

Application of Therapeutic Exercise

Therapeutic Exercise?

- * Therapeutic exercise is described as a **procedural intervention** that is **intended to reduce impairments, functional limitations** or disabilities that interfere with a client's ability to perform physical tasks.
- * The word “Remedial” refers to supplying a remedy intended to correct or improve deficient skills.

Role of Therapeutic Exercise

1. Remediate or prevent impairments
2. Improve, restore or enhance physical function
3. Prevent or reduce health related risk factors
4. Optimize overall health status, fitness or sense of well-being

Prescribing Remedial Exercise

- Positive and negative effects must be told to client
- Why you have prescribed the exercise - what is it for
- Demonstrate to client and have them demonstrate the exercise back to you - so you know they are performing it correctly
- Give: frequency, duration, reps/sets
- When the client is demonstrating the exercise can they feel the proper goal of the exercise ☐ strengthen or stretch in appropriate muscle(s)
- Remind the client if they forget or become uncomfortable at home with the exercise given to discontinue and wait until you have a chance to discuss it with them ☐ NEVER put the client at risk

Determinants of Health

1. The clients socioeconomic status
 - * income, employment, social status, support networks, education and status in the workplace
2. The physical environment they exist in
 - * Physical factors in their natural and human-made environment
3. Personal Health Practices:
 - * Risk-taking behavior (smoking) vs. health enhancing behaviors (yoga, jogging)
4. Coping Skills & Personality
 - * Physiological and psychological characteristics related to an individual; personal competence, coping skills, genetic/biological characteristics, feelings of sense of control
5. Health Services
 - * Access to services to restore and maintain health (massage, physiotherapy, nutritionist, etc.)

Types of Therapeutic Exercise & Uses

Range of Motion

Uses

- * To determine limitations of motion, joint stability and muscle/soft tissue elasticity
- * Preparation for stretching
- * Maintain elasticity and contractility of muscle
- * Provide sensory feedback from contracting muscle
- * Increase circulation
- * Develop coordination and motor skills

Reasons for loss of ROM

1. Systemic, joint, neurological or muscular diseases
2. Surgery
3. Trauma
4. Inactivity
5. Immobilization

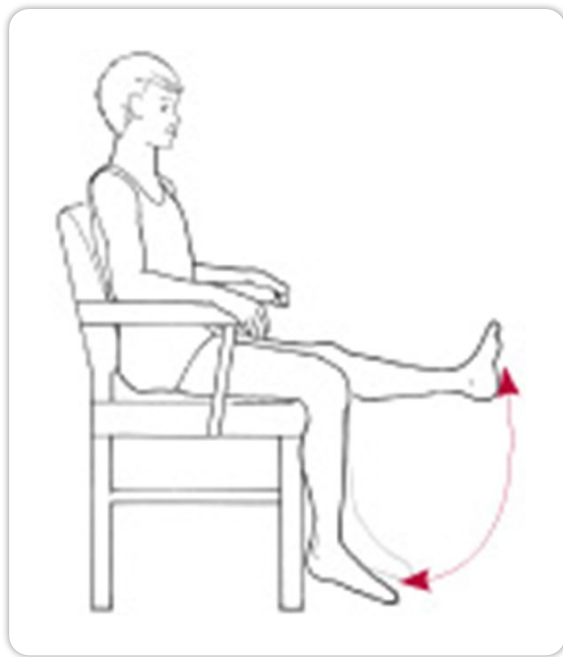
ROM types used for remedial Exercise

- * AFROM – Active Free Range of Motion – Client does complete movements under their own strength
- * AAROM - Active Assisted Range of Motion – Client requires assistance from an outside source to complete the movement
- * PROM – Passive Range of Motion – Movement is created completely from an outside source

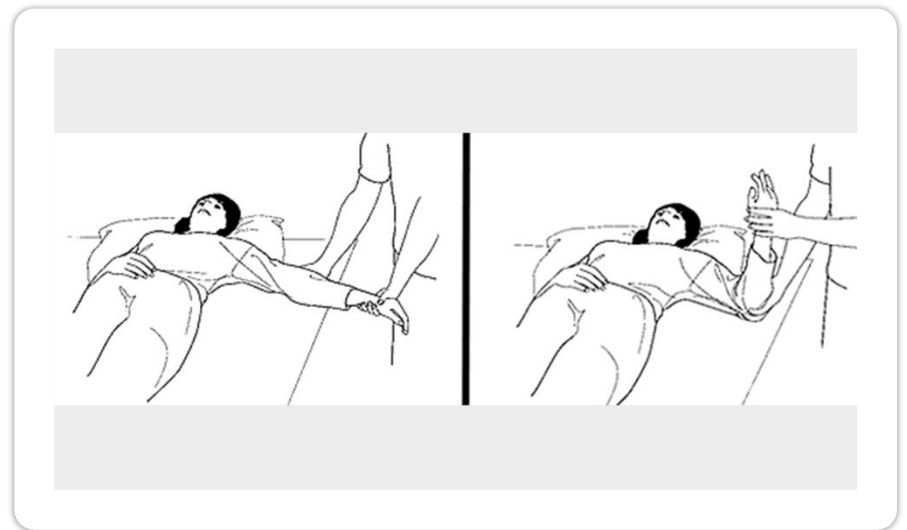
Review Principals and Procedures page 53 & 54

