oculo-pedic: refers to the ability to use the feet according to what we perceive with our eyes. It is characteristic of gross motor skills.

Co-ordination and balance exercises:

1-Squats and lunges

We stand with our feet parallel, hip-width apart.

Our arms are placed alongside the body.

We'll lower with our knees parallel, without going over the tips of our toes, then we'll raise our arms until we place them at eye level.

We hold down for five seconds and then come back up. We'll do between 8 and 10 repetitions.

انتقال ›

How to Do Squats: Form

2-Exercise in quadruped position

We get into a quadruped position, with the palms of our hands resting on a mat.

Arms shoulder-width apart and legs hip-width apart.

We raise our feet and one of our hands, supporting the weight of our body on our knees and the other hand.

3-Exercise with heel raises

We stand with our feet parallel and our arms stretched along the body.

Inhale, and as you exhale, bring your arms in front of you, raising your heels.

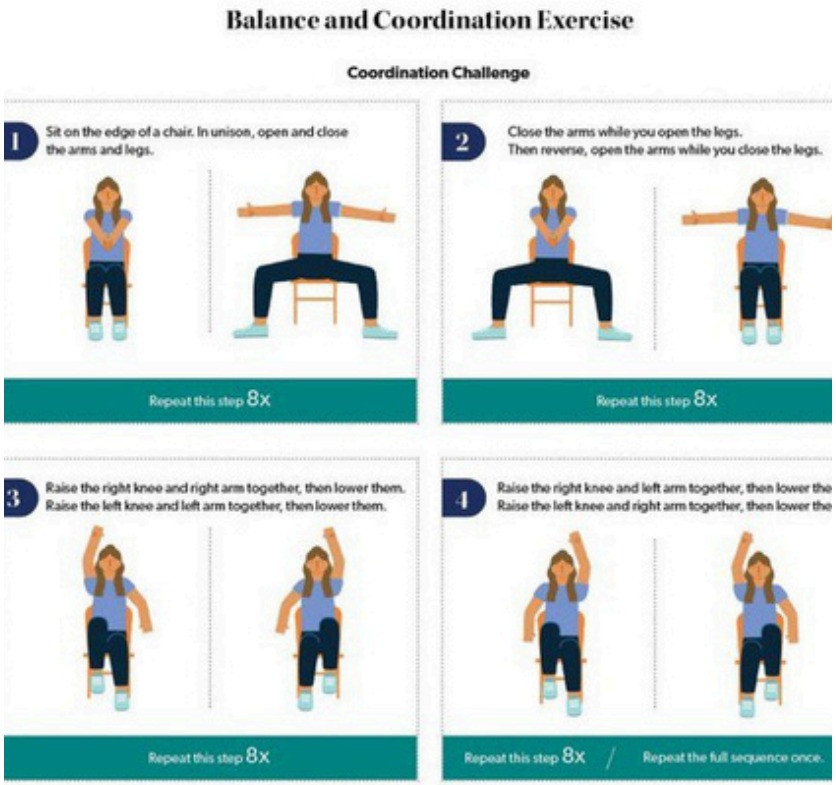
Hold this position for 15 seconds.

4-Exercise with a support chair

For this exercise we'll use a chair as a support.

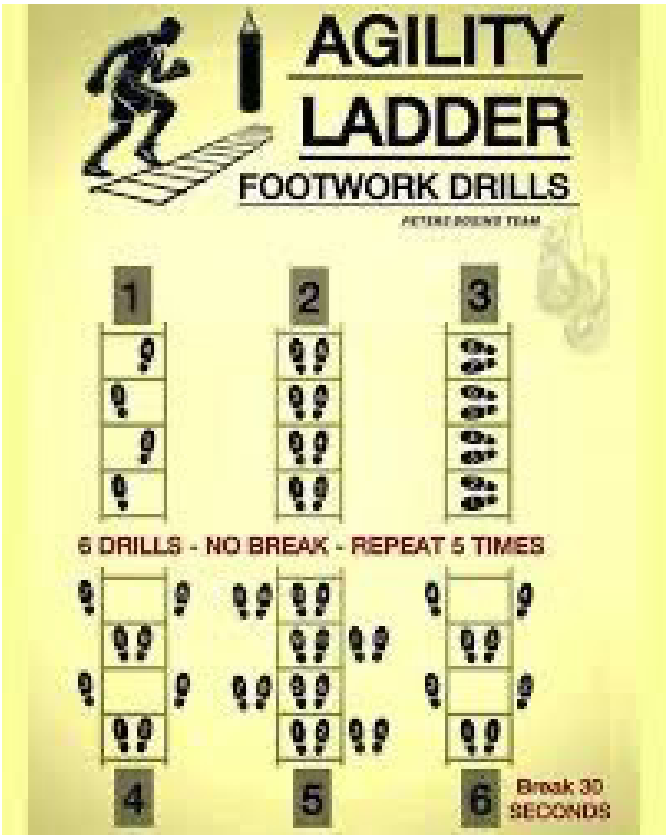
We stand behind the chair with our right hand resting on the backrest.

Inhale, exhale, and then do a hip extension, bringing the left leg backwards, raising the foot slightly and bringing the left arm into the cross position.



5-Agility ladder

It’s not an expensive item, it’s easy to acquire, and it provides a wide range of exercises, such as: being able to cross from one side to the other, running, skipping, laterally coordinating the feet, etc.


