**CORE STRANDS and Standards**

Strand 12 Students will explain therapeutic modalities and rehabilitation techniques.

* 1. Explore therapeutic modalities.
		+ Identify the purpose of therapeutic modalities.
		+ Explain how to properly select the use of therapeutic modalities.
		+ Identify the Gate Control Theory as a principle of pain management and describe the physiological process of the theory.
	2. Describe the physiological effects, indications, contraindications, and application of the following:
		+ Cryotherapy
			- Ice packs
				* **REQUIRED SKILL**-Prepare an ice bag/pack
			- Ice massage
			- Ice immersion
			- Cold whirlpool
			- Chemical coolant
			- Describe the R.I.C.E. method for acute injuries
				* **REQUIRED SKILL**-Apply a compression wrap to an ankle
				* **REQUIRED SKILL**-Apply a compression wrap to a knee
		+ Thermotherapy
			- Heat packs
			- Ultrasound
			- Hot whirlpool
		+ Electrotherapy
		+ Massage
	3. Discuss the components and goals of a rehabilitation program.
		+ Identify the general guidelines of a rehabilitation program.
			- Individualize each program
			- Be as aggressive as possible without causing harm
			- Use a variety of equipment
			- Common mistakes
				* Treat the cause not the symptoms
				* Not addressing the contra-lateral side
				* Postural defects, anatomical mal-alignment, and biomechanical imbalances
			- Appropriate goal setting
			- Components of a rehabilitation program
		+ Phase I
			- Body conditioning/maintain cardiovascular fitness throughout all phases
			- Control swelling
			- Control pain
			- Increase range of motion
		+ Phase II
			- Restore full range of motion
			- Strength, endurance, speed, power in all muscle groups
			- Begin skill patterns and proprioception
		+ Phase III
			- Functional and sport specific skills
			- Restore balance and proprioception
			- Return to sport
		+ Relate the different exercise principles to rehabilitation
			- SAID
			- Overload
	4. Vocabulary
		+ Analgesic
		+ Contraindicate
		+ Cryotherapy
		+ Hydrotherapy
		+ Indicate
		+ Modality
		+ Thermotherapy
		+ Vasoconstrictor
		+ Vasodilator

Unit 12 – MODALITIES AND REHABILITATION

Lecture Notes

*Therapeutic Modalities*

**Standard 1: Explore Therapeutic Modalities**

1. Introduction
	1. What are they?
		1. Therapeutic= something that promotes healing and injury repair
		2. Modality= the method of application of any therapeutic agent
		3. Create an optimum environment for injury healing by reducing pain, discomfort, inflammation and spasms.
	2. There are several types of therapeutic modalities.
		1. The selection of specific treatments or combinations of treatments is based on such factors as:
			1. The physician’s prescription.
				1. Legal concerns can arise when modalities are not administered with local regulations.
				2. Document all treatments for legal purposes as well to help assess the efficacy of the treatment.
			2. Modality indications and contraindications.
				1. Indication- when use is appropriate
				2. Contraindicate- when use is not appropriate
			3. Injury site, type, and severity.
			4. The athlete’s willingness to accept treatment.
	3. Legal Concerns:
		1. Must be administered in accordance with local regulations
		2. Documentations of all treatments
		3. Misuse or overuse of modalities can often aggravate a condition, delaying rather than facilitating the athlete’s return to play.
	4. Principle of pain control is the Gate Control Theory
		1. The spinal cord is organized in such a way

that pain and other sensations may be experienced.

* + 1. An area or “gate” within the spinal cord organizes various

stimulus input and transmits the stimulus to the brain.

* + 1. Therefore, stimulation from the larger, faster nerve fibers can

selectively “close the gate” to the smaller, slower pain fiber

input.

* + 1. This concept explains why cold can “numb” pain, or why when you rub an area when it hurts it can decrease pain, as well as,

acupuncture, acupressure, heat, and chemical skin irritation

can provide some relief against pain.

**Standard 2: Describe the physiological effects, indications, contraindications, and application of cryotherapy, thermotherapy, contrast baths, electrotherapy and massage.**