ROM Exercises

Active



Passive



Contraindications to ROM Exercise

- * Any circumstance when motion to a part is disruptive to the healing process
- * Acute tears, fractures surgery – small passive controlled motion well with pain tolerance can be allowed
- * ROM needs to be carefully monitored after incidents or surgery involving the cardiovascular system

PROM

- * What is the difference between PROM and stretching?
- When using it for ROM we are remaining in the pain free ROM and not extending past therefore not creating a stretch on the muscles

Indications for PROM

- * Acute and inflamed tissue, when Active ROM would be detrimental to healing
- * When client cannot or is not supposed to actively move a segment(s) of the body

Goals of PROM

- * Maintain joint and connective tissue mobility
- * Minimize the effects of the formation of contractures
- * Maintain mechanical elasticity of muscle
- * Assist circulation and vascular dynamics
- * Enhance synovial movement – cartilage nutrition and diffusion of materials in the joint
- * Decrease or inhibit pain
- * Assist with the healing process after injury or surgery
- * Maintain patients awareness of movement

Limitations of PROM

- * Prevent muscle atrophy
- * Increase strength or Endurance
- * Assist circulation in the same way active exercise or voluntary muscle contraction would

Goals of AFROM & AAROM

- * Maintain physiological elasticity and contractility of the participating muscles
- * Provide sensory feedback from the contracting muscle
- * Provide a stimulus for bone and joint tissue integrity
- * Increase circulation and prevent thrombus formation
- * Develop coordination and motor skills for functional activities

Limitations of AFROM

- * Does not maintain or increase strength
- * does not develop skill or coordination, with the exception of movement patterns used

When is AFROM used?

- * when patient is able to contract muscle actively and move a segment with or without assistance
- * can be used for aerobic condition programs
- * relieves stress from sustained postures
- * When a segment of the body is immobilized for a period of time AAROM is used above and below the immobilized segment to maintain the areas in as normal of condition as possible and to prepare for new activities such as walking with crutches

When is AAROM used?

- * AAROM – When patient is unable to completely move through a full range of motion due to weakness. AAROM would be used until patient can regain control of their ROM
- * Both can be used when a body segment is immobilized AROM can be used above and below that body segment to maintain these areas in as normal condition as possible to prepare for new activities (crutches ex)

Principles & Procedures for Applying ROM Techniques

1. Examine and evaluate the patients impairments and level of function, determine any precautions and their prognosis; plan the intervention
2. Determine the ability of the Patient to participate in the ROM activity, and whether PROM, AFROM or AAROM can meet the immediate goals
3. Determine the amount of motion that can be applied safely for the condition of the tissues and health of the individual

Continued

4. Decide what patterns can best meet the goals. ROM techniques may be performed
 - a. Anatomic Planes of motion
 - b. Muscle range of Elongation
 - c. Combined patterns – Diagonal motions or movements that incorporate several planes of motion
 - d. Functional patterns – motions used in activities of daily living

Continued

5. Monitor the patients general condition and responses during and after the examination and intervention: note any change in vital signs, warmth and colour of segment, ROM of patient, or quality of the movement
6. Document and communicate findings and intervention
7. Re-evaluate and modify the intervention as necessary

Patient Preparation

1. **Communicate** with patient, describe plan, method of intervention to meet goals
2. Free the region from restrictive clothing, linen, splints and dressings. Drape Patient as necessary
3. **Position** the *patient* in a comfortable position, with proper body alignment and stabilization but that allows you to move the segment through the required ROM
4. **Position** *yourself* so proper body mechanics are used

Application of Techniques

1. To control movement, grasp the extremity around the joints. If the joints are painful, modify the grip, still providing support necessary for control
2. Support areas of poor structural integrity, such as hypermobile joint, recent fracture, or paralyzed limb segment
3. Move limb through it's complete pain-free ROM to the point of tissue resistance. DO NOT force beyond available range as this becomes a stretching techniques
4. Perform the motions smoothly and rhythmically, with 5 – 10 repetitions. The number of reps depends on the objectives of the program and the patients condition and response to treatment

Application of PROM

1. During PROM the *force of movement is external*.
When appropriate a patient may be taught to move the part with a normal extremity
2. No active resistance or assistance is given by the patients muscles that cross the joint
3. The motion is carried out with the free ROM – range available without forced motion or pain

Application of AFROM

- * Demonstrate motion using PROM, then ask patient to perform motion, place your hands in a position to assist or guide if necessary
- * Provide assistance only as needed for smooth motion, when there is weakness, assistance may be required only at the beginning or end when the effect of gravity

Stretching Interventions

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What is Stretching

- * a form of physical exercise in which a specific muscle or tendon (or muscle group) is deliberately flexed or stretched in order to improve the muscle's felt elasticity and achieve comfortable muscle tone

Definitions

- * **Flexibility:** ability to move smoothly and easily through an unrestricted pain free ROM
- * **Dynamic flexibility:** the degree that an muscle contraction moves a body segment
- * **Passive flexibility:** the degree that a muscle can be passively moved through ROM
 - * Passive flexibility is a prerequisite for dynamic flexibility, but doesn't ensure it

Stretching as an Intervention

- * When should stretching be used as an intervention?
 - * restricted mobility adversely affects function and increased risk of injury
 - * promote wellness and reduce risk of re-injury in sport specific conditioning programs
 - * Limited ROM due to decreased soft tissue extensibility, adhesions, scar tissue
 - * As a component of fitness or sport specific activity