AGILITY
LADDER
FOOTWORK DRILLS
1
2
3
6 DRILLS - NO BREAK - REPEAT 5 TIMES
4
5
6
Break 30
SECONDS

Massage

Dr.Fawzi Hammadi

is the practice of rubbing and kneading the body using the hands. During a massage, a trained massage therapist will apply gentle or strong pressure to the muscles and joints of the body to ease pain and tension.

Massage causes physiological changes in your body through:

The relaxation response, which is an involuntary, yet predictable response of the nervous system to massage techniques and touch

Mechanical responses, which are physical effects that occur in the body when pressure is applied to the soft tissues

Together, these responses can produce physical and emotional benefits.

Types:

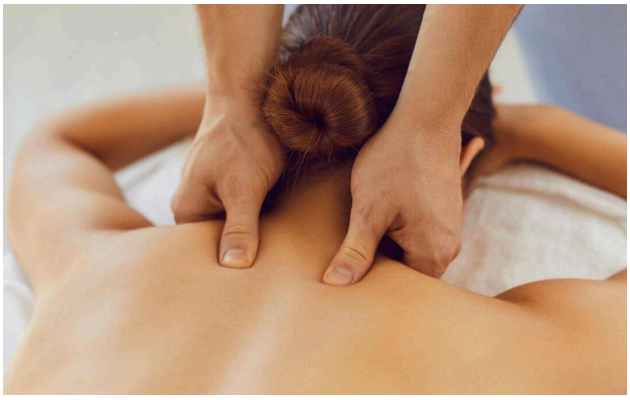
*Superfacial:

gentle massage like swedish massage

***Hot stone massage**

Hot stone massage is best for people who have muscle pain and tension or who simply want to relax.

This type of therapeutic the massage therapist uses heated stones in lieu of or in addition to their hands.



Hot stone massage may help:

ease muscle tension

improve blood flow

alleviate pain

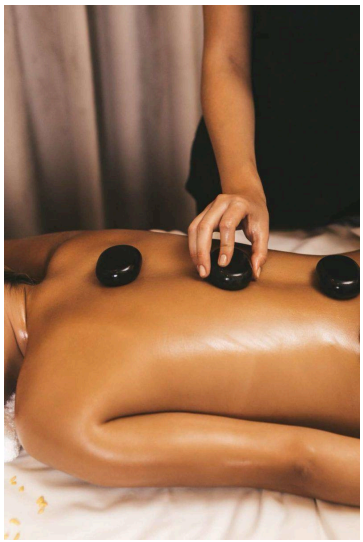
promote relaxation

relieve stress

During a hot stone massage, heated stones are placed on different areas of the whole body. Your therapist may hold a stone as they massage different parts of your body using Swedish massage techniques with gentle pressure. Sometimes, cold stones are also used.

You don’t wear clothes for hot stone massage, unless you’d prefer to wear your underwear. You’ll be covered with a sheet.

Usually, the massage is 90 minutes long.



*Aromatherapy massage

Aromatherapy massages are best for people who enjoy scent and want to have an emotional healing component to their massage. This type of massage can help:

boost your mood

reduce stress and anxiety

reduce symptoms of depression

relieve muscle tension

relieve pain

*Deep tissue massage

Deep tissue massage uses more pressure than a Superfacial massage. It's a good option if you have muscle problems, such as:

soreness

injury

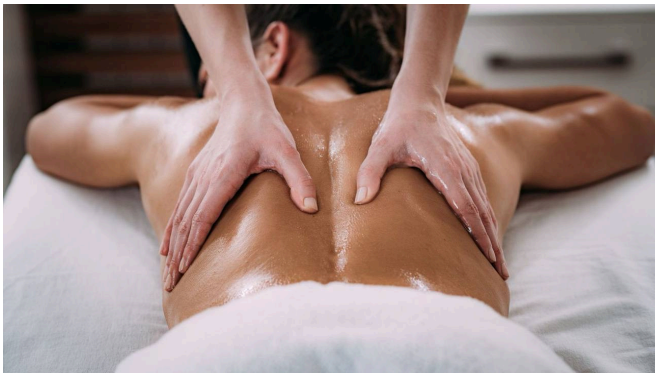
imbalance

tightness

chronic muscle pain

During a deep tissue massage, your massage therapist will use slow strokes and deep finger pressure to relieve tension from the deepest layers of your muscles and connective tissues. You can be naked during this massage or wear your underwear.

While deep tissue may be more intense, you shouldn't feel any pain or soreness.



*Sports massage

is a good option if you have a repetitive use injury to a muscle, such as what you may get from playing a sport. It's also a good option if you're prone to injuries, because it can be used to help prevent them.

Sports massage can:

increase flexibility

improve athletic performance

relieve pain

reduce anxiety

release muscle tension

A sports massage can be done as a full-body massage or on specific parts of the body that need the most attention. Deep pressure may be alternated with soothing strokes, depending on your needs.

***Trigger point massage is best suited for people who have injuries, chronic pain, or a specific issue or condition.**

Sometimes, areas of tightness in the muscle tissues, known as trigger points, can cause pain in other parts of the body. By focusing on relieving trigger points, this type of massage can reduce pain.

A 2018 review found that treatment of head and neck muscles with trigger point

therapy may reduce frequency, intensity, and duration of tension and migraine headaches, though more research is needed.

