

# Functional Training for Sports Performance



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# Education & Career Track

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- Mt. Tahoma HS (Tacoma, WA)
- Yakima Valley CC (AA-'86, varsity football)
- Western Washington University (BA-'90 Exercise Science, varsity football)
- '91-'97: Pacer Physical Therapy – Tacoma
- '97-'98: Olympic Physical Therapy – Kirkland
- '98-'02: Washington Institute of Sports Medicine - Kirkland
- '02-present: Co-owner ProActive SportsMed - Olympia



# Tonight's Objectives

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- Explain FUNctional training and how it relates to athletic performance enhancement
- Talk about the core or “pillar” strength's role in injury prevention
- Functional Movement Screen as an initial assessment tool
- Movement prep and exercise demonstrations
- Questions and other thoughts



# Functional Training

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- Doesn't replace a good cardiovascular program
- Is a complement to other types of resistance training
- Is key to injury prevention or "Prehab"



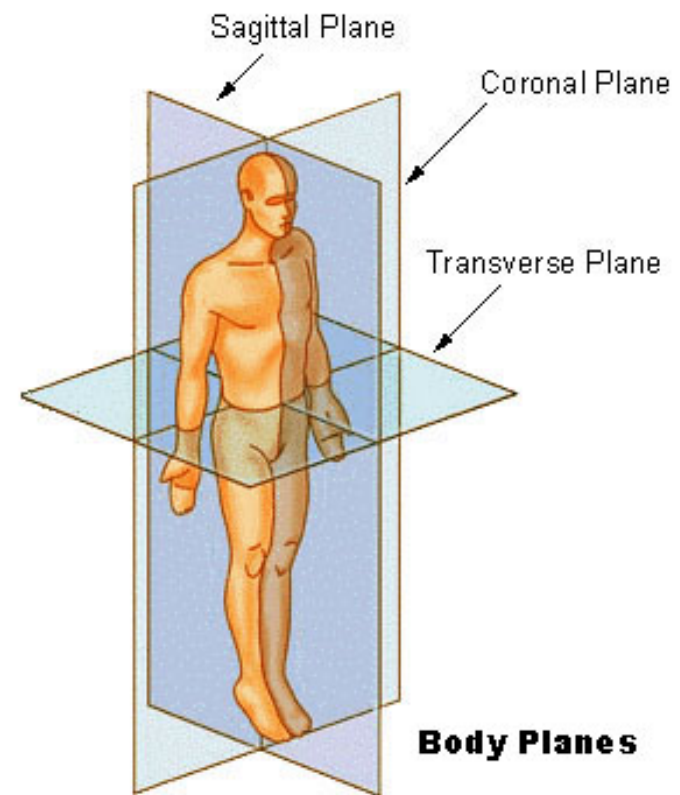
# Functional Training Defined

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- Function is, essentially purpose. Therefore Purposeful Training.
- Often occurs in a closed kinetic chain environment (foot/hand is in contact with the ground or another object)
- Training movement not muscles
- Involves multiple joints in multiple planes

# Planes of The Body

- **Frontal/Coronal Plane** – A vertical plane running from side to side; divides the body or any of its parts into anterior and posterior portions.
- **Sagittal Plane** - A vertical plane running from front to back; divides the body or any of its parts into right and left sides.
- **Transverse Plane** - A horizontal plane; divides the body or any of its parts into upper and lower parts.





# Functional Training Defined

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- \* Exercises that teach one to handle their own body weight initially and are progressed by:
  1. Adding resistance
  2. Adding an unstable surface
  3. Changing the lever arm
  4. Balancing on one leg or utilizing one arm

# Functional Training Is Not

- Machine based - applying force in a pre-guided motion while the body is supported
- Muscle Isolation Training
- Single planar or single joint