Stretching

- * Benefits of stretching (page 82)
 - * Increased flexibility and ROM
 - * Improve general fitness
 - * Injury prevention
 - * Reduced post exercise muscle soreness
 - * Enhanced performance

Types of Stretching

- * ballistic stretching
- * dynamic stretching
- * active stretching
- * passive (or relaxed) stretching
- * static stretching
- * isometric stretching
- * PNF stretching (Neuromuscular Stretching) AKA?
- * Muscle Energy Techniques
- * Manual/Self Stretching
- * Passive joint mobilization

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Contraindications

- * Bony block
- * Recent fracture
- * Acute inflammation , infection or edema
- * Sharp acute pain with movement
- * Hematoma or trauma
- * Hypermobility
- * Short tissue provides joint stability
- * Short tissue allows specific movements to occur
- * Do not go beyond normal ROM
- * Caution with osteoporosis
- * Caution with joints that have been immobilized for a long period of time
- * Progress dosage gradually

Goals

- * increase flexibility and ROM
- * General fitness
- * MAY decrease DOMS

Factors that affect Stretching

- * Alignment
 - * Proper body position for the muscles being stretched
- * Stabilization
 - * Stabilizing the proximal or distal attachment site of the muscle. Helps in proper alignment
- * Intensity
 - * The amount of load placed on a muscle. Stretching should be low intensity.

Duration

- * Duration
 - * The length of time the force (stretch) is held.
 - * Low intensity, long duration is considered safest.
 - * Still debate over how long to hold a stretch (see box 4.5 pg. 88)
- * General rule
 - * 2 x 30 second stretches at low intensity
 - * Twice a week to maintain mobility
 - * More frequently to achieve increases in ROM
 - * Will depend on client tolerance

Speed

- * To reduce muscle contraction and risk of injury the rate of stretching should be SLOW
- * Ballistic stretching (rapid forced stretching) should only be done in healthy populations where that type of movement is necessary for activity. Example?

Frequency

- * The number of times you stretch in an day / week
- * Not a lot of research on frequency
- * Depends on goals and client tolerance

Procedural Guidelines for Stretching Interventions

- * Warm up before applying stretches with heat or massage
- * Move slowly into the stretch
- * Hold at low intensity level
- * Release stretch slowly
- * Use diaphragmatic breathing through the stretch

Preparation for stretching

- * Review goals and desired outcomes of stretching program with patient, obtain consent
- * Select the most effective stretching techniques
- * Warm up soft tissues by local heat or active low intensity exercise
- * Have patient assume a COMFORTABLE AND STABLE position in the correct plane of motion to perform the stretch
- * *Explain the procedure and be sure client understands*
- * Free the area of any restrictive clothing, bandages or splints
- * Have client attempt to remain as relaxed as possible and that we are wanting to remain within their pain tolerance

Application of Manual Stretching Procedures

- * Move the extremity slowly through the free range to the point of tissue restriction
- * Grasp the areas proximal and distal to the joint in which the motion is to occur. Grasp should be firm but not uncomfortable. Use broad surfaces of your hands to apply all forces
- * Firmly stabilize your proximal segment and move the distal segment
- * Stretching a multi joint muscle, stabilize either the proximal or distal segment – stretch one joint at a time and then over all joints simultaneous

Continued

- * To avoid joint compression during the stretching procedure, apply a gentle distraction to the moving joint
- * Apply a low intensity stretch in a slow, sustained manner. When stretching adhesions, patients may experience a stinging sensation
- * Maintain the stretch for 30 seconds or longer, when tension decreases move the extremity a little further. For a fascial stretch, stretch at least two minutes to effect or affect the fascia
- * Gradually release the stretch force and allow therapist and patient rest momentarily while maintaining the range limiting tissues comfortably elongated position. Repeat sequence several times

Continued

- * If the patient does not seem to tolerate a sustained stretch use several very slow, intermittent stretches with the muscle in a lengthened position
- * If deemed appropriate, apply selected soft tissue mobilization procedures, such as fascial massage or cross fiber massage at or near the sites of adhesion during the stretching maneuver

Reading and assignment

- * Fascia Handout Review as a class
- * Pg 95-105 Determinants and type of stretching exercises to the end of agonist contraction
- * Pg 106-108 procedural guidelines for application of stretching intervention to cold on
- * Make notes of important points

Resistance Exercise for Impaired Muscle Performance

What is muscle performance

- * Refers to the capacity of a muscle to do work
- * Complex component of functional movement and influenced by all of the body systems
- * Includes all of the morphological qualities of muscle
- * Necessary for a person to carry out physical demands of everyday life in a safe and efficient manner
- * Key elements of muscular performance
 - * Strength, Power and endurance

Strength, Power & Endurance

- * If any of these elements are impaired the possible results are
 - * Activity limitations
 - * Participation restriction
 - * Increase risk of dysfunction

Factors that result in decreased Muscle Performance

- * Injury
- * Disease
- * Immobilization
- * Disuse
- * Inactivity
- * Muscle atrophy

Resisted Exercise

- * Any form of active exercise in which dynamic or static muscle contraction is resisted by an outside force either manual or mechanically. Also known as Resistance training
- * Essential part of Rehab program and an important part of any program to improve conditioning or maintain health of physical well being
- * Strength, power or endurance can all be enhanced by some form of resistance exercise