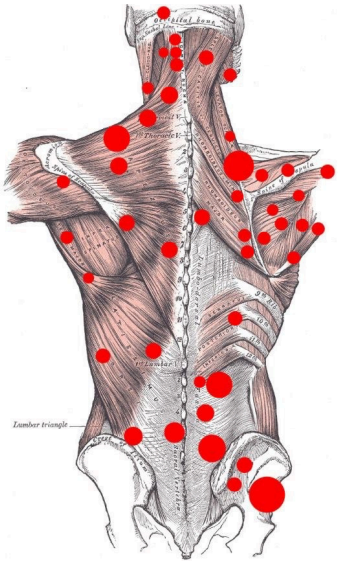
Trigger point massage uses alternating levels of pressure in the area of the trigger point to alleviate tension.

The massage will include work on your entire body, though your therapist will focus on specific areas that need to be released. You can wear lightweight clothing for the massage, or you can be fully or partially undressed.

This type of massage will usually last 60 to 90 minutes.

A Trigger Point (TrP)

is a hyperirritable spot, a palpable nodule in the taut bands of the skeletal muscles' fascia. Direct compression or muscle contraction can elicit jump sign, local tenderness, local twitch response and referred pain which usually responds with a pain pattern distant from the spot



*Reflexology

Reflexology uses gentle to firm pressure on different pressure points of the feet, hands, and ears.

It’s best for people who are looking to relax or restore their natural energy levels. It’s also a good option for those who aren’t comfortable being touched on the entire body.

Reflexology may be especially beneficial for:

relaxation

reduced pain

reduced fatigue

improved sleep

reduced anxiety

improved mood

*Lymphatic drainage massage

Lymphatic drainage massage, also known as manual lymphatic drainage (MLD), is a type of gentle massage that encourages the lymph fluids to circulate through the body.

The lymphatic system helps remove toxins, and improved circulation can help with a number of conditions, including:

lymphedema

fibromyalgia

edema

skin disorders

fatigue

insomnia

stress

digestive problems

arthritis

migraine

*Cranial sacral therapy

Cranial sacral therapy or craniosacral massage is a type of bodywork that helps release compression in the bones of the head, low back, and spine.

The idea behind cranial sacral therapy is that gentle manipulation of the bones in the skull, spine, and pelvis, can help the flow of cerebrospinal fluid in the central nervous system. It can also produce deeply relaxing results.

Some conditions that may benefit from cranial sacral therapy include:

migraine

headaches

constipation

irritable bowel syndrome (IBS)

disturbed sleep cycles and insomnia

scoliosis

sinus infections

neck pain

fibromyalgia

recurrent ear infections or colic in infants

temporomandibular joint (TMJ) disorders

trauma recovery, including trauma from whiplash

mood disorders, like anxiety or depression

difficult pregnancies

*Myofascial release therapy

Myofascial release therapy is another type of bodywork that involves releasing stiffness in the fascia, the connective tissue system that contains each muscle in the body. Your therapist will massage and stretch any areas that feel tense with light pressure.

Specific conditions that may benefit from myofascial therapy include:

myofascial pain syndrome

headaches

venous insufficiency

These massages usually last 60 minutes or longer.

Hydrotherapy

is any method that uses water to treat a variety of symptoms throughout your body. You might see it called water therapy, aquatic therapy, pool therapy or balneotherapy.

*What does hydrotherapy treat?

People with several conditions can benefit from using water in different forms and at different temperatures to feel better. Hydrotherapy can provide symptomatic relief to people with the following conditions:

Osteoarthritis.

Fibromyalgia.

Parkinson's disease.

Neuropathy.

Ankylosing Spondylitis (AS).

Multiple sclerosis (MS).

Cerebral palsy.

It's important to remember that hydrotherapy doesn't cure any of these conditions. It shouldn't take the place of any treatments or medications your healthcare provider prescribes you. In most cases, hydrotherapy helps people feel better by temporarily relieving pain, stiffness and swelling.

*Some of the most common forms of hydrotherapy include:

Baths: Soaking in hot or cold water.

Pressurized jets: Applying pressurized water to your body.

Temperature regulation: Applying ice packs, cyro (dry ice) packs or heat (in a sauna, for example) to different parts of your body.

*Advantages:

Hydrotherapy has lots of advantages. It can be a great way to reduce symptoms without medication or other more invasive treatments. If you receive hydrotherapy from a licensed, certified provider, hydrotherapy is also very safe and has little to no side effects.

*Risks of hydrotherapy treatments include:

Slips, falls or other accidents.

Burns or frostbites (from either heat or extreme cold).

Infections.

Because hydrotherapy isn’t regulated by the FDA, some claims about what it can help/prevent have spread online.

Posture

Dr.Fawzi Hammadi

Posture is a highly individual and dynamic aspect of human physiology. It is more about how your body adapts and interacts with different situations than a fixed 'correct' or 'incorrect' state.

Posture can be simply defined as the way in which we hold our bodies while standing, sitting, or lying down

Types:

1-Inactive Posture: Describe postures adopted during resting or sleeping, and they are more suitable for this purpose when all the essential muscular activity required to maintain life is reduced to a minimum.

2-Active Posture: The integrated action of many muscles is required to maintain active postures, which may be either static or dynamic.

-Static posture- the body and its segments are aligned and maintained in certain positions. Examples include standing, sitting, lying, and kneeling.

-Dynamic posture- the body or its segments are moving—walking, running, jumping, throwing, and lifting.