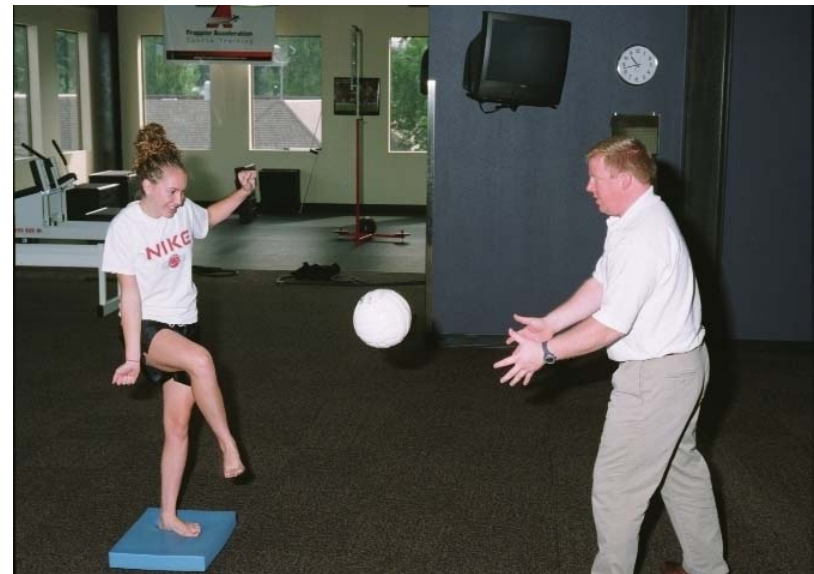




# Influenced by the Physical Therapy Profession

PT's have found that injuries usually occur:

- “Compensations” When a stabilizing muscle is inactive or weak therefore the stress was shifted to another part of the body
- Use of “functional tools” work the joint and muscle stabilizers simulating how one plays, moves, and works
- However, it's not just about the tools but the knowledge gained when using the tools in regard to why and how injuries occur





# Weaknesses Usually Found

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- Hip Stabilizers (gluteus medius, adductors, quadratus lumborum, hip external rotators)
- Lumbar Stabilizers (transverse abdominus, internal obliques)
- Scapular Stabilizers (lower traps, rhomboids)



## In Other Words... "The Core"

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- Evolving concept of trunk strength & stability
- "Pillar" a more inclusive concept, more than just the abdominals
- It is the **integration** of the hips, trunk and shoulders



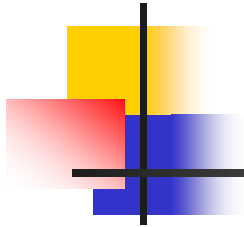
## Some other roles of the Core

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- Posture
- Balance
- Energy transfer (LB to UB & vice-versa)
- Protection (internal organs)
- Anchoring (muscle origins & insertions)

# Where do we start?

## ...Assessment Process



### Functional Movement Screen

Developed by Gray Cook, PT, OCS

- Shows us where the weaknesses are with respect to standard functional movement
- Shows limitations and asymmetries (differences between R and L sides of the body)
- Helps predict poor movement efficiency and breakdown
- Creates a feedback system for functional exercise and helps predict the potential for injury



# FMS™ as a Screening Tool

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- Mesa CC Firefighter Recruiting school
- Matt Rhea - exercise science student at ASU
- 18 recruits for 16 week academy
- Looked at fitness and FMS as an injury & performance predictor
- Found that fitness alone is a very poor predictor of injuries
- FMS 89.5% ability to predict self-reported injuries
- Fitness & FMS combined – higher ability to predict injuries and performance

**Combination is the Key!**



# Mobility, Stability & Strength

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- Must co-exist to create efficient movement
- Mobility – involves the muscle & joint and is more inclusive when describing freedom of movement (different than flexibility)
- Stability – the ability to control force or movement. Precursor to strength or neuromuscular control
- Strength – the ability to produce (concentric) or receive (eccentric) forces

# Consider Squatting

## What is required?



1. Ankle Mobility
- +  
2. Knee Stability
- +  
3. Hip Mobility
- +  
4. Lumbar Spine Stability
- +  
5. Thoracic Spine Mobility =

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Think of it in terms of building blocks that are integrated simultaneously in order for a smooth movement pattern to occur