Benefits of Resistance Exercise

* Page 158 and 159

Benefits

- * Increase muscle strength and other connective tissues
- * Enhance muscle performance
- * Increase bone mineral density
- * Decrease joint stress during physical activity
- * Reduce risk of future soft tissue damage
- * Positive changes in body composition

Muscle Strength

- * Broad term that refers to ability of contractile tissues to produce tension and a resultant force based on the demands placed of the muscle
- * Insufficient muscle strength can contribute to major loss of function losses of even the most basic activities of daily living

Strength Training

- * Systematic procedure of a muscle or muscle group lifting, lowering or controlling heavy loads (aka resistance) for a relatively low number of reps over a short time

Uses of Strength Training

- * To improve muscle strength & rate of performance
- * Increase muscle strength and other connective tissues
- * Enhance muscle performance
- * Increase bone mineral density
- * Decrease joint stress during physical activity
- * Reduce risk of future soft tissue damage
- * Positive changes in body composition

Principles of Strengthening

- * Overload principle: demands on a muscle must progressively increase in order for the muscle to continue to achieve gains.
- * Can be done through increasing sets, reps, weight

SAID Principle

- * Specific Adaptation to Imposed Demands
 - * specificity is needed when designing an exercise program
- * Strengthening programs should try to mimic functional needs

Reversibility Principle

- * Reversibility Principle
 - * If you don't use it you loose it!
- * Increases or gains in strength and endurance will diminish unless they are maintained

Factors That affect Strengthening

- * Energy stores and blood supply
- * Fatigue (muscle or cardiopulmonary)
- * Recovery from exercise
- * Age
- * Psychological / cognitive factors

Considerations in Strengthening

- * Alignment
 - * Proper body position for the muscles being strengthened
- * Stabilization
 - * Stabilizing the proximal or distal attachment site of the muscle.
- * Intensity
 - * The amount of load placed on a muscle.

Continued

- * Volume
 - * The number of sets / reps in a session
- * Exercise order
 - * The sequence that muscle groups are exercised
- * Frequency
 - * The number of exercise sessions per week / day
- * Rest interval
 - * The time between sets and sessions of exercise

Continued

- * Duration
 - * Total time frame of a resistance training program
- * Mode of exercise
 - * Type of muscle contraction, client position, type of resistance
- * Velocity
 - * of the exercise

Types of Resistance Training

- * Based on your examination determine the type of exercise that is appropriate by evaluating:
 - * What is the extent of the deficit
 - * Are there any underlying pathologies
 - * What are the goals
 - * Are there any contraindications
 - * Can they perform the exercise safely

Continued

- * Manual resistance exercises: These are resistance exercises where the therapist provides the resistance\
- * Used at the beginning of rehab, when the muscle is weak and can only overcome a minimal force
 - * What are other manual Resistance exercises?

Continued

- * Isometric exercises: muscle contraction with no associated movement
- * Used when needed functionally for a specific activity like holding a grocery bag
- * What are other isometric Exercises?

Continued

- * Muscle setting exercises: low intensity isometric exercise that is used in the acute stage to decrease muscle pain, promote relaxation and increase circulation
- * Muscle setting exercises DO NOT increase strength but they delay muscle atrophy and maintain mobility between muscle fibers

Continued

- * Stabilization exercises: an isometric exercise that uses less than maximal force over a sustained period of time. Used to increase postural or joint stability
- * Example: scapular stabilization

Effects of Isometric Training

- * Use 60% of the max force of the muscle contraction to increase strength
- * Hold for 6-10 sec
- * Repeat contraction
- * Adjust angle of contraction
- * Can be performed with or without equipment, example?

Precautions and Contraindications

- * People will often hold their breath during isometric exercises this can create a valsalva maneuver causing a rapid increase in blood pressure
- * High intensity isometrics may be contraindicated for patients with a history of cardiac or vascular disorders.

Dynamic Exercise

- * concentric and eccentric
 - * Dynamic exercises cause joint movement
- * Concentric exercise?
- * Eccentric exercise?

Continued

- * Concentric contractions are used to accelerate body segments
- * Eccentric contractions are used to decelerate body segments and as shock absorption during high impact
- * Eccentric exercise is essential to rehab and sport specific training

Adding Resistance

- * Resistance can be applied in various ways:
- * Constant resistance ex: _____
- * A weight machine that provides variable resistance
- * An isokinetic device that controls the velocity of movement
- * Precaution – there is greater stress on the cardiovascular system with eccentric exercises

Open/Closed Chain Exercises

- * Open chain – Where the distal segment is free to move in space. Example?
- * Closed chain - Where the distal segment is fixed and the body moves. Example
- * Both are beneficial in a rehab program and both should be incorporated based on client ability and need
- * Table 6.8

Implementation of Open and Closed Exercises

- * Open chain is typically performed in non weight bearing and can be the only option for early rehab
- * Progression of closed chain exercises:
 - * Partial to full weight bearing
 - * Wide to narrow base of support
 - * Stable to unstable surface
 - * External support to no support
 - * Small limb range to larger limb range
 - * Uniplanar to multiplanar
 - * Slow to fast

Examination and Evaluation

- * Before you prescribe any form of resistance training:
 - * Take health history and assessment
 - * Determine baselines of ROM, strength and general ability to function
 - * Determine what type of resistance exercise is indicated
 - * Periodically evaluate progress