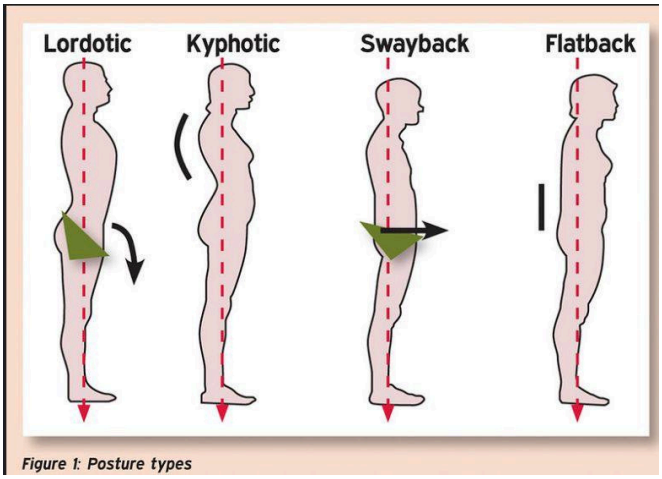
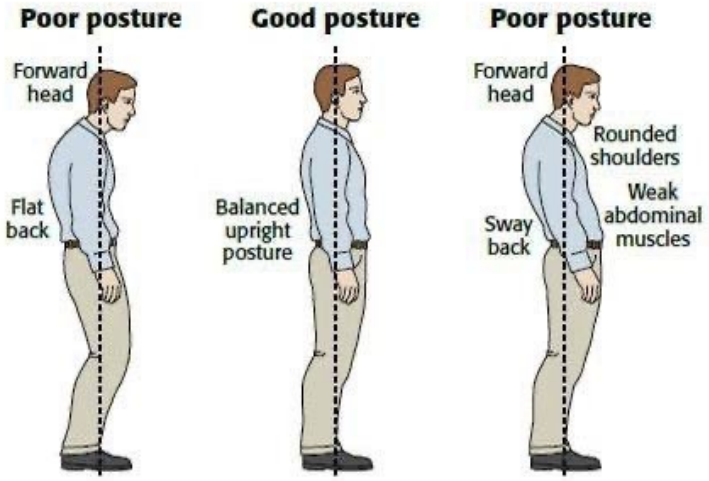


Figure 1: Posture types

Optimal posture: According to Vleeming et al., the sacral base is the geometric center of the postural system. Unlevelness of the base of the sacrum contributes to decreased postural balance and can be a chronic postural stressor. If posture is

misaligned, to maintain postural balance, the lumbar spine tends to angle laterally and concave towards the high side of the sacral base.



Bad posture :

Impairments that can cause unlevelness of the base of the sacrum bad posture may include:

1-Leg length discrepancies

If there is a leg length discrepancy, the pelvis will present as asymmetrical.

2-Piriformis Syndrome

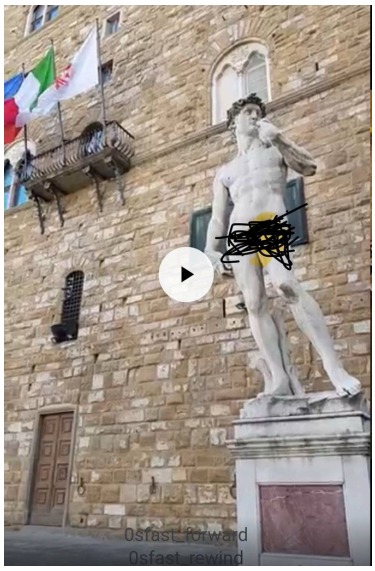
Piriformis syndrome has the ability to increase the tension on muscles of the pelvis as they try to stabilize the pelvis and the spine. This can throw the sacral base off of its geometric center.

3-Tight adductor muscles

Tight or weak hip adductors can cause a lateral pelvic tilt, which leads to issues with long-standing and standing posture.

4-Asymmetrical dynamic postures

A common asymmetrical dynamic posture is generally identified as the "Statue of David" posture. During this, one lower extremity is externally rotated, which potentially causes weakness in the internal rotators of the hip, and the opposing lower extremity is internally rotated, potentially causing weakness in the external rotators of the hip. To combat these weaknesses, strengthening of the weaker muscles is recommended



Bad Posture effects:

-Increase pressure on the spine, making it more prone to injury and degeneration

-Decrease flexibility

Affect how well joints move

-Affect balance and increase risk of falling

Make it harder to digest food

-Induce breathing disorder and affect surrounding structures including the heart and phrenic nerve

-In women it can lead to imbalance in the core muscle leading to incontinence and/or pelvic organ prolapse

Age related changes:

-Thoracic hyperkyphosis

-Loss of lumbar lordosis

-Decreased plantar arch

Physiotherapy

Rather than 'correcting' posture, physiotherapy can play a crucial role in improving postural awareness and promoting postural variability. Physiotherapists can help

individuals explore a range of postures and movements, enhancing their ability to adapt to different activities and environments comfortably.

Important advice could include:

1-Be mindful of posture during everyday activities, like watching television, washing dishes, or walking

2-Stay active. Any kind of exercise may help improve your posture, but certain types of exercises can be especially helpful. eg. yoga, tai chi, and other classes that focuses on body awareness. It is also a good idea to do exercises that strengthen your core.

3-Maintain a healthy weight. Extra weight can weaken abdominal muscles, cause problems for pelvis and spine, and contribute to low back pain.

4-Wear comfortable, low-heeled shoes. High heels, for example, can throw off balance and force person to walk differently. This puts more stress on muscles and harms posture.

5-Make sure work surfaces are at a comfortable height for you, whether sitting in front of a computer, making dinner, or eating a meal.

6-Ensure to engage your core (example deep abdominal and pelvic floor muscles) during strenuous activities and breath out as you lift. This helps to stabilise your spine.

7-Remember to maintain a neutral posture as this helps body to function optimally.

And to avoid:

A-Static postures such as prolonged sitting and standing.

