BFR, HIIT, AND KINESIO TAPE BASICS AND PRACTICAL APPLICATION

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Intro and Disclosures

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OBJECTIVES

- Understand current clinical impressions of BFR, HIIT, and Kinesiotape
- Describe the BFR product attributes that make it safe and reliable
- List at least one patient population that would benefit from BFR, HIIT, and Kinesiotape
BLOOD FLOW RESTRICTION (BFR)
WHY AND WHO

REASONS FOR:

- CSA – ATROPHY
- STRENGTH
- BONE LOSS (RASCHKE 2007- 26% Faster Bone Healing after FX)
- FITNESS/ENDURANCE (TRY WITH STATIONARY BIKE OR UBE)

POPULATIONS:

- AGES 10 – GERIATRIC
- ORTHO, SPORTS, NEUROLOGIC
HOW IT WORKS

• COMPRESSION DEVICES APPLY A PRESSURE HIGH ENOUGH TO O C C L U D E 50% UE – 80% LE OF BLOOD FLOW TO THE TARGETED MUSCLES

• W E A R IT ON THE PROXIMAL EXTREMITY + LOW-LOAD EXERCISE

WHAT PATIENTS SEE
HOW: PROPOSED MECHANISMS

- **SECRETION OF GROWTH HORMONE (TAKARADA ET AL 2000)**
- **INCREASED METABOLITES + LOCAL HYPOXIA → DECREASED LOCAL pH → INCREASED RECRUITMENT OF TYPE II MUSCLE FIBERS (TAKARADA ET AL 2004)**
- **INCREASED GH LEVELS, MYOSTATIN DECREASED; BELG IN BLUE COW**
- **"THE PUMP" = SWELLING IN THE TISSUES INDICATIVE OF INFLAMMATORY RESPONSE IN THE CELLS WITH FLUID (WITHOUT THE LOAD)**
  - **ONE STUDY KUBOTA 2011 HAD JUST CUFF AND NO EXERCISE AND STILL SAW 50% LESS CSA LOSS IN LE**
HOW: LIKELY MECHANISM

- IT IS REALLY REALLY TOUGH = MAX MOTOR FIRING RECRUITMENT
- DESCRIBE IT AS “ALTITUDE TRAINING FOR YOUR MUSCLES”
TOP UNITS FOR CLINICAL USE
**RISKS INVOLVED**

**Risk of Serious Adverse Events**
- Deep vein thrombosis (DVT)
- Pulmonary embolism (PE)
- Rhabdomyolysis
- Similar to other tourniquets

Additional Adverse Events
- Subcutaneous hemorrhage
- Numbness
- Pain
- Dizziness or fainting

**Contraindications**
- History of DVT, clotting issues
- Active or recent CA
- Pregnancy
- Varicose veins, vascular compromise
- Severe chronic diseases; HTN

*Less than 0.1% occurrence*

(Nakijima et al 2006) Ariaga 2018
OTHER CONSIDERATIONS

• P/O BEFORE SUTURES ARE REMOVED

• RECOVERY TIME IS REDUCED WITH LESS TISSUE DAMAGE, SO CAN CHALLENGE THE MUSCLE MORE OFTEN

• PROTEIN INTAKE FOR PROTEIN SYNTHESIS – MOST HYPERTROPHY AND STRENGTH PROGRAMS THAT YOU DESIGN
  • MEAT > AMINOS (LEUCINE IS BEST) > WHEY > MILD > SOY
HOW: (BFR) TRAINING

BFR + low-load exercise

- Pressure: 80% total limb occlusion pressure (TLOP)
  - Occlude venous flow
- Exercise load: 15-30% 1RM
  - 1st set: 30 repetitions
  - 2nd – 4th sets: 15 repetitions each
  - Inter-set rest period: 30-60 seconds
- Dosage: 3x/week

Alternative BFR applications

- BFR alone
- BFR + walking/cycling
- BFR + high-load exercise

(Scott et al 2014)
Implications for Practice (Arriaga and Koch 2018)

Findings for knee strength and CSA

- BFR protocol + standard rehabilitation improves quadriceps atrophy & strength compared to standard rehabilitation alone
- BFR may positively impact hamstring strength

Considerations

- No serious adverse effects reported
- Proper training and equipment is required
- Specific protocol & BFR parameters unclear
LITERATURE SYNTHESIS: BFR

- Cross sectional area
- Strength
- Performance
• 64 Y/O active female w/ moderate medial compartment OA of bilateral knees. L has pain, R is not painful
• ROM R= 2-135, L= 5-132, atrophy LLE thigh
• Wants to hike Half Dome
KINESIO TAPE
KINESIO TAPE: SCIENCE?

This is one of the most important benefits of kinesio taping for competitive athletes. Allow athletes to continue training and/or competing as their injuries heal.

Improve neurological muscle activation, infants and young children with hypotonia, poor muscle tone that limits their ability to learn to sit up, crawl, etc.

The unique elastic properties of kinesio tape allow it to provide support to an injured muscle or joint, discouraging harmful movements while still allowing a safe, healthy range of motion.

The lifting action of the tape relieves pressure on pain receptors directly under the skin.

Reduced pressure on the lymphatic drainage channels enhances the removal of fluids and other materials that collect in an injured area.

Enhanced circulation to working muscles helps deliver oxygen and nutrients at the cellular level as well as accelerate the removal of waste products.