Preparation for Strength Training

- * Warm up – ie: walk on treadmill for 5-10 minutes
- * Type of resistance – body weight, theraband etc.
- * Stabilization – make sure no unwanted movement occurs
- * Intensity – movements should be smooth and pain free with proper alignment

Reps/Sets

- * 8-12 repetitions of an exercise are performed (one set)
- * Rest 30-60 seconds
- * Attempt another set
- * To progress first increase reps, then sets then resistance

Additional Info

- * Instructions should be both written and verbal
- * Cool down should be performed (walking / cycling)
- * Stretching is appropriate after strength exercises

Precautions

- * Appropriate temperature
- * No pain should occur during exercise
- * Initiate exercise with minimal to moderate force
- * Avoid having client hold their breath
- * Ensure stabilization occurs
- * Avoid heavy resistance in children older adults and those with osteoporosis
- * Ballistic movements
- * Medications that can alter response to exercise
- * Avoid cumulative fatigue

Contraindications

- * across an unstable joint
- * Distal to fracture site
- * Pain / dizziness / shortness of breath
- * Recent eye surgery
- * Inflammation
- * Severe cardiopulmonary disease

Overtraining

- * A decline in physical performance in healthy people participating in high intensity strength and endurance activities.
- * Caused by inadequate rest between exercise sessions, inadequate diet and fluid intake

Exercise Induced Muscle Soreness

- * Most people who aren't used to exercise will experience some muscle soreness. There are 2 types of muscle soreness.
- * Acute muscle soreness: develops during or directly after exercise. Usually burning or aching. Due to a build up of metabolites
- * Delayed onset muscle soreness: Exercise induced muscle tenderness that occurs 24- 48 hours after vigorous exercise. Occurs more severely with high intensity eccentric contractions

Manual Resistance Exercise

- * Apply appropriate amount of resistance, do not overpower
- * Resistance should be smooth
- * Use simple directions
- * See pages 200 – 207 in Therapeutic Exercise

Special Considerations for 65+

- * Muscle performance decreases with age
- * Strengthening programs are designed to increase or maintain the ability to function independently
- * DOMS is more common in older adults, therefore resistance should be increased gradually
- * Avoid high load resistance as it stresses the joints

Examples of Strength Exercises



* From Left to Right:

- * Butt Lift
- * Side Leg Lift
- * Lunges
- * Plank
- * Squats
- * Push-ups

* Questions:

- * What is each of these exercises strengthening? Keeping that in mind....
- * Come up with an alternative exercise for each option and demonstrate.
- * Read pages 158 and 159 we will look at resistance training in more depth later
- * Stabilizers and mobilizers Handout

Endurance

- * Broad term that refers to the ability to perform low intensity, repetitive or sustained activities over a prolonged period of time
- * Total body Endurance – associated with repetitive dynamic motor activities (involve large muscles of the body)
- * Muscular Endurance (local endurance) ability of a muscle to contract repeatedly against a load, generate and sustain tension and resist fatigue over an extended period of time
- * Almost all daily living activity require some degree of muscle and total body endurance

Endurance Exercises

Page 168

- * Positive impact on improving function of muscle
- * Minimizes adverse effects on the joints
- * Produces less irritation to soft tissues
- * Creates an overall feeling of well being
- * Improved balance

Aerobic Exercises – Key Terms

- * Physical fitness - The ability to perform physical work, measured by the maximum oxygen consumption
- * (VO₂ max)
- * (VO₂ max) – The amount of oxygen used per minute when a person has reached maximum effort
- * Endurance – The ability to do physical work over a period of time
- * Aerobic training – the improvement of the muscle's ability to use energy
- * Adaptation – the increased ability of the cardiovascular system to work as it changes to the demands placed upon it
- * Deconditioning - decreases in VO₂ max and cardiac output as a result of disuse

Energy Systems

- * Energy systems are metabolic systems that the body uses to create ATP (adenosine triphosphate), carbon dioxide and water. Cells use the energy produced from the conversion of ATP to ADP. Muscle cells use this energy during muscle contraction.
- * There are three major energy systems
 - * ATP – PC system
 - * Anaerobic glycolytic system
 - * Aerobic system

ATP-PC

- * ATP – PC system
- * ATP is the fuel source
- * No oxygen is required
- * When muscle is rested the ATP gets replenished
- * Used in short, quick bursts of activity
- * Major source of energy for first 30 seconds of intense exercise

Anaerobic Glycolytic System

- * Glycogen (glucose) is the fuel source
- * No oxygen is required
- * Lactic acid is produced
- * Used in activities of moderate intensity and short duration
- * Major source of energy from the 30th to 90th second of intense exercise

Aerobic System

- * Glycogen (glucose) fat and protein are the fuel sources
- * Oxygen is required
- * This system predominates over the other energy systems after the second minute of exercise

Functional Implications

- * Each energy system works with the others to some degree
- * Depending on what type of activity is engaged in you need to train a specific system
- * Is training in sprinting going to help you in a marathon?

