MODALITIES: APPLICATIONS FOR THE TRAINING ROOM

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Objectives

- Define modality
- Discuss appropriate use of modalities
- Examine 3 primary modalities used in training room and associated evidence
What is a modality?

- The method of application of a therapeutic agent or regimen in order to promote, maintain, or restore the physical and physiologic well-being of an individual.
- These include the therapeutic use of heat, cold, ultrasound, massage, and electrical stimulation to induce a healing effect.
What is a modality?

“Physical agents/modalities should be utilized only as a component of patient/client management. Without documentation which justifies the necessity of the exclusive use of physical agents/modalities, the use of physical agents/modalities in the absence of other skilled therapeutic or educational interventions should not be considered physical therapy.”
Back to the basics

Modalities:
- Should not be the sole focus of treatment intervention
- Are most effective when used in conjunction with other treatment interventions (i.e. manual therapy, active movement/exercise)
- Parameters for use vary
- Most have limited research evidence to support use
What is a modality?

- **Heat modalities**: increasing blood flow to propagate healing factors at injured area
- **Cold modalities**: decreasing blood flow to inhibit influx of chemical byproducts and inflammatory mediators which impede healing process
- **Electrotherapy**: altering neuromuscular excitability and increasing electrical current to improve muscle activation and strength
Contraindications

The following are applicable to most modalities:

- Cancer
- Pregnancy
- Vascular disease or those areas with impaired circulation
- Impaired sensation
- Thrombophlebitis
- Hemorrhage
- Heat or cold intolerance (for cold/heat modalities)
Types of Modalities

- **Cryotherapy**
  - Ice packs, ice massage, whirlpool, immersion, sprays

- **Thermotherapy**
  - Moist heat packs, whirlpool, paraffin, ultrasound, phonophoresis

- **Contrast baths (hot and cold alternating)**

- **Electrotherapy**
  - Electrical stim, interex, biowave

- **Iontophoresis**

- **Massage**
Heat

- Superficial heating (hot pack, paraffin) penetrates skin 1-2 cm
- Deep heating modalities (ultrasound, diathermy) heat 2-5 cm below skin
- Heating effect occurs with transfer of energy via conduction
- Increases local or systemic circulation
- Promotes vasodilation
Heat Physiology

- A localized increase in temperature causes increased metabolic rate, capillary pressure and flow, clearance of metabolites, and oxygenation of tissue
- Increases extensibility of soft tissue structures
- In most cases *should not* replace active warm-up
- As a movement based profession, active motion should be encouraged to increase tissue temperatures and oxygen to healing tissue via increased blood flow
Clinical Application for Heat

- Promote relaxation and blood flow before stretching, prepares for other treatments
- Decrease muscle guarding following whiplash type injuries in contact sports
- Improve local circulation to an area
- Used in sub-acute and chronic situations
- Often used after dry needling or other manual techniques to decrease soreness and promote flexibility/blood flow

Cryotherapy

- Most commonly applied modality in sports medicine
- Examples: Cold pack, ice cup massage, whirlpool
Cryotherapy Physiology

- Reduced blood flow due to vasoconstriction
- Reduction in inflammatory response due to reduced metabolic rate/enzyme levels
- Reduced pain through gate-control theory and inhibition of nociceptors
- Altered nerve conduction velocity
- Tissue temp needs to be reduced 10-15 degrees for therapeutic effect to occur
Cryotherapy Physiology

- Used to intervene in presence of arthrogenic muscle inhibition (AMI) which is a protective reflex mechanism following joint injury
- External stimulus of cold application or low-level sensory input alters inhibitory signaling
- Increased excitatory efferent signaling to muscle results in increased activation
Cryotherapy

- Cryotherapy and TENS shown to increase vastus medialis motor neuron pool following artificial knee joint effusion
  
  Hopkins et al. *Cryotherapy and Transcutaneous Electric Neuromuscular Stimulation Decrease Arthrogenic Muscle Inhibition of the Vastus Medialis After Knee Joint Effusion J Athl Training*

- 20 minutes of ice bag application/45 minutes of TENS shown to increase quadriceps activation in subjects with diagnosed tibial osteoarthritis
  
  Pietrosimone et al. *Immediate Effects of Transcutaneous Electrical Nerve Stimulation and Focal Knee Joint Cooling on Quadriceps Activation Med Sci Sports Exerc 2009*
Clinical Applications

- Cold pack: Suggested application varies in the literature from 10-20 minute treatments 2-4x/day up to 20-30 minutes every 2 hours
- Recent research promotes intermittent sessions of 10 minutes, followed by 10 minutes off, then 10 minutes on every 2 hours
- Training room application: post-practice/surgery/injury
- Recent study has shown decrease in temp at intercondylar notch following cryotherapy performed after ACLR
- Post-op application: Ice bag DIRECTLY applied to injured area, encourage quad strengthening exercise during application

Pietrosimone et. al *Immediate Effects of Transcutaneous Electrical Nerve Stimulation and Focal Knee Joint Cooling on Quadriceps Activation Med Sci Sports Exerc* 2009

Rashkovska, A., Trobec, R., Avbelj, V., & Veselko, M. (2013). Knee temperatures measured in vivo after arthroscopic ACL reconstruction followed by cryotherapy with gel-packs or computer controlled heat extraction. *Knee Surgery, Sports Traumatology, Arthroscopy, 1-9*
Compression Devices

- Often used in conjunction with cryotherapy and elevation
- Most popular device is the Game Ready
- Also seeing more use of pneumatic compression devices such as Normatec
Electrical Stimulation

- Used for acute/sub acute/chronic injuries
- Settings vary depending on acuity of pain and effects desired
- Most often used in combination with heat or ice
- An athlete modality of choice
Electrical Stimulation

- Based on the gate control theory in the dorsal horn of the spinal cord
- Pain travels through small diameter afferent nerve fibers (A-delta and C fibers)
- By activating the larger diameter afferent fibers (A-beta) through touch, pressure, or electrical currents, the gate is closed on pain fibers
- Training room application: used during exercise in post-op period, everyday use
Electrical Stimulation
Clinical Applications

- Russian wave form for post op quad activation
- Low pulsatile current for longer acting pain control
- High pulsatile current for immediate pain control, but short term benefits
- Should be an adjunct to exercise, not a stand alone treatment

Biowave

- Latest technology in electrotherapy
- Similar to TENS/Interferential that uses surface electrodes to reduce pain
- Claims to use “Deep tissue signal technology”
- Provides deeper delivery of stimulation while also being more comfortable for pt
- Research very limited so far
Summary

- Modality application most effective when used with other treatment measures
- Modalities should not be the sole focus of treatment
- Implementation of modalities promote the healing and recovery of injured tissues
- More research is needed to support parameters and effectiveness of modalities in treating a variety of musculoskeletal conditions
References


- Hopkins et. al Cryotherapy and Transcutaneous Electric Neuromuscular Stimulation Decrease Arthrogenic Muscle Inhibition of the Vastus Medialis After Knee Joint Effusion JAthl Training

References


- Pietrosimone et. al *Immediate Effects of Transcutaneous Electrical Nerve Stimulation and Focal Knee Joint Cooling on Quadriceps Activation Med Sci Sports Exerc 2009*


- Rashkovska, A., Trobec, R., Avbelj, V., & Veselko, M. (2013). Knee temperatures measured in vivo after arthroscopic ACL reconstruction followed by cryotherapy with gel-packs or computer controlled heat extraction. *Knee Surgery, Sports Traumatology, Arthroscopy, 1-9*