B-Prolonged cross-legged sitting can lead to a bent and asymmetrical posture, especially for people with low back pain.Erect sitting for long hours can also cause postural problems.

C-It is recommended to get up from your chair and move around at least every 30 minutes.

D-Prolonged standing, usually at work, can lead to musculoskeletal pain and vascular disorders. Seated breaks are necessary to prevent the risk of causing associated pain or discomfort.

E-Smoking. Smoking habits were suggested to have a long-term-effect on the posture control system as it increases risk for lumbar disc degeneration.

Muscle Action in Posture

The balanced posture of the body reduces the work done by the muscles in maintaining it in an erect posture. It has been determined (using electromyography) that, in general:

The intrinsic muscles of the feet are quiescent, because of the support provided by the ligaments.

Soleus is constantly active because gravity tends to pull the body forward over the feet. Gastrocnemius and the deep posterior tibial muscles are less frequently active.

Tibialis anterior is less active (unless high heels are being worn).

Quadriceps and the Hamstrings are generally not as active.

Iliopsoas is constantly active.

Gluteus maximus is inactive.

Gluteus medius and tensor fascia latae are active to counteract lateral postural sway.

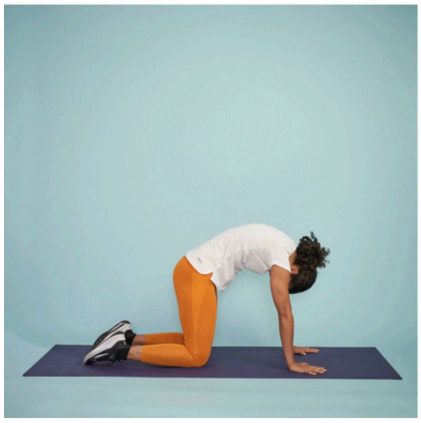
Erector Spinae is active, counteracting gravity's pull forwards.

The abdominal muscles remain quiescent, although the lower fibres of the Internal obliques are active in order to protect the inguinal canal

1. Child's Pose

2. Forward fold

3. Cat-Cow



4. Standing Cat-Cow

5. Chest opener

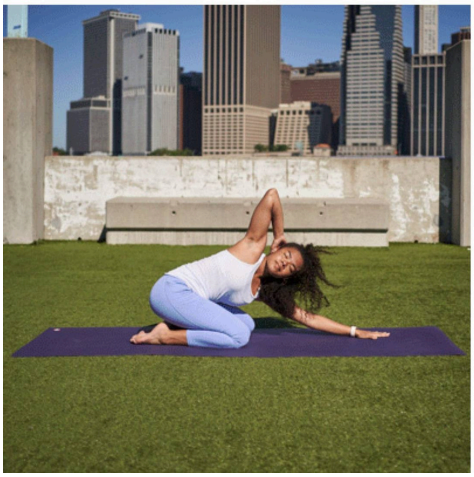
6. High plank

7. Side plank

8. Downward-Facing Dog

9. Pigeon Pose

10. Thoracic spine rotation



11. Glute bridge

12. Isometric pulls

Normal Gait:-

Dr-Fawzi Hammadi

Is aSeries. of rhythmical, alternating movements of the trunk & limbs which result in the forward progression of the center of gravity & the body

Gait cycle:

First, there's the Stance Phase. It accounts for 60% of the full gait cycle. During Stance Phase, the right foot is always in contact with the floor. Hence the term stance. In the Swing Phase, which makes up 40% of the gait cycle. The right leg is swinging. During Stance Phase, the right leg has to complete different tasks. With the Heel Strike, the leg has to accept the weight of the body. This so-called Loading Response. It marks the first 10% of the gait cycle.

The Loading Response ends once the contralateral foot lifts off the ground.

Determinant of gait:

The six major determinants are pelvic rotation, pelvic tilt, knee and hip flexion, knee and ankle interaction, and lateral pelvic displacement.

Who can benefit from gait training exercises?

-Anyone who has an abnormal gait can benefit from gait training exercises. Most often, -irregular gait can result from:

1-Spinal cord injuries

2-Stroke

3-Neurologic conditions such as multiple sclerosis (MS), cerebral palsy, and Parkinson's disease

4-Brain injuries

5-Orthopedic conditions such as osteoarthritis

Joint injuries or replacements

Broken bones in the legs or pelvis

6-Sports injuries

7-Advanced age

Gait training exercises

1. Knee Extension

Knee extension exercises are a great gait training exercise because they help strengthen our quadricep muscles which are used in both the swing and stance phases of gait..

To perform a seated knee extension exercise, extend your leg in front of you so that it's parallel to the floor by contracting your quadricep muscles in the front of your thigh.

Once your leg is fully extended, slowly bring your foot back down to the floor. Alternate back and forth between your legs while maintaining good posture.

2. Seated Marching

Seated marching is a great exercise to engage the hip flexor muscles which are primarily active during the swing phase of gait.

To perform seated marching sit on a a stable chair or surface and lift one leg towards your chest while maintaining good posture. Slowly place it back down on the floor. Repeat on your other leg, alternating back and forth.

If you're interested in adding a challenge, pause at the top for a few seconds. You can also add arm swings to the movement (opposite arm, opposite leg) as if you're walking in place while seated on the chair.

3. Single Leg Stance

Single-leg stance is a great way to improve balance, stability, and strength for the stance phase of gait.

Start by finding a stable surface, such as a counter or tabletop. Place your hands on the surface and lift one foot off the ground so all of your weight is on the opposite leg. Hold this movement for up to 30 seconds and repeat it on the other leg.