Fatigued, overused muscles contain byproducts of exercise (such as lactic acid) that contribute to pain and stiffness and limit the ability to continue exercising. When kinesio tape is used over these areas, enhanced removal of these byproducts allows for more rapid recovery.
KINESIO TAPE; PROPOSED USES

- **Sensory Stimulus = Receptors**
- **Edema Control = Lift**
- **Biofeedback = Postural Awareness**
- **Facilitate firing of patterns w/ recoil = Strength?**
- **Structural Support?**
**Kinesiology Tape**

- Sensory Stimulus
- Edema Control
- Biofeedback
- Recoil
- Structure
LITERATURE SYNTHESIS: KINESIO TAPE

- **Sensory Stimulus** (Lu 2018) knee OA - walking, pain
- **Edema Control** – no quality studies, less oro facial
- **Biofeedback** (Shin 2018) scap control, ankle balance, grip good, some question on ankle proprio (Raymond 2012)
- **Recoil** (Selva 2019) - every brand is different, forces, environment; (Reneker 2018) no studies with improved performance
- **Structure** (Ouyang 2018) Knee OA less than leuko or Mulligan, CLBP not effective (Nelson 2016)
STRUCTURE: WHIPS AND FOOT PROGRESSION ANGLE
PICTURE THIS

- 20 y/o with R SLAP tear 6 months and wants to go back to crossfit, doesn’t want surgery. Pain anterior shoulder posterior
- Cervical spine hypermobile, Upper T/S hypo
- Depressed scapulae bilateral, R>L
HIGH INTENSITY INTERVAL TRAINING (HIIT)

- TABATA
- ORANGE THEORY
- F45
- BARRY’S
- HILL REPEATS, STAIRTRAIN, BIKE, VASPER, ELIPTICAL....
HIGH INTENSITY INTERVAL TRAINING (HIIT)

- Athletes
- Weekend Warriors
- Geriatrics
- Pediatrics
- Specific Comorbidities DM, CAD, Obese
- Aerobic Capacity
HIGH INTENSITY INTERVAL TRAINING (HIIT)

- In general ratios of work to rest
  - 1:1, 2:1, 1:5.....
- Intense : Recover
- ~3-5 times per week
HIIT: F45

- Australian based; Functional (F)… ?
- 45 minutes
- Station based rotation
- Heart rate monitors and interactive screens
  - Technique and performance
HIIT: ORANGE THEORY

- 60 MINUTES
- TECHNOLOGY INTEGRATED
- GROUP CLASS FORMAT

5 HEART RATE ZONES

- ZONE 1: VERY LIGHT ACTIVITY, 50-60% OF MAX HR
- ZONE 2: WARM UP, 61-70% OF MAX HR
- ZONE 3: CHALLENGING, 71-83% OF MAX HR
- ZONE 4: ORANGE EFFECT, UNCOMFORTABLE, 84-91% OF MAX HR
- ZONE 5: ALL OUT EFFORT! 92-100% OF MAX HR
HIIT: BARRY’S BOOTCAMP

- Red Room
- Group Class Format
LITERATURE SYNTHESIS: HIIT

- **AEROBIC - EPOC THOUGH!?!**
  - **VO2MAX** (MA 2013, WESTON 2104) in 6 weeks increase 14-19%, (MILANOVIC 2015) better than traditional endurance training in young-middle aged

- **ANAEROBIC** (NAIMO 2014) decreased training time and same results

- **OBESITY** Insulin sensitivity, mild changes fat mass, increased compliance (WEWAGE 2017, CAMPBELL 2019)
HIGH INTENSITY INTERVAL TRAINING (HIIT)

**But Don’t Forget:**

- Precautions, Contraindications, and Screening
- Base Foundational Strength
- Proper Frequency and Dosage
- Muscle Imbalances Compensation Patterns
PICTURE THIS

- 39 y/o with CLBP w/o radiculopathy and looking to get in half marathon shape before turning 40. Has not done resistance training in 10 years, min cardio
- Soft 6’ and weighs 220
- Working at startup with 12 hr days, but gets out for beer league softball 1x/wk
- H/H Type 1 DM, HTN moderate, depression
SUMMARY BFR:

- **Same Gains for Strength as HIIT without the tissue damage**
- **Improved gains of hypertrophy (CSA) in systematic reviews**
- **Can start hypertrophy phase much earlier in rehab protocol**
- **Can avoid DOMS that prevents some patients from wanting to do exercise**

\[ \text{Rx = Compliance and Frequency Improved} \]
SUMMARY KINESIO TAPE:

- **IN COMBINATION AS MULTIMODAL TOOL**
  - MOST EFFECTIVE IN THE SHORT TERM ONLY
- **DOES NOT CHANGE MECHANICAL FORCES**
- **IMPROVE LYMPHATICS IN LOCAL AREA**
- **AS A SENSORY TOOL IS THE BEST USE**
SUMMARY HIIT:

• “JUST DO IT”
• FITS WELL INTO FAST PACED LIFESTYLES
• TRADITIONAL TRAINING REGIMES PRODUCE THE SAME RESULTS WITH LOWER INTENSITY LEVELS
• CAUTION WITH QUICK RAMPING AND OVERLOADING CERTAIN STRUCTURES
• VO2 MAX CHANGES SUITABLE FOR CROSS TRAINING


22. MONTALVO AM, CRYA EL, MYER GD. Effect of kinesiology taping on pain in individuals with musculoskeletal injuries: systematic review and meta-analysis. Phys Sportsmed. 2014 May;42(2):48-57


Thank You!!

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