Benefits of Cardiovascular Training

- * Increase exercise capacity
- * Enhance cardiac function, which may delay coronary heart disease
- * Increase metabolic activity
- * Relieve stress and anxiety

Guidelines

- * Children ages 6 to 17 – 60 minutes of moderate to vigorous activity a day
- * Adults ages 18 to 65 – 30 minutes moderate intensity 5 days a week
- * Ages 65+ - 30 minutes moderate intensity 5 days a week
- * Activity can be broken down into 10 minute segments

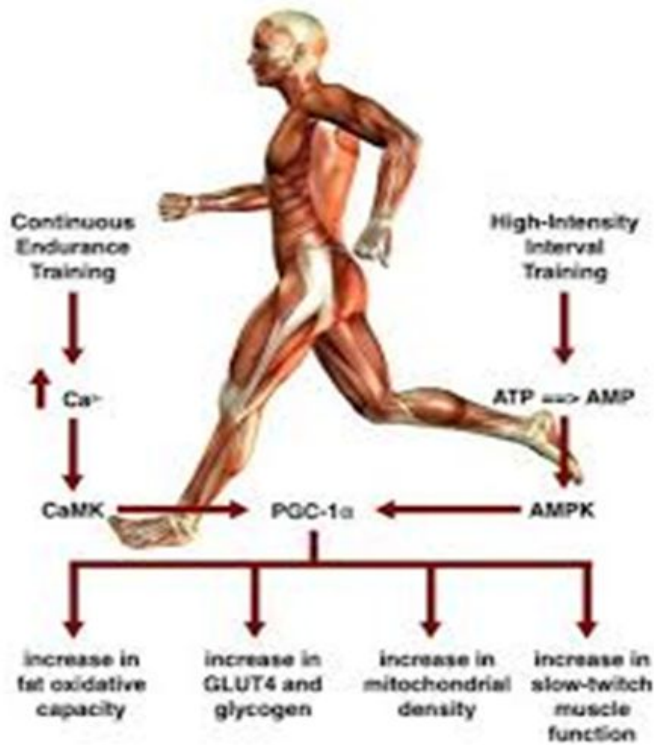
Heart Rate

- * The best way to determine maximum heart rate without testing is using the formula $220 - \text{age}$
- * Calculate your maximum heart rate
- * In healthy young individuals a 70% max heart rate is needed for conditioning. What is 70% of your max heart rate?
- * In people with lower fitness levels a heart rate of 50-60% is needed
- * In completely deconditioned individuals a heart rate of 40-50% of max heart rate will begin to improve conditioning

Exercise Program

- * Should include a warm up (10 min)
- * Aerobic exercise which can be:
 - * Continuous
 - * Interval
 - * Circuit
- * Cool down period (5-10 min)

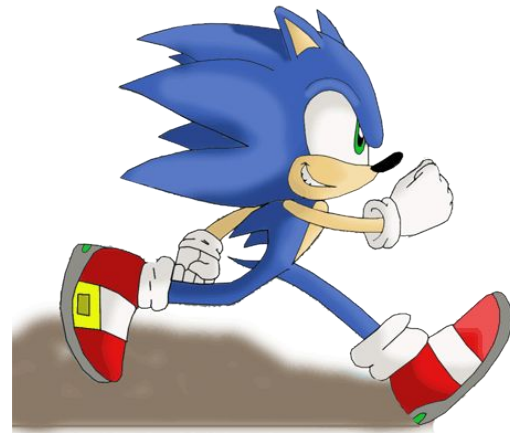
Muscular Endurance Training



- * Characterized by having a muscle contract and lift or lower a light load for many repetitions or sustain a muscle contraction for an extended period of time. Key parameters include low intensity contraction, large number of contractions over a long period of time

Endurance In Class Assignment

- * Running is not a viable endurance training option for all people due to the amount of impact involved.
- * What are 5 other endurance training options that your clients might consider?



Muscle Power

- * Related to the strength and speed of movement and is defined as the work produced by a muscle per unit of time (rate of performing work)
- * Can be expressed as a single burst of high intensity activity or repeated bursts of less intense muscle activity
- * Many motor skills are composed of movements that are explosive and involve both strength and speed. May be an important priority in rehab plan. Muscle strength is a necessary foundation to developing muscle power

Power Training

- * Can be enhanced by increasing the work a muscle must perform during a specified period of time or reducing the amount of time required to produce a given force
- * The greater the intensity of an exercise and the shorter time to generate the force, the greater the muscle power

Balance Training

What is it?

- * Generic term used to describe the dynamic process by which the body's position is maintain in equilibrium. The body is most stable when the Centre of Gravity is maintained over the base of support.

Key Terms

- * Balance – The process that the body's position is maintained in equilibrium
- * Equilibrium is either static when the body is at rest, or dynamic when the body is in motion
- * Centre of gravity – the vertical line through the point of equilibrium
- * Base of support – the perimeter of the contact area between the body and the surface it is supported on
- * As long as a person maintains their centre of gravity within the base of support they will not fall – this is called the limit of stability

Balance Control

- * Balance control requires input from the nervous system in the form of sensory processing and sensorimotor integration.
- * The musculoskeletal system plays a role in balance including postural alignment, flexibility, muscle strength and ROM
- * The environment that you are in also plays a role in balance. For example the type of shoes you are wearing, the surface you are standing on or the amount of lighting in the room

Balance During Lifting

- * It is common to lose balance when lifting heavy or large objects off the floor. This is we have to shift our centre of mass quite low to lift something from the ground.
- * Lifting style is not important to proper lifting. Having knees extended can be beneficial for people with weak quads.
- * If balance is an issue a semi-squat are safer as is widening your base of support