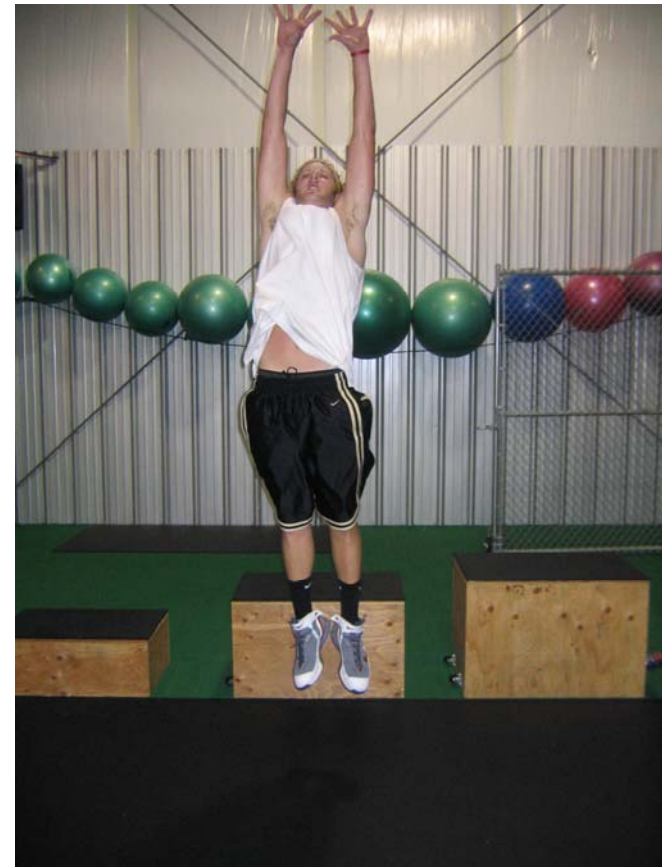


# Adding it all up

Neural Programming  
+  
Muscular Mobility/Function  
+  
Joint Mobility/Stability =

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Max Power Output  
Potential





# Self Movement Screen™

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- Simplified version of the FMS
- Gauges your ability to perform basic movement patterns
- Think of it as a filter... what do you need to catch?
- Remember it's only a screen not a medical evaluation

Consists of 5 tests graded pass, fail or no score

Pass – completion of movement pattern and all criteria are met

Fail – unable to perform the movement pattern without a compensation

No score – if the movement causes pain



## SMS... what is required?

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- Short warm-up (20 jumping jacks will do)
- Doorway 32" or 36" wide
- Masking tape
- Approx. 4 ft. long dowel

Best time perform SMS is:

1. Before strenuous activity
2. No soreness from a previous workout



# SMS™ Scoring System

	<u>Screen Score</u>	<u>Final Score</u>
<u>Assess movement by testing</u>	<u>R/L</u>	
1. Deep Squat	P	P
2. Hurdle Step	F/P	F
3. In-Line Lunge	P/P	P
4. Active Straight Leg Raise	P/P	P
5. Seated Rotation	F/P	F



# Test #1 – Deep Squat<sup>©</sup>

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**Purpose:** Tests the symmetrical movement of squatting- the left and right sides of the body do the same movement. To pass this screen you need optimal mobility at the ankles, knees, hips, and shoulders, and optimal stability throughout the spine.

**Description:** The individual starts with their feet shoulder width apart. The individual then adjusts their hands on the dowel to assume a 90 degree angle of the elbows with the dowel overhead. Next, the dowel is pressed overhead with the elbows fully extended. The individual then descends slowly into a squat position. As many as three tries are given. The squat position should be assumed with the heels on the floor, head and chest facing forward, and the dowel maximally pressed overhead. If these criteria are not met the individual fails the test.

# Deep Squat Criteria

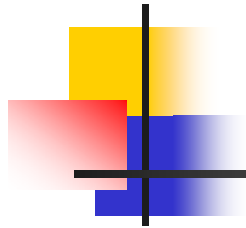
Passing Grade:

1. Upper torso is parallel with tibia or toward vertical
2. Femur is below horizontal
3. Knees are aligned over feet
4. Dowel aligned over feet



# Deep Squat

## Poor Performance Errors



1. Ankle Mobility – heels off the ground
2. Hip Mobility – tight glutes and/or hamstrings
3. Hip Stability – gluteus medius weakness (knee caving)  
intrinsic foot weakness
4. T-Spine Mobility/Core Stability – forward torso – weak core
5. Shoulder Mobility – tight lats, pec minor, lower trap, serratus anterior





## Test #2- Hurdle Step©

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**Purpose:** Examines the asymmetrical movement of stepping, the left and right sides of the body perform opposite movements. To pass this screen, you need optimal mobility of one ankle, knee, and hip while demonstrating optimal stability and balance of the other ankle, knee, and hip as well as the spine. This test is done on both right and left sides.