1. To properly select a modality the physiological effects, indications, contraindications, application and precautions need to be explored
	1. CRYOTHERAPY
		1. An umbrella term that describes multiple types of cold application.
		2. Physiological Effects of Cold
			1. Decrease in tissue temperature.
			2. Decrease in blood flow. Vasoconstriction of the blood vessels in the area.
			3. Decrease in muscle spasms by slowing metabolism in the area, thus decreasing the waste products, which act as a muscle irritant and thus cause spasm, which may have accumulated in the area.
			4. Decrease pain perception. Cold decreases free nerve ending excitability, as well as the excitability of peripheral nerves. Analgesia is caused by raising of the nerve’s threshold.
		3. Indications
			1. Acute soft tissue injuries
				1. Sprains
				2. Strains
				3. Contusions
				4. Spasm
			2. Chronic inflammatory
				1. Tendonitis,
				2. Tenosynovitis
				3. Fasciitis.
		4. Contraindications
			1. Circulatory disturbances
				1. Raynaud’s phenomenon is a condition that causes vasospasm of digital arteries lasting for minutes to hours, which could lead to tissue death.
				2. Signs and Symptoms: intermittent skin blanching or cyanosis of the fingers or toes, skin pallor followed by redness, and finally a return to normal color. Pain is uncommon, but numbness, tingling, or burning may occur during and shortly after an attack.
			2. Hypersensitivity to cold
				1. Allergic to cold
				2. React with hives
				3. React with joint pain and swelling
			3. Prolonged application
				1. Ice should never be applied longer than 20-30 minutes at any one time.
				2. If cold is continuously applied for 15-30 minutes, an intermittent period of vasodilation occurs for 4-6 minutes. This period is known as the “*hunting response”*, a reaction against tissue damage from too much cold exposure. When the hunting response occurs, the tissue temperature does not return to pre-application levels.
			4. Cold application over superficial nerves can cause prolonged, unwanted numbness and tingling
		5. Stages of Cryotherapy
			1. Cold sensation (0-3 minutes after initiation).
			2. Mild burning, aching (2-7 minutes after initiation).
			3. Numbness; relative cutaneous anesthesia (5-12 minutes after initiation).
		6. Cryotherapy Methods

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| Method | What it is | Effective for   | Application |
| R. I. C. E. | RestIceCompressElevate  | Initial control of bleeding, swelling spasm and painAcute Musculoskeletal injuries | **Rest**: immobilize with brace, crutches, cane**Ice –**apply ice bag for 15-30 minutes every 1-2 waking hours for first 24-72 hours after an acute injury**Compress-** applying an ace bandage aids in decreasing circulation and swelling as well as helps support the injured area\* **Elevate-** place affected body area above heart to reduce bleeding and encourage venous return\* |
| Ice Packs | Flaked or crushed ice in a plastic bagCommercially made gel packs | Conforms to body’s contours Best combined with RICE\* | 1. Fill bag with appropriate amount ice2. Make sure will conform to body area3. Remove all excess air4. Tie bag with knot 5.Apply ice and secure with ace wrap or flexi-wrap6. Instruct athlete proper time: 15-30min |
| Ice massage | Paper cups filled ¾ full with water and then frozen | Biceps tendinitis Patellar tendinitisMuscle spasmsShin splintsSpasmsAcute strains | 1.Peel down paper to ice cylinder2. Rub or massage over affected area until pink- usually 7-10 minutes |
| Ice immersion | Whirlpool tank, bucket, or other container filled with a mixture of water and ice  | Highly contoured areas like the hand, feet and anklesROM exercises can be done simultaneously  | Fill whirlpool, bucket or container with cold water55-65 degreesImmerse body area for 10-30 min |
| Chemical coolant / Vapocoolant Spray  | Cold sprays which use rapid evaporation of chemicals to freeze skin Effects are temporary and superficial | Use prior to stretchingBest to treat trigger points, myofacial pain | Spay entire length of muscle 2 -3 timesFollowed by stretching or applying a firm pressure over area |

**\*An elastic wrap (ace bandage) can help secure the ice bag in place while during icing intervals, and also should be worn when not icing. A compression elastic wrap should always be started distally, and should be wrapped toward the heart. The wrap should overlap itself by about half of its diameter. No gaps should be left as these would serve as an escape for swelling. Check for comfort and signs of impaired circulation after application**

**\* Many studies conclude that elevation may be the best method of reducing swelling.**

* 1. THERMOTHERAPY
		1. The application of heat for healing purposes
		2. Physiological Effects of Heat
			1. Increase in circulation. Vasodilation occurs as the body attempts to shunt cooler blood to the warmed area to dissipate the heat.
			2. Decreased muscle spasms.
			3. Decreased pain perception
			4. Increased metabolic rate.
			5. Decreased joint stiffness
			6. Promote increase ROM
			7. Increased general relaxation.
		3. Indications
			1. Sub-acute injuries
				1. Acute-inflammatory phase is completed
				2. No signs of heat, swelling or inflammation
				3. Tendinitis
				4. Strains
				5. Spasms
		4. Contraindications:
			1. Loss of sensation.
			2. Immediately after an injury.
			3. Decreased arterial circulation.
			4. Applied directly to the eyes or to the genitals.
			5. Applied to abdomen during pregnancy.
			6. Malignancy
			7. Carefully monitor heat when applied to either elderly patients or infants who cannot report their reactions.
		5. Thermotherapy Methods