Impaired Balance

- * Sensory input impairments
- * Sensorimotor integration impairments
- * Biomechanical impairments
- * Deficits with aging
- * Deficits from medications

Sensory Balance Impairments

- * A decrease in proprioceptive deficits
- * Often follows a lower body injury
- * Neuropathies in the lower limb can affect proprioception
- * Deficits in vision or damage the vestibular system can cause balance issues

Sensorimotor Balance Impairments

- * Damage to the Basal ganglia or cerebellum can result in difficulty processing sensory information

Biomechanical Balance Impairments

- * Balance issues caused by the musculoskeletal system.
For example hyperkyphosis or limited joint ROM,
contractures

Aging

- * Due to decline in all sensory systems and sensory motor integration
- * Falls are a major cause of mortality in those 65+

Common Risk factors for falls among elderly

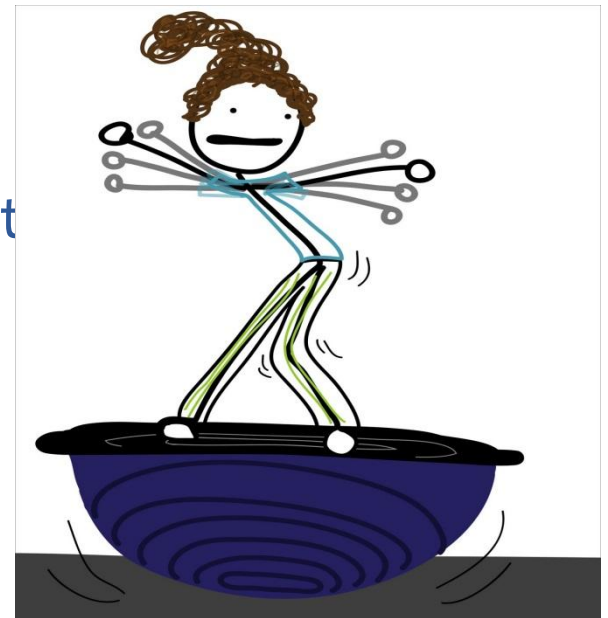
- * Muscle weakness
- * History
- * Gait issues
- * Balance deficit
- * Use of assistive device
- * Arthritis
- * Vision problems
- * Arthritis
- * Impaired ADL
- * Depression
- * Cognitive function
- * Over 80 year of age

Medications

- * Certain medications can increase the likelihood of falling ie: sedatives / antidepressants
- * An increased chance of falling if you are on 4 or more medications
- * Have medications reviewed by a doctor if falls occur or loss of balance while on medications

Balance Training Benefits

- * Improve ability to perform daily activities
- * Improve postural alignment
- * Improve motor performance
- * Improve ability to perform daily/function
- * Reduce risk of falls



Balance Interventions

- * Multisystem approach
 - * Some areas may need stretching interventions while others require strengthening
- * Important to determine the areas and types of balance where improvement is required
- * Because these exercises challenge stability it is important that safety is considered

Safety is very important with balance training, having a way for a person to regain balance quickly is important

Assessing Balance

- * Static postures
- * Dynamic – seated to standing
- * Anticipatory – reaching, catching, lifting
- * Reactive – response to pushes / pulls
- * Sensory organization – reduce visual inputs
- * Balance during functional activity – multitask
- * Safety during gait – environment modifications

Safety First!

- * Perform exercises nearing a railing or bars where they are able to grab on when necessary
- * Do not perform exercises near sharp edges or equipment
- * Use two people when working with high risk patients
- * Check that equipment is operating correctly
- * Guard or assist when getting on or off equipment
- * Ensure floor is clean and free of debris

Static Balance control

- * Activities that promote non moving balance
- * Examples
 - * Sitting, half kneeling, tall kneeling
- * Activities can be progressed by working on soft surfaces, narrowing base of support, moving arms or closing the eyes

Dynamic Balance Control

- * Maintaining balance while in motion
- * Examples
 - * Maintaining balance while working on a moving surface such as
 - * Therapeutic ball, bosu ball, wobble board or mini trampoline
- * Progress exercising by shifting body weight, vary arm position, size of steps, hopping or skipping, base of support

Anticipatory Balance control

- * complex motor control ability that human use at workplace and other everyday physical activities
- * Involves having your client reach in all directions to touch objects, catching a ball or kicking
- * Progress by using a variety of postures, use functional tasks using multiple body parts, varying speeds and weights or using obstacle course

Reactive Balance Control

- * Automatic movement patterns that occur when balance is disturbed
- * Activities to improve reactive balance control can include swaying in different directions on a firm surface
- * Depend on the body area there are different strategies that can be used including balance beams, stepping up or cross stepping

Balance training for Functional Activities

- * Have them perform activities similar to those they are having difficulty with, ex reaching
- * Progress by performing two or more task at once
- * Use recreational activities the client enjoys to increase their enjoyment of functional training

Balance Training In Class Assignment

- * Come up with 3 balance exercises. Keep in mind that they do not necessarily need to occur in standing.
- * How might you make a basic exercise more challenging?