As your balance improves, you can progress this exercise by removing one or both hands from the counter or tabletop and/or closing your eyes to improve proprioception.

4. Sidestepping

Sidestepping can help strengthen the hip abductors which help to stabilize the pelvis during the stance phase of gait.

Start by standing and facing a table or counter. Place your hands on the surface for balance. Stand up straight, engage your core, and step to the side with one leg, then follow with the other leg. Do a few repetitions in that direction and then reverse to the other side.

For an added challenge, you can add an obstacle to step over.

5. Sit-to-Stand

Sit-to-stand exercises not only improve strength needed for walking, but they also enable you to stand up more easily, especially from low chairs or soft couches, further improving your mobility.

Start in a seated position in a sturdy chair, with your feet planted hip-distance apart. Lean forward, bending at the hips. If you're able, try to avoid using your hands to assist you as you come to a standing position. Push down from all four corners of your feet to maximize stability and balance as you stand.

Once standing, reverse the movement by leaning forward as your knees bend and your hips move back towards the chair as you slowly lower yourself back to a seated position.

6. Backward Walking

Backward walking can improve hamstring flexibility, quadriceps activation, and overall coordination. By switching from forward walking, which is a heel-to-toe motion, to backward walking, which is a toe-to-heel pattern, your lower extremity muscles and joints are challenged in new ways, which helps improve your gait.

Start by standing sideways next to a stable surface, such as a countertop or table. Place your closest hand on the surface to maintain balance and stability. Start stepping backward with one foot while maintaining hand contact with the stable surface. Take a few steps backward and then reverse direction.

common devices that are helpful for people with irregular gaits:

-Straight cane

-Axillary crutches

-Lofstrand crutches

-Walkers

-Cionic Neural Sleeve

Other supplement exercises:

1-Resistance training to increase muscle mass and overall strength

2-Stretching to improve range of motion and flexibility

3-Core training to improve stability and posture

4-Functional electrical stimulation to target affected muscles

Exercises of the parallel bars:

Mini squats

Standing hip flexion

Standing leg raises

Heel raises

Toe raises

These bars are used during balance exercises as well. When your physical therapist puts a cushion under your feet for an added challenge in exercises such as single-leg standing exercise then these bars are there to protect you from any imbalance.

Exercises of the parallel bars:

Mini squats

Standing hip flexion

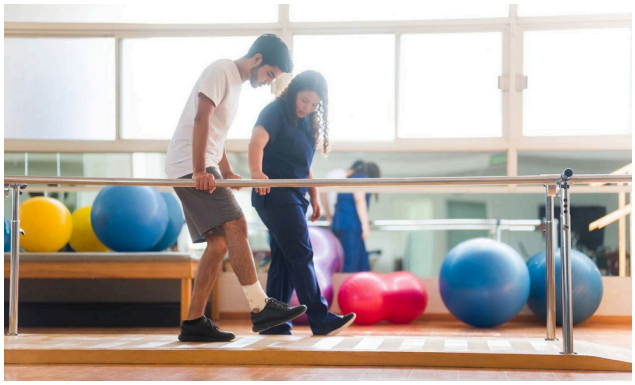
Standing leg raises

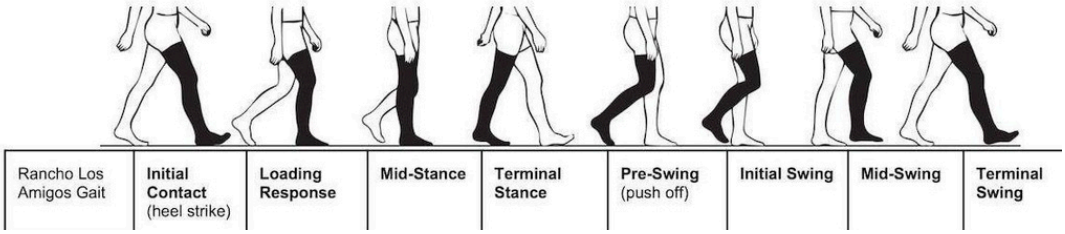
Heel raises

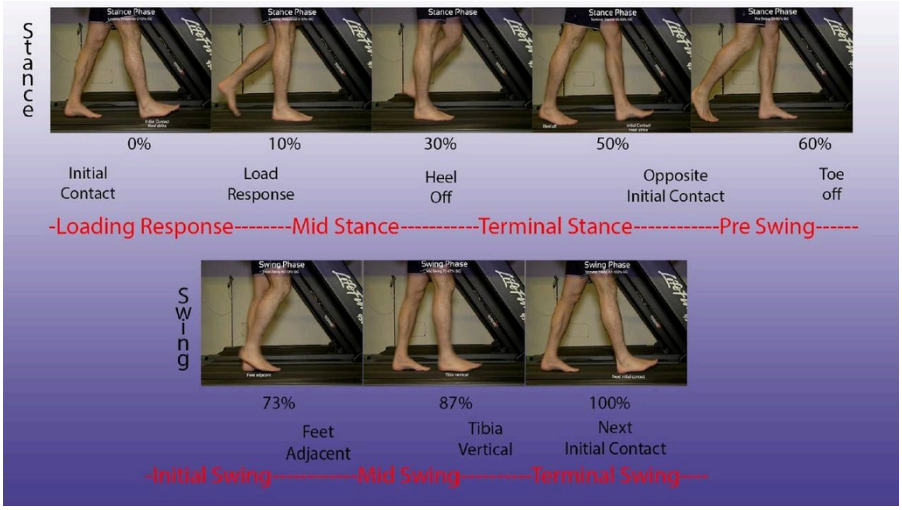
Toe raises

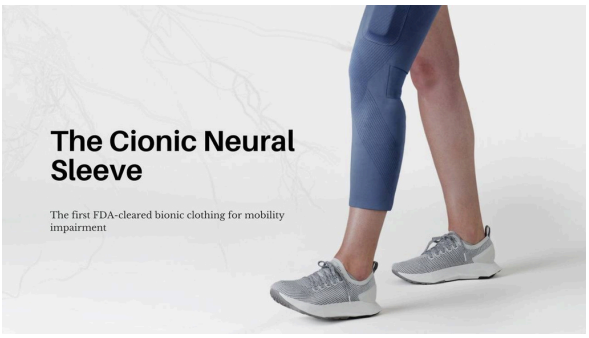
These bars are used during balance exercises as well. When your physical therapist puts a cushion under your feet for an added challenge in exercises such as single-leg standing exercise then these bars are there to protect you from any imbalance.


Exercises for
GAIT TRAINING
Heel-to-Toe Walk
Side Stepping
Marching in Place
Tandem Walking




Rancho Los Amigos Gait
Initial Contact (heel strike)
Loading Response
Mid-Stance
Terminal Stance
Pre-Swing (push off)
Initial Swing
Mid-Swing
Terminal Swing


Stance
0%
10%
30%
50%
60%
Initial Contact
Load Response
Heel Off
Opposite Initial Contact
Toe off
-Loading Response--------Mid Stance----------Terminal Stance----------Pre Swing------
Swing
73%
87%
100%
Feet Adjacent
Tibia Vertical
Next Initial Contact
-Initial Swing----------Mid Swing----------Terminal Swing----

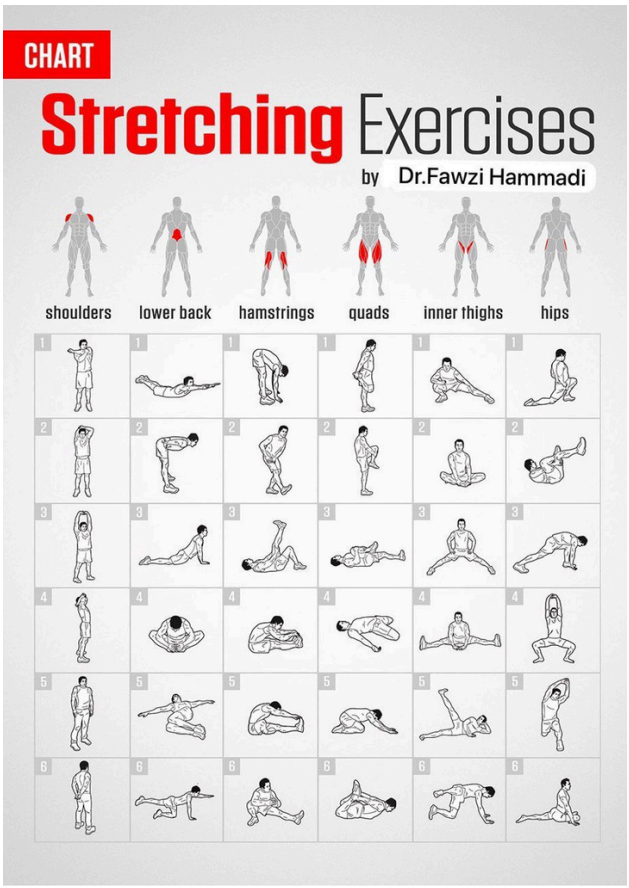

The Cionic Neural Sleeve
The first FDA-cleared bionic clothing for mobility impairment

Stretching exercises

Dr.Fawzi Hammadi

Defination:

Stretching is a physical exercise that requires putting a body part in a certain position that'll serve in the lengthening and elongation of the muscle or muscle group and thus enhance its flexibility and elasticity.



Effects of stretching:

1-Improves flexibility 2.delaying impaired mobility associated with ageing

3-Improves performance in physical activities as a result of improved flexibility

4-Reduces the risk of injury and damage

5-Improves blood circulation which reduces muscle soreness and time for recovery

6-Increasing the range of motion

Indications:

1-Improves the joint range of motion

2-Improves posture by strengthening the back muscles

3-Restores normal neuromuscular balance between muscle groups

4-Reduce injuries, strains and damage

5-Before and after exercise to reduce muscle soreness

Contraindications:

1-Limited movement at the joint due to the presence of a bony block

2-Directly after fracture when it has not completely healed

3-Acute inflammation or infection

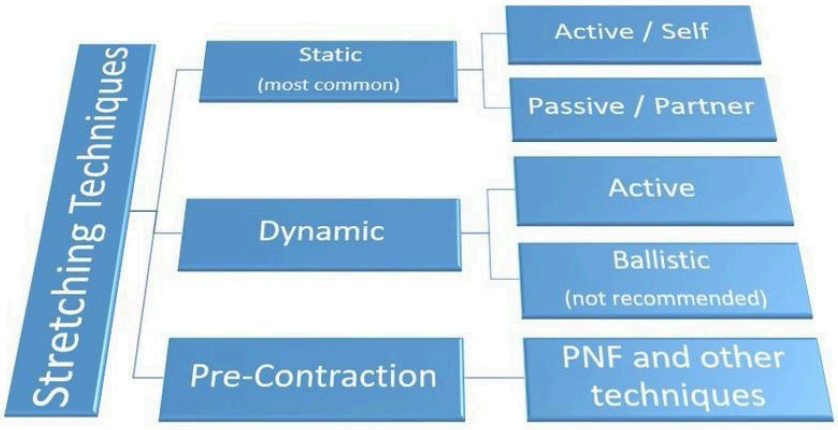
4-Sharp pain during joint movement

5-Hematoma or other soft tissue trauma

6-Hypermobility

Types of stretching:

Stretching exercises have traditionally been included as part of the training and recovery program. It is important to note that, maximal strength, number of repetitions and total volume is different for each type of stretching



1-Static Stretching

Static stretching (SS) is a slow-paced controlled physical activity which involves putting the body part in a comfortable position that elongates the muscle without causing pain with low force for a prolonged duration of time (usually 30 seconds).