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| Method  | What it is | Effective For | Application |
| Heat Packs | Hydrocollator pack which contain silicate gel in a cotton pad which is immersed in 170-degree water  | Sub-acute strains, spasms, tendinitisPacks come in different sizes for different body areasSuperficial heat- does not significantly heat deep tissues | 1.Select appropriate pack size for body area2. Place pack on desired area, layering with towels.3. Keep in place for 15-20 minutes, removing towels as pack cools4. Patients should not lie on the hot pack because pressure from their body weight can impede the circulation necessary to dissipate the accumulated heat and cause burning  |
| Ultrasound | Sound waves delivered through a transducer (sound head) which bounce between tissues and the applicator causing the tissues to vibrate and create heat and micro-massage | Sub-acute  Tendinitis, bursitis, spasms Reducing scar tissue and joint adhesions Heating of **deep tissue** (3-5cm+) is achieved | 1. Apply coupling agent\* (without deep tissue burning will occur)2. Move the transducer head in small circles or back and forth over area- keeping it in one place can cause a burn3. Intensity and time will be set according to injury site and stage of healing |
| Hot whirlpool | Tank and a turbine motor, which regulates the movement of water and air. The whirlpool can be used with the water at any temperature Combines thermotherapy with hydromassage  | SpasmsSore MusclesJoint PainJoint StiffnessMechanical debridement of woundsROM exercises can be done simultaneously  | Fill whirlpool with water 92-96 for neutral bath, 96-98 degrees for warm and 98-104 degrees for hot110 degreesTreatment time is 20 minutesFrequent water changes and daily cleaning are essential |

\*A coupling agent allows acoustic energy to travel through air and skin. Lotion, gel, or water can be used.

* 1. Electrotherapy- see chart below
	2. Massage – see chart below

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| --- | --- | --- | --- | --- |
| Modality | Physiological Effects | Indications | Contraindications | Application |
| ELECTROTHERAPYElectrical Stimulation | Decrease painIncrease blood flowIncrease ROMRe-educate muscleDecrease atrophyBreakdown adhesions | StrainsSpasmsPost-surgical muscle weakness or atrophyInflammation | PacemakersNear malignanciesAreas of bleedingPregnancyAreas where contraction is not wanted | 1. Place moist electrodes on treatment area2. The closer the pads the shallower the muscle contractionPlaced farther apart the contraction is deeper and generalized3. Intensity and other parameters are set according to desired resultsAverage TX time is 15-30 min 4. Ice, heat, ultrasound and exercise can be combined with electrotherapy |
| MASSAGE | Increase circulationIncrease venous flowStretch scar tissueRelax muscleStimulate cell metabolism | Sub-acute injuriesSpasmsTendinitisStiff and sore musclesTrigger points | Acute injuriesContusionsHemorrhagingInfectionBlood clotsNerve damageSkin disease | Proper position patientUse lubricant (oil, lotion, powder)Stroke toward the heartUse deep stroking, kneading, cupping, friction and vibrating motions |