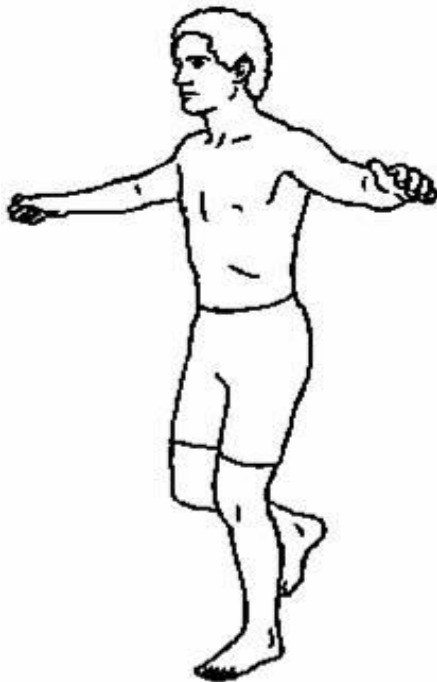
Proprioception – What is it?

- * Proprioception is the sense of knowing where your body part is in space.
- * Most proprioception occurs subconsciously.
- * Your proprioception capabilities can be impaired when joints are injured, such as with ligament sprains. When you lose proprioception of your joint after a sprain, you may experience an unstable sensation of the joint. Your joint may even give-out.
- * The most common symptom of reduced proprioception is poor balance. In this respect, most people can understand the concept that poor balance can be a result of poor proprioception. However, even your spinal posture has a proprioception component telling you whether or not you are sitting or standing upright. Good posture, for example, could be thought of as perfect spinal balance!

Proprioception

- * Every injury has the potential to decrease your proprioception and subsequently your balance. However, you can quickly improve both your proprioception and balance with proprioception and balance exercises.
- * That's where your physiotherapist is an expert and can help you.

Proprioception and Coordination



- * Improve ability to perform daily activities
- * Improve ability to perform exercises accurately
- * Improve balance

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Examples of Proprioception exercises

- * Most closed chain exercises
- * Balance and proprioception exercises are often similar, for example wobble board can be used as both proprioceptive and balance exercise

Example of proprioception progression

- * Static Balance: Begin on 2 feet. Try placing the feet one in front of the other heel to toe. Balance for 30 seconds with arms down or raised, eyes open. Repeat with eyes closed.
- * Graduate to single leg balances
- * Dynamic Balance: Balancing on an unstable surface; a wobble board, a cushion or an exercise ball, (depending on the position,) and have some movement to challenge their stability. I.e. Mini-squats on a Bosu, hip abduction on a cushion, leg raises prone on a ball.
- * Later, Coordination and Agility may be added, but since this involves stops & starts and jumping and twisting activities, this is best left to a qualified fitness professional if possible

Developing a therapeutic exercise plan

- * Therapeutic exercise must be dynamic and responds to changing demands
- * Will account for potential changes in status of the client based on physiological response to exercise plan and/or progression of the active pathology
- * Client status may also change with progression through various health care settings (hospital, rehab center, home)
- * Ongoing physical examination and evaluation must be taken into consideration as well as functional goals and problems that arise

Ongoing Examination and Evaluation

- * Re-evaluations are all performed in the same methods used for the initial evaluation
- * Interview, observations, tests and measurements can all be included
- * Therapist should document the findings (positive or negative)
- * List all problems, if any, that have arisen

Determination of Functional Goals

- * Functional Goals are defined as those meaningful activities that, because of active pathology, the individual is unable to do and for which that individual seeks therapy.
- * Allow the client to state the reason for seeking out therapy
- * The task of the therapist is to help the client frame their issues into achievable goals
- * Be sure to allow each goal to have a measure of progress
- * Every client will have a different achievable goal
- * Therapist must determine what the individual is hoping to gain from the plan and the types of things the client hopes to be able to accomplish after the plan is complete
- * Each goal must be linked to a problem/issue the client has
- * Each goal must be measurable and address short and long term goals

Aquatic Exercise

- * The use of water to facilitate the application of therapeutic exercises including strengthening, stretching, balance and endurance.

Goals and Indications

- * Facilitate ROM
- * Start resistance training
- * Start weight bearing exercises
- * Facilitate cardiovascular exercise
- * Minimize risk of injury
- * Enhance patient relaxation

Precautions

- * Fear of water
- * Neurological disorders
- * Ataxic patients many have more trouble controlling movement
- * Some MS patients have not tolerate heat (33+)
- * Respiratory disorders
- * Immersion in water may affect breathing of a client with a respiratory disorder because of the hydrostatic pressure on the chest wall
- * Cardiac dysfunction
- * Clients with abnormal BP, angina and heart disease need to be monitored closely
- * Open wounds need to be covered with water proof bandages

Contraindications

- * Open wounds
- * Unstable heart conditions
- * Severe respiratory dysfunction
- * Severe kidney disease
- * Uncontrolled bowel / bladder
- * Infectious disease
- * Uncontrolled seizures

Properties of Water

- * Buoyancy – the upward force that works opposite gravity
- * Buoyancy provides relative weightlessness and unloads joints
- * Provides resistance to movement
- * The amount of air in the lungs and amount of body fat affect buoyance
- * At the ASIS weight bearing is 50%, at the xiphoid it is 33% and at C7 it is 10%

Continued

- * Hydrostatic pressure – The pressure exerted by the water on the body
- * Reduces or limits effusion, assists in venous return
- * Viscosity - friction that occurs in the water
- * Provides resistance
- * Surface tension – The surface fluid acts as a membrane under tension
- * Movement at the surface creates more tension