ACE Understanding Movement-Based Training

Presented by: Jonathan Ross, www.AionFitness.com; www.AbsRevealed.com

Exercise is a function of movement where coordinated movement is a skill that can be taught. The more we learn about the fascial system the more we realize that all muscles are interconnected yet many exercises are designed to work on only one muscle group or body part at a time. This interactive session will introduce the theories behind movement-based training as well as provide specific strategies on how to use progressions and regressions of common exercise movements to help clients enhance their coordination and create the lean, "toned" look they desire.

Wolff's law, which states that functional stimulation precedes structural change, was developed in the late 1890s to describe how the structures of the body adapt on the macro level.

Davis' law, "soft tissue models along the lines of stress" (Siff and Verkhoshansky, 2009).

On the microscopic level, cells function as individual structures to remodel their architecture in response to applied stresses.

There are two distinct parts of human skeletal muscle: the contractile element and the visco-elastic non-contractile component.

The contractile element of muscle is organized into different layers:

- The myofibril, or individual muscle fiber, comprised of sections of sarcomeres containing the actin and myosin protein filaments responsible for muscle contractions
- The fascicle formed by a bundle of individual muscle fibers
- An entire section of muscle containing of a number of fascicles

The non-contractile component includes the fascia or connective tissue, which surrounds each layer of the contractile element:

- The endomysium—the connective tissue around an individual myofibril (muscle fiber)
- The perimysium—the layer of connective tissue around a fascicle
- The epimysium—the outermost layer of connective tissue around an entire muscle or collection of fascicles

Muscle contractions by the contractile element are generally identified as:

- Wholly eccentric—a lengthening action where the resistive force is overcoming the muscular force
- Wholly concentric—a shortening action where the muscular force is overcoming the resistive force
- Completely isometric—an action where the muscle fibers are contracting but no joint motion occurs

The non-contractile component is comprised primarily of fascia, which is broadly defined as all of the soft, fibrous connective tissue interwoven between all of the cells and organs within the human body (and should be considered an organ in its own right). Recent research suggests that non-contractile connective tissue is the richest sensory organ in the human body, containing up to 10 times as many free nerve endings than the contractile element (Schleip et al., 2012)

Presented by: Jonathan Ross, www.AionFitness.com; www.AbsRevealed.com

Through mechano-transduction, which is the transmission of mechanical forces through fascia and connective tissue to initiate a biochemical response, it is estimated that mechanical vibrations transiting the myofascial network move three times faster than the signals sent by the CNS.

Tensegrity, which refers to the combination of tension and integrity, is an architectural term used to describe a structure that is self-supporting through a combination of tensile (lengthening) and compressive (shortening) forces. Given that the myofascial system is a balance of compression and tension, *biotensegrity* is an effective term to describe how the body has a natural, structural tendency to balance forces (Myers, 2009; Galli et al., 2005; Ingber, 2003).

If the system is not properly balanced, then forces such as compression, tension, torsion or shear can change the architecture of cellular structures and the overall function of the body. The key message for fitness professionals is that continued stresses from repetitive movement patterns, movements performed with poor technique, or a lack of multiplanar movement in general affects the body on many different levels and can have a significant impact on the results a client experiences from an exercise program.

The Take-Home Message: Exercise is a function of movement. Movement is a function of numerous muscles working together to propel joints through their structural range of motion. *Designing an exercise program based on body-part isolation does not take advantage of the mechanical forces produced when numerous muscles and fascial structures work together in synergy.* If you have only a limited amount of time to engage your clients in activity, then it is important that the client perform multiplanar, multidirectional movements that include both slow and fast-paced tempos to ensure adequate stimulation of all layers of the myofascial network.

Practical Application:

Movement efficiency is defined as an integrated balance between the central nervous system responsible for sensory reception and the motor or muscular system that identifies the appropriate motor response for movement (American Council on Exercise, 2010). Movement efficiency requires exercise strategies that first restore balance to the structural framework of the body before increasing the force production capabilities of the muscular system. The ACE Integrated Fitness Training® (ACE IFT®) Model was designed to provide personal trainers with a specific methodology for creating exercise programs that can improve movement efficiency by enhancing the function of a client's entire myofascial system.