**Standard 3: Discuss the components and goals of a rehabilitation program**.

1. *Rehabilitation* is defined as restoration to a functional level for daily living and the return to an appropriate level of competitive fitness.
	1. General guidelines of a rehabilitation program
		1. Each rehab program must be individualized. The factors that influence the individuality of each program are:
			1. Severity of injury.
			2. Stage of tissue healing.
			3. Type of treatment (surgery – precautions and restrictions).
			4. Sport specific demands
		2. Restoration of function to the greatest possible degree in the shortest possible time.
		3. Be as aggressive as possible without causing harm
		4. Involve injured athlete with team as much as possible including functions, meetings, and practice.
		5. Program must be progressive so that an increasing amount of work is performed at each session (as long as predetermined limits and limits of discomfort are not exceeded).
		6. Use a variety of equipment and exercises so athlete does not get bored and lose interest.
		7. Correct form with each exercise should be constantly stressed in order to maximize the results and prevent injury.
		8. Common mistakes in rehabilitation programs
			1. Only the signs and symptoms are treated. Rehab programs should treat the cause not just the signs and symptoms presented
			2. Failure to focus on al muscles involved. All muscles need to be considered, not just the muscles where they’re feeling the pain.
			3. Not addressing the contra-lateral side. Rehab programs should include exercises for both sides, not just the limb involved. The program also should include exercises for weak muscles involved in the movement of the injured area.
			4. Failure to improve or correct technique
			5. Postural defects, anatomical mal-alignment and biomechanical imbalances are neglected. Rehab programs need to address and correct technique and postural defects to be successful.
		9. Goals must be realistic and reachable and should focus on the following components
			1. Joint stability and structural integrity
			2. Decrease pain, inflammation and swelling
			3. ROM and flexibility
			4. Muscular strength and endurance
			5. Speed
			6. Muscular Power
			7. Agility, coordination and sport specific skills.
			8. Improve technique, posture and mechanics.
			9. Maintain cardiovascular Endurance
			10. Prevent re-injury
2. Phases of Rehabilitation.
	1. Phases of rehabilitation often overlap. It is important to focus on the progression of the athlete and what their individual needs are. The following are general guidelines to progress an athlete through an acute injury to full recovery.
	2. Phase I
		1. Symptoms are redness, heat, swelling, pain, inflammation, loss of function.
		2. Short term goals
			1. Decrease pain.
			2. Decrease swelling and inflammation.
			3. Increase range of motion
			4. Maintain strength of unaffected musculature
			5. Maintain cardiovascular conditioning.
		3. Examples of exercises and modalities used:
			1. Immobilization
				1. Braces
				2. Crutches
				3. Isometric contractions if joint is immobilized.
			2. Exercising the opposite unaffected limb may provide a cross-over reaction and maintain the muscles of the opposite limb.
			3. Cross training on bike or pool
			4. Muscle stimulation.
			5. RICE used to control swelling.
	3. Phase II
		1. Inflammation is decreasing and tissue is being repaired.
		2. Begins as soon as pain and swelling are controlled and complete immobilization is no longer necessary.
		3. As the athlete moves out of the acute stages of healing, when performing rehabilitation sessions, applying thermotherapy before the session and cryotherapy after the session
		4. Short term goals
			1. Restore full ROM
			2. Increase muscle strength in all muscle groups affected by injury
			3. Once strength in injured side is 80-90% of non-injured side, emphasis should move to muscular endurance and power to all muscle groups affected by injury
			4. Maintain cardiovascular endurance levels and pre-injury strength of all areas unaffected by the injury.
			5. Begin balance and proprioception exercises
		5. Examples of exercises
			1. Passive, active and resistive range of motion exercises
			2. Balance training
				1. Floor
				2. Airex pad, Dynadisc, pillow, BOSU
			3. Cross training on bike or pool
			4. Modalities
				1. Muscle stimulation can help with controlling pain and increasing range of motion
				2. Thermotherapy before therapy session
				3. Cryotherapy after therapy session
	4. Phase III
		1. Tissue is repairing, changing and remodeling to restore function.
		2. Goals for phase 3
			1. Prepare for specific functional exercises and regaining sport specific skills
			2. Ensure that the athlete’s normal biomechanical function has been restored and that technique has been corrected if needed.
			3. Restore balance and proprioception.
			4. Evaluate for protective taping, bracing, padding and other protective devices to ensure safety
			5. Return to practice and activity
		3. Examples of exercises
			1. Strength training continues to progress
			2. Heel raises, single leg stands
			3. Balance boards, foam rollers, dyna disks
			4. Plyometrics
			5. Strength training which progressively places stress on muscle groups
			6. Jog, run, sprint
			7. Perform sport specific skills repeatedly for the purpose of perfecting the skill
			8. Modalities:
				1. Deep heating modalities like ultrasound to help increase circulation to promote healing
				2. Massage can help reduce spasm, increase circulation and reduce pain
3. Relate the different exercise principles to rehabilitation
	1. SAID Principle (Specific Adaptations to Imposed Demands)
		1. Also known as specificity.
		2. The effects of the conditioning program are specific to the type of stress applied and to the particular system of the body that is exercised.
		3. “If the body is placed under stress of varying intensities and durations, it attempts to overcome the stress by adapting specifically to the imposed demands.” (Allman, FL 1974).
		4. While it is important to overload or place demands on the body so that improvement may occur, the stress should not be so severe as to prevent the body from being able to cope or adapt.
	2. Overload
		1. To facilitate improvement, the system involved must be progressively and gradually challenged or placed under additional stress.
		2. Depending upon the component of conditioning being challenged, overload might be implemented by increasing the:
			1. Resistance.
			2. Repetitions or sets.
			3. Rate (intensity) of work or exercise.
			4. Duration of work or exercise.
		3. A training load or a conditioning level should be used so that the workload is difficult enough that the final set is difficult to complete.

**Standard 4** Vocabulary:

* 1. Analgesic
	2. Contraindicate
	3. Cryotherapy
	4. Hydrotherapy
	5. Indicate
	6. Modality
	7. Thermotherapy
	8. Vasoconstrictor
	9. Vasodilator