There are two types of static stretching:

A-Active-static stretching involves performing static stretches without assistance.

B-Passive-static stretching involves performing the stretches passively with assistance from an external force which can be a partner, an accessory or the force of gravity.

Effects of static stretching:

1-Improves range of motion in the joint

2-Reduces stiffness and pain in muscles

3-Reduces the risk of muscle strains and other injuries

4-Improves postural awareness and body posture

5-Increases circulation which in return decreases recovery period after exercise

Frequency and Duration of Static Stretching

The duration of the hold of the stretch is irrelevant to notice improvement but rather how many times the stretch is repeated in a week. It is important to note that each muscle should be stretched only once and should be held for five minutes which is broken into five one-minute exercises or ten exercises of thirty seconds.

2-Dynamic Stretching

Dynamic Stretching (DS) is a controlled movement, unlike ballistic stretches that involve bouncing movements which increase the risk of injury ,involving the performance of a movement progressively increasing the range of motion through

successive repetitive motions till the end of the range is achieved. It can be done standing or while moving

For individuals who perform specific sports such as swimming, dynamic stretching exercises involve mimicking the movement of the activity such as circling arms before getting in the water and is often done after static stretching.

Effects of dynamic stretching:

Restore physical functioning and flexibility

Improve neuromuscular control through repetitive movement which: enhance the nervous message conduction speed, motor control and muscle compliance

Elevates core body temperature

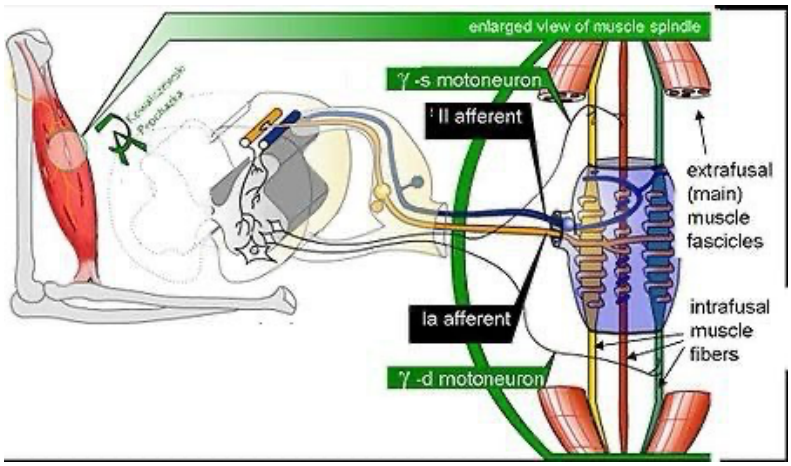
Accelerates energy production

Improves performance measures such as speed and strength

The Stretch Reflex:

When the muscle is stretched, so is the muscle spindle. The muscle spindle records the change in length (and how fast) and sends signals to the spine which convey this information. This triggers the stretch reflex which attempts to resist the change in muscle length by causing the stretched muscle to contract. The more sudden the change in muscle length, the stronger the muscle contractions will be (plyometric training is based on this fact).

This basic function of the muscle spindle helps to maintain muscle tone and to protect the body from injury. One of the reasons for holding a stretch for a prolonged period of time is that as you hold the muscle in a stretched position, the muscle spindle adapts and reduces its signalling. Gradually, you can train your stretch receptors to allow greater lengthening of the muscles



Determinants ofStretching:

1-Alignment: The position of the patient has to be comfortable and should be such that the stretch force is applied on the particular muscle.

2-Stabilization: The bony segment of the muscle to be stretched, should be fixed appropriately.

3-Intensity: It is the magnitude of the stretch applied.

4-Duration: Total time of the stretch which is to be applied.

5-Speed: The rate at which initial stretch is applied.

6-Frequency: Total number of stretching sessions per day or per week.

7-Mode of Stretch: This is the type of stretch. Static, ballistic or cyclic, the amount of participation of the client (active or passive) and the source of the stretch

Out come of researches

1-To increase joint range of motion all types of stretching are effective, 2-PNF-type stretching may be more effective for immediate gains.

3-Dynamic stretching is recommended for warm-up for athletes before competition or activity.As static stretching will likely decrease strength and may influence performance.

4-Post exercise static stretching or Proprioceptive Neuromuscular Facilitation stretching is recommended for reducing muscle injuries and increasing joint range of motion.

3-Although Stretching has not been shown to be effective at reducing the incidence of overall injuries.

4-Stretching is often included in Physiotherapy interventions for management of many kinds of clinical injuries. 5-Despite positive outcomes, it is difficult to isolate the effectiveness of the stretching component of the total treatment plan because the protocols usually include strengthening and other interventions in addition to stretching.

6-Despite stretching not having strong evidence in research, it is highly sought by Physiotherapists for an effective long-term treatment modality.