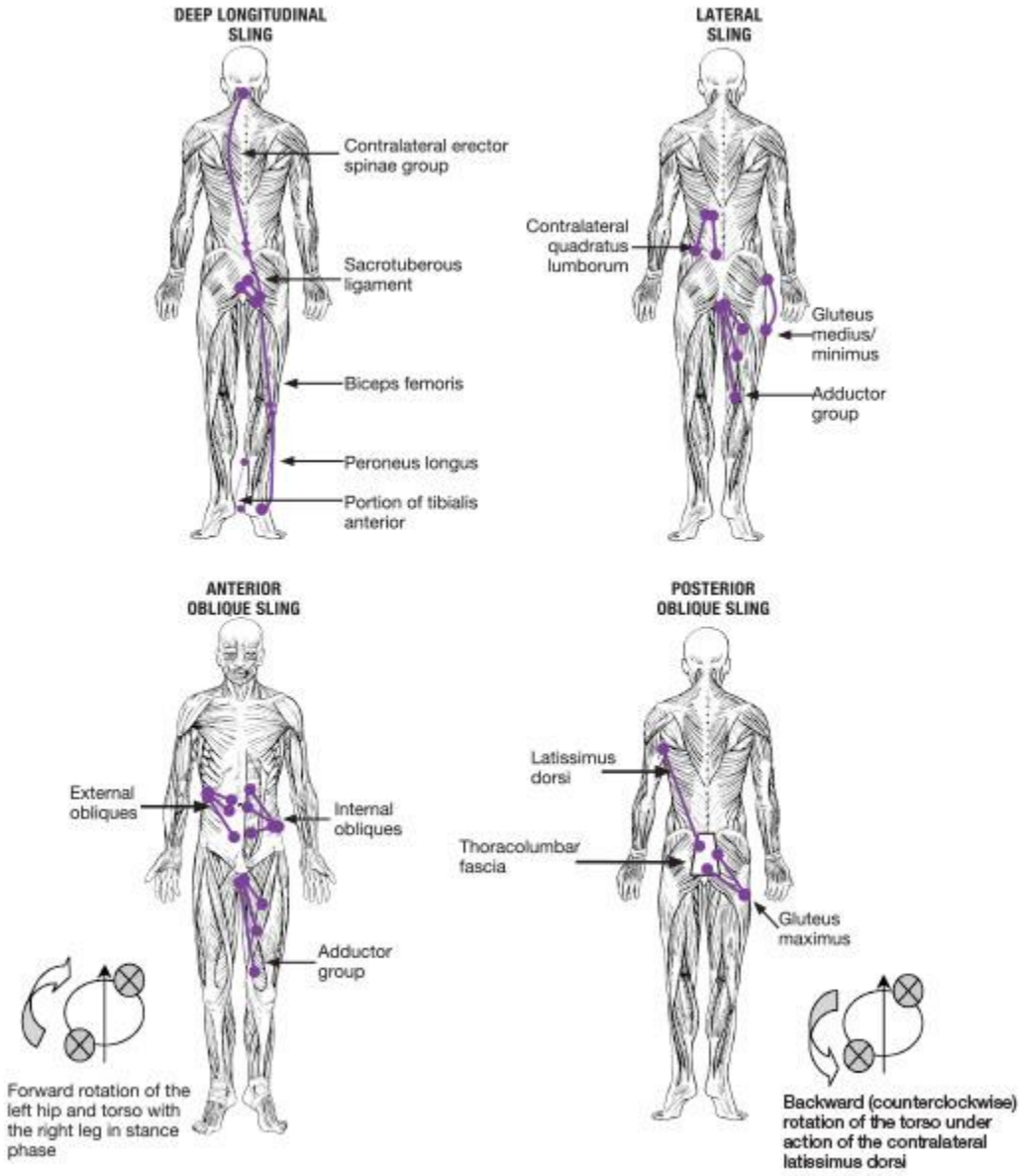
If a muscle experiences constant stress or tension from repetitive movements or chronically poor posture, then it will layer down inelastic collagen fibers as a way to reduce the stress and protect the muscle from damage. Muscle tissue and connective tissue are organized in layers. When collagen binds between these layers, it can reduce their ability to slide against one other and alter the function of involved joints. If individuals move frequently during the aging process and engage in activities that provide changes in velocity and direction of movement (e.g., learning new dance routines or forms of martial arts), then they create a more elastic, resilient myofascial network. However, if individuals become sedentary and restrict their movement patterns to predictable, repetitive actions, they may experience a significant loss of elasticity from the myofascial system as collagen binds between the fascial layers along the established lines of stress.

The model the American Council on Exercise uses for the ACE IFT Model involves the myofascial slings, as described by Andrey Vleeming and colleagues (American Council on Exercise, 2009).

