CORE STABILIZATION and Abdominals
Research Enhanced Presentation
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CORE STABILITY
• Core stabilization and abdominal strength require the activation of the muscles of the core to stabilize and control movement of the torso.
• These muscles are classified as to their anatomical location and function.
• They are essential for proper load balance within the spine, pelvis and kinetic chain.
• They provide a stable base from which the body and extremities move.
• Proper strengthening instruction prevents uncontrolled movements that have the potential to injure your lower back.
• Multiple muscle synergies in core stabilization include isometric, concentric, and eccentric contractions and co-contractions.

MUSCULAR PERSPECTIVE of CORE STABILIZATION
Core stability requires global and segmental muscle activation
• We cannot remain stable in any activity or position without including some of the global muscles.
• The gluteus complex, hamstrings, and hip flexors are not global muscles but impact the trunk and pelvic alignment.
  o Back extensors with hip flexor muscles create anterior pelvic rotation
  o Hamstrings and gluts with Abdominal muscles = posterior Pelvic rotation
• When there is substantial force generated by the large muscles but inadequate activity of local muscles, the spine remains unstable.
• Local, segmental muscles are deep stabilizers and important for alignment of weight-bearing lumbar area.
  o Intertransversari and Interspinalis
  o Transverse Abdominus, Multifidus, Pelvic Floor, Diaphragm
  o Walls, ceiling and floor on lumbo-pelvic region
  o Low load activation of 25% contraction
• Global muscles are spinal mobilizers, balance external loads.
  o Obliques, Rectus Abdominus, Erector Spinae, Quadratus Lumborum, Hip Flexors, Gluteals, Hamstrings
  o Big movement muscles are force generators for spinal motion
  o Balance external loads

BALANCE and STABILIZATION
• Adherence to the concept of bio-motor integration indicates that all movement performed unsupported while on the feet requires an integrated combination of:
  o Proper alignment enables balance and coordination
  o Flexibility is a result of balance & coordination
  o Endurance including full ROM on stable base is achievable
• Awareness of body positioning.
  o Proprioception enables the body to transmit a sense of position, analyze the information, and react to stimulation with proper movement – the properties of water challenges this
• Interaction between visual feedback & trunk rotation indicated that core spinal stability is critical in coordinating balance control.
  o Trunk muscle imbalance may contribute to unbalanced postural activity
FUNDAMENTALS of AQUATIC STABILIZATION

• Elimination of gravitational forces directly related to the properties of water allows participants to train with decreased, yet variable, axial loads and sheer forces.
  o Trunk is supported in a vertical functional position
  o Buoyancy unloads the spine with decreased pain complaints
  o Viscosity facilitates core muscle training
  o Intensity of movement can be controlled by varying the speed of movement, the surface area & one’s position in the water
• Water requires continuous muscle activation with static positioning and dynamic movement.
• Trunk strengthening is accomplished by increasing the intensity, frequency and/or duration of the exercise.

COMPONENTS OF STABILIZATION

• Understand neutral spine and alignment in all positions
  o Proper contraction of local and global muscles to achieve benefit
• Activating the Transverse Abdominis
  o Abdominal hollowing/abdominal bracing
  o Activates prior to movement to help stabilize spine and pelvis
  o Low back pain can impair the timing of firing of muscle
• Activating the Multifidus
  o Provides direct stability to spinal segments
  o Prevents back-to-front force against the vertebrae
  o May not function correctly with low back pain and must be re-trained
• Activating the Pelvic Floor
  o Help stabilize the pelvis and lower back

BENEFITS OF AQUATIC STABILIZATION

• Minimization of segmental trunk motion and shear forces
• Reinforcement of lumbar control
• Core muscle activation
  o Studies show that without the activation of the deep core muscles the spinal column buckles under a 20 lb. load
• Balance is possible when alignment is correct and neutral
• Encouragement of hip, knee, and ankle propulsion
• Development of head and neck stability
• Identifies muscle imbalances
• Muscle endurance

RESEARCH SUPPORT

• We know the water requires activation of the muscles of the core and torso, but a review of validated research shows statistical aquatic evidence is lacking.
• A search of aquatic specific research includes terms – water, aquatic, hydrotherapy, and balneotherapy.
• Specific aquatic research with a core/abdominal focus deals primarily with low back pain and deep water exercise.
• Land research is easily accessible for these topics.
• Why is the research lacking?
  ■ The challenge of measuring muscle activation when immersed
  ■ The difficulty, inexperience and caution of therapists using EMG testing in the pool
RELATED RESEARCH

• Hall, Jane, PhD, MPhil, MCSP, et al. “Does Aquatic Exercise Relieve Pain in Adults with Neurologic or Musculoskeletal Disease? A Systematic Review and Mets-Analysis of Randomized Controlled Trials.” Arch Phys Med Rehab. Vol. 89m May 2008


RESOURCES for DOCUMENTATION

• Handout listing applicable research is available
• Specific references to Pilates, Yoga, Tai Chi, and Ai Chi studies may be applicable – Pilates, Yoga, Tai Chi are land-based, Ai Chi is water based
  o Consider conducting a study or research on these
• Recommend Cole and Becker’s Comprehensive Aquatic Therapy, 3rd ed, 2011.