SESSION 610
PROGRESS CLIENTS WITH ISOLATED AND INTEGRATED EXERCISE
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ISOLATION - VS - INTEGRATION
2 Ends of the Continuum

1. “Functional Exercise is the key”
   • Integrated Exercise = functional
   • Isolated Exercise = nonfunctional
   • “If you work a weak muscle as part of a chain, it will eventually strengthen to its balanced strength ratio to the other muscles of that chain.”
   • What is function???

2. “Cannot improve function without isolated exercises”
   • Must strengthen isolated muscle in order to improve integrated movements
   • “Isolated strength is vital for functional stability”
   • Any isolated weakness will inhibit integration of all muscles
   • Weakness throws off timing
   • Must prescribe isolated exercises

The Research:
• “Without evidence that what we think should happen, our use of exercises to achieve training affects is really hypothetical”
• “There is little concrete evidence regarding how to design functional exercises........No single approach creates a comprehensive program”

• “Regardless of how you train your body to learn movements, the body is limited to the capabilities it has for the muscles to produce and sustain force”
  ...C. Cunningham
“Isolated Exercises Are Not Functional??”
Dr. Wayne Westcott, PhD
– Four studies improving golf swing
– All used isolated exercise
– One set to failure
– 77 participants increased 3.4 mph
  • The groups that included stretching = 5.2 mph
CC Cunningham on why...improved neuro-anatomy!

MUST LOOK AT THE WHOLE PICTURE: It is an Exercise Continuum!!!

Consider: Divisions of Muscles and the capability to compensate
• Many muscles have isolated divisions which are separated by fascia and are separately innervated
• Each division of a muscle gains the mechanical advantage relative to the position of the joint in space
• Changes in the moment arm give dominance to different fiber

Take A Look At The Shoulder: A Complex Joint!!!
• How do we differentiate between isolated and integrated exercises with so many variables to address?
  • Spinal stability
  • Scapular motion
  • Clavicular motion
  • Rotator cuff function
• ***All the muscles have to do the right thing at the right time
  • What if the connections are not there??
  • How do we know??
Identifying Compensations

• Look at the muscles that have the mechanical advantage in each movement: Prime mover
• Identify different divisions of each muscle
• Can it contract and can it contract now??
  • If not, the another muscle or division of muscles will have to take over
  • How do we know???
  • Must test: neuro-proprioceptive response
• Must find positions of weaknesses (instability)
  • Body will attempt to find positions of strength!!!!!

FACTORS TO CONSIDER

• Note: The rules are the same at any joint!!!
• Must have a thorough understanding of joint mechanics
• Must also understand of the role of muscular imbalances
• The goal is to improve functional capabilities
• Muscles respond to loads: They will do their job when called upon if there is proper neurological connection

WHAT HAPPENS WHEN THE FOOT HITS THE GROUND?

• When the foot hits the ground, everything changes
• More muscles are working to perform motion at each joint
  • Ground reaction forces
  • Forces moving back through body
• Must look at the variety of functions
• Add to what we learned in anatomy
• Address tri-planar components of each muscle
  • The structure of the joint will determine its function and its dominant plane of motion
  • Muscles are designed to move and control movement through these planes of motion
• Muscle do not have to cross a joint to produce motion at that joint
  – Piriformis -vs- Gastroc
  – Vastus Medialis
ISOLATION VS INTEGRATION

- Is the isolated muscle going to be involved in the integrated exercise? – How do we know
- If all muscles can contract on demand we will be much stronger and there will be less risk of injury

MUSCLE INHIBITION AND ITS ROLE IN INTEGRATED MOVEMENT

- All muscles must contract on demand
- It’s not about strength ratios or balance
- What is the neural integrity of each muscle – Can a muscle contract and can it contract now???
- Does not matter if it is used in isolated strengthening or integrated strengthening
- You are only as good as what you have to work with

JOINT STABILITY & JOINT MOBILITY

- **ROM IS GOOD:** If its stable.
- Muscles support and control motion around joints.
- Mobility will be limited if there is no sense of muscular stability (ice)
  - If the antagonist muscles cannot contract efficiently
- Body will naturally protect the joint when muscles cannot support it
  - Ligaments are 2nd form of protection: Not primary tension regulators!
- **Alpha Gamma Co-activation**
  - Higher centers recognize change in length and send info to activate the gamma motor neuron
  - Gamma motor neuron sends info directly to the intrafusal fibers (contractile portion)
    - Intrafusal fiber tenses:
      - Sensory input directed to alpha MN
      - Combined information!!!
**ISOLATED WEAKNESS IN EXTREMES**
- **Neurological advantage:** Lengthened position (spindle feedback)
- **Biomechanical advantage:** actin and myosin crossbridging
- **Biomechanical and neurological disadvantage:** Shortened position
  - ***Pain and dysfunction typically show up in the extremes***
  - **The lengthened position of one muscle is the shortened position of the opposite muscles**

**Muscle Tightness –vs- Muscle Weakness**
- Consider muscles that shorten in order to move you into the position of limitation
  - **Limitation in Hip Flexion:**
    - Tight Hamstrings OR Weak Hip Flexors:
      - Rectus Femoris
      - TFL
      - Psoas Major/minor
      - Iliacus
      - Sartorius
      - Adductors/abductors that flex the hip

**ROM Exam Becomes The Indicator**
- Where ever you see a limitation in ROM
  - Means the muscles that move you there, cannot shorten efficiently
- The ROM exam tells where the problem originates
  - What is the body protecting from??
  - What muscles cannot shorten?
    - A representation of instability
  - We are only as strong as our weakest link
    - Must improve the ability for the muscles to shorten
• Muscle Weakness -vs- Muscle Tightness
  • Hip Flexor weakness/Hip Extensor tightness
  • Hip Extensor weakness/Hip Flexor tightness
  • Internal Rotator weakness/External Rotator tightness
  • Trunk rotator weakness/trunk rotator tightness
  • Dorsiflexor weakness/Plantarflexor tightness
• Active -vs- Passive Range
  • Only as good as the motion that you can control
  • Must fill in the gap between active and passive ROM
  • Ex: Quads –vs- Hams

**MUSCLE ACTIVATION TECHNIQUES:**
Increase Stability In Order To Increase ROM

• Low-Intensity Isometric contractions:
  • Create less muscle spindle stretch lag and unloading effects.
  • Easier to regulate the intensity of the contraction.
  • Least stressful and most controlled form of exercise when dealing with injury.
  • Low-intensity isometrics, then a continuum of reinforcement exercises.

• **LOW-INTENSITY ISOMETRICS**
  – Place joint in specific position relating to weakness.
  – Maintain extreme of motion.
  – Client activates into plane of weakness.
  – Performs 6 contractions: Hold 6 seconds with each contraction.
  – Start with the minimal amount of effort (10%) and increase appropriately.

• **30-60-90 PRINCIPLE**
  • 15 degree carry over in isometric strengthening.
  • Reinforce 30 degree increments from neutral
    • Actively moving away from neutral in order to restore active/passive relationship
• **MAT STRENGTHENING**
  • Must activate “POSITIONS OF WEAKNESS”
  • Must be “Jump-Started” prior to prescribing isolated strengthening exercises

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