Presented by: Jonathan Ross, www.AionFitness.com; www.AbsRevealed.com

The Four Myofascial Subsystems or Slings

Vleeming and associates identified four specific slings of fascia responsible for transmitting and controlling forces:



Bodyweight Exercises

- Lower Body
  - Lateral Squat Walks w/Alternating Toe-In/Toe-Out
  - Rotational Sumo Squats
  - Skaters (use regressions and progressions to use them with any population)
  - Step Over Squats (T-Feet)

Presented by: Jonathan Ross, www.AionFitness.com; www.AbsRevealed.com

  - Jumping Jack Series
    - Frontal, sagittal, transverse
- Arm Shifts – static & dynamic arm positions
  - Squat
    - Double leg – 1 and 2 arm shift
    - Single leg – 1 and 2 arm shift to ipsi- and contra-lateral sides
  - Lunge
    - Static (constant foot position)
      - Sagittal lunge - 1 and 2 arm shift to ipsi- and contra-lateral sides
      - Frontal lunge - 1 and 2 arm shift to ipsi- and contra-lateral sides
      - Transverse lunge - 1 and 2 arm shift to ipsi- and contra-lateral sides
    - Dynamic (varied foot position)
      - Sagittal lunge - 1 and 2 arm shift to ipsi- and contra-lateral sides
      - Frontal lunge - 1 and 2 arm shift to ipsi- and contra-lateral sides
      - Transverse lunge - 1 and 2 arm shift to ipsi- and contra-lateral sides
    - Front to back Lunge with contra-lateral reach (always reach toward front foot)

- Torso (center-of-mass) shift
  - Plank Shift (from either elbows or hand)
    - Front-to-back; side-to-side
  - Tripod Plank (lift one limb)
  - Tripod Push-Up (lift one limb at top)
  - Shifting Push-Up
    - Front-to-Back
    - Side-to-Side
  - Walking Plank
    - Side-to-side
    - Lateral Walk-Out (walk feet wide to narrow)

IV. Exercises with Handheld Weights (eg. Dumbbells, kettlebells, medicine balls, ViPR, sandbags, etc.)

- Dumbbell / Kettlebell Medicine Ball, ViPR exercises
  - Shifting Single DB/KB Shoulder Press
    - Add squat for push press variation
  - "Scarf" Squat and Lunge Series (perform a "halo" movement with your load)
    - Squat
    - Sagittal Lunge
    - Frontal Lunge
    - Transverse Lunge
  - Rainbow (overhead arc) Squat Series
  - Front-to-back lunge with contra-lateral reach (LIGHT DB/KB)
  - Step Back or Step Forward Lunge w/Single Arm Swing
- Stability Ball / BOSU Ballast Ball exercises
  - Lateral "monkey" squat
  - Crunch
    - Static – Arm Shift Crunch
    - Dynamic – Rotating Arm Crunch
  - Hip Bridge
    - Offset to side

Presented by: Jonathan Ross, www.AionFitness.com; www.AbsRevealed.com

  - Offset Mt. Climber

V. Choosing Exercises:

- What is the current conditioning level?
- What is/are the goal(s) of the training program?
- What movements are currently most difficult?
- What is the appropriate intensity / threshold (sets, reps, rest, resistance, ROM) of exercise to provide a training stimulus?
- Choosing external load: The weight is not the weight! What it feels like will be determined by leverage, position, and momentum.
- 3 Main Ways to Use Shifting Exercises
  - Easier versions make great warm-ups
  - Re-conditioning / Functional training exercises
  - Performance exercises (higher speeds, loads, complexity)

VI. Modifying Exercises: Just remember that **Momentum = Mass * Velocity**

- Modify the mass
  - External load
  - Internal load
- Modify the velocity
  - Speed of the exercise (if using internal load)
  - Speed of the shift (if using external load)
  - Direction of movement (either of the body or the external load)

Additional Information: *Training the Fascial Network* – Pete McCall (Two-Part Article series)
http://www.acefitness.org/certifiednewsarticle/3161/cutting-edge-training-the-fascial-network-part-1/

http://www.acefitness.org/certifiednewsarticle/3226/cutting-edge-training-the-fascial-network-part-2/

References

American Council on Exercise (2010) *ACE Personal Trainer Manual (*4th ed.). San Diego, Calif.: American Council on Exercise.

American Council on Exercise (2009) *ACE Advanced Health & Fitness Specialist Manual*. San Diego, Calif.: American Council on Exercise.

Galli, C. et al. (2005) Life on the wire: On tensegrity and force balance in cells. *Acta BioMed*,76, 512.

Ingber, D.E. (2004). The mechanochemical basis of cell and tissue regulation.*Mechanics & Chemistry of Biosystems: MCB,* 1, 1, 53–68.

Ingber, D.E. (2003). Tensegrity II: How structural networks influence cellular information processing networks. *Journal of Cell Science,* 116, 1397–1408.

Langevin, H. (2006). Connective tissue: A body-wide signaling network? *Medical Hypotheses,* 66, 1074–1077.

Myers, T. (2009). *Anatomy Trains (*2nd ed.). London: Elsevier.

Myers, T. (2011). Fascial fitness: Training in the neuro-myofascial web. *IDEA Fitness Journal,* 38–45.

Neumann, D. (2010). *Kinesiology of the Musculoskeletal System* (2nd ed.). St. Louis: Mosby.

Presented by: Jonathan Ross, www.AionFitness.com; www.AbsRevealed.com

Oschman, J. (2009). Charge transfer in the living matrix. *Journal of Bodywork and Movement Therapies,*13, 215–228.

Schleip, R. et al. (2012). *Fascia: The Tensional Network of the Human Body*. London: Elsevier.

Schleip, R. (2003). Fascial plasticity: A new neurobiological explanation (Part I).*Journal of Bodywork and Movement Therapies,* 7, 1, 11–19.

Schleip, R. (2003). Fascial plasticity: A new neurobiological explanation (Part II).*Journal of Bodywork and Movement Therapies,* 7, 2, 104–116.

Schultz, R.L. and Feitis, R. (1996). *The Endless Web: Fascial Anatomy and Physical Reality*. Berkeley, Calif.: North Atlantic Books.

Siff, M. and Verkhoshansky, Y. (2009). *Supertraining* (6th ed.). Denver, Co.: Supertraining Institute.

Vogel, V. and Sheetz, M. (2006). Local force and geometry sensing regulate cell functions. *Nature Reviews: Molecular Cell Biology,* 7, 265–275

Common myths:

Fuel utilization during exercise
- Fats
- Carbohydrates
- Crossover point

Energy Pathways
- ATP-PCr
- Glycolytic
- Aerobic

Muscle fiber physiology
- Type I
- Type II
    - Motor unit activation
    - Stimulate motor units to engage, use muscle fibers

Total Daily Energy Expenditure (TDEE)
- RMR
- TEPA
- TEF

Resting metabolic rate (RMR) – Using the Mifflin/St. Joer equation

Women
- (9.99 x BW-kg) + (6.25 x HT-cm) – (4.92 x age) – 161
- (4.54 x BW-lbs) + (15.875 x HT-in.) – (4.92 x age) – 161

Men
- RMR = (9.99 x BW-kg) + (6.25 x cm) – (4.92 x age) + 5
- RMR = (4.54 x BW-kg) + (15.875 x HT-in.) – (4.92 x age) + 5

Applying the activity factorActivity factor

ACE Understanding Movement-Based Training

Presented by: Jonathan Ross, www.AionFitness.com; www.AbsRevealed.com

Category	Physical Activity (PA)	Activity Score
Sedentary	< 30 min/day	1.2
Lightly active	Light PA 1-3 days/week	1.375
Moderately active	Moderate PA 3-5 days/week	1.55
Very active	Hard PA 6-7 days/week	1.725

Estimating energy expenditure using Metabolic Equivalents (METs)
- METs x 3.5 x BW-kg / 200 = kcal./min.

Identify MET values using 2011 Compendium of Physical Activity
- Available online (using favorite search engine)

Exercise program design for energy expenditure and motor-unit stimulation
- Principles
- Variables

Endocrine response to exercise stimulus
- Anabolic hormones
- Catabolic hormones
    - Promote anabolism – protein synthesis using exercise program design

High Intensity Interval Training

Tabata Training

Recent research – effects of HIIT
- Schoenfeld / Gibala

Exercise program design
- Understanding physics – increase work-rate and power output
    - Change mass / change acceleration → change power output
- Resistance training
    - Manipulate volume and rest/recovery interval
- Energy system training (cardiovascular)
    - Use metabolic markers: VT_1 / VT_2
    - Interval training – adjusting intensity/volume
- Adjust intensity/volume to tweak training stimulus / recovery time (periodization)
    - Nonlinear / undulating periodization aka “muscle confusion”

Contact:

Jonathan Ross, www.AionFitness.com
Abs Revealed Products and Information:
Main site for the book: www.AbsRevealed.com
- **Book**, **iPhone app**, **video library** available: www.AbsRevealed.com/buynow.php

Presented by: Jonathan Ross, www.AionFitness.com; www.AbsRevealed.com

- Extra exercises not included in the book available on the "Deleted Scenes" page

Twitter: www.twitter.com/JonathanRossFit
Facebook: search "**Everyday Fitness with Jonathan Ross**" and "**Abs Revealed**"