**Description:** First measure your tibial tuberosity by measuring from the bump below the kneecap to the floor. Fasten a piece of tape across the doorway at the height of the tibial tuberosity. The individual starts by placing their feet shoulder width apart with toes beneath the tape. The dowel is positioned across the shoulders below their neck. The individual then steps over the tape and touches the heel lightly to the floor while balancing on the stance leg. The dowel does not touch the doorway and there should be no movement above the waist. The hurdle step should be performed slowly and allow as many as three attempts on each leg.



# Hurdle Step Criteria

Passing Grade:

1. Hip, knees, and ankles aligned
2. Minimal to no movement in the lumbar spine
3. Dowel and tape are level



# Implications for the Hurdle Step

The ability to perform the hurdle step test requires:

1. Stance leg stability of the ankle, knee, and maximal close kinetic chain hip extension
2. Step leg ankle dorsiflexion and flexion of the knee and hip

Poor Performance of this test can be the result of:

1. Ankle instability – Instability, loss of balance and proprioception
2. Hip instability – knee cave, hip hike, weak core and glute medius
3. Hip Mobility – IR/ER of step leg hits the tape, tight hips and glutes



## Test #3 – In-Line Lunge©

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**Purpose** -Examines the asymmetrical movement of lunging. To pass this screen, you need optimal mobility, stability, and balance on both legs in opposing positions of hip flexion and hip extension. Lunging also requires optimal spine stability, the test is performed on both left and right sides.

**Description** – First cut a strip of tape that is the length of the your tibial tuberosity to the floor. Center the tape on the floor with the doorway marking the halfway point. Stand over the tape with the toes of the rear foot touching the back end of the tape and the heel of the front foot touching the front end of the tape. Place dowel across shoulders. Perform the test by lowering the back knee enough to touch behind the front heel. The heel of the front foot should remain flat. Your feet should be straight and on the same line throughout the lunge. Three attempts should be taken.

# In-Line Lunge Criteria

Passing Grade:

1. Minimal to no movement in torso
2. Feet remain in-line in the sagittal plane
3. Knee touches the tape behind the front heel





# In-Line Lunge Continued

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Implications-The ability to perform the In-Line Lunge test requires:

1. Stance leg - stability of the ankle, knee, and hip
2. Step leg – mobility of the ankle (dorsiflexion), knee and hip
3. Adequate balance must be maintained

Poor Performance of this test can be the result of:

1. Inadequate hip mobility of either the stance or step leg
2. The stance leg knee or ankle may not have the required stability as the lunge is performed
3. Imbalance may be present between adductor weakness and abductor tightness in one or more hips
4. Tightness of a quad muscle (rectus femoris) on the stance leg may be the cause for poor performance



# Test #4 – Active Straight Leg Raise<sup>©</sup>

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**Purpose** -Examines the asymmetrical movement of a straight leg raise. To pass this screen, you need optimal mobility of the legs and optimal core stability in a supine position. The test is performed on both left and right sides.

**Description** - The individual starts by lying on their back through the doorway. Find your mid-point between the knee and the hip and center this point next to the doorjamb. Next, lift the test leg with a dorsi-flexed ankle position and leg completely straight. During the test the opposite leg should remain in contact with the floor with no movement of the head or arms. Give a passing grade if the ankle (lateral malleolus) of the lifted leg clears the doorjamb and the floor-bound leg does not move. The Active Straight Leg Raise test can be attempted three times bilaterally.

# Active Straight Leg Raise Criteria

Passing Grade:

1. The lateral malleolus of the lifted leg clears the doorjamb
2. The floor-bound leg does not move
3. The foot of the floor-bound leg should point straight upward





# Active Straight Leg Raise Continued

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Implications - The ability to perform the test requires:

1. Functional hamstring flexibility. This is the true flexibility an individual has available during movement, as opposed to passive flexibility, which is most often assessed.
2. The individual is also required to demonstrate adequate passive hip flexor flexibility of the opposite leg as well as lower abdominal stability

Poor performance during this test can be the result of:

1. Poor functional hamstring flexibility.
2. Inadequate passive mobility of the opposite hip may be the result of hip flexor tightness associated with an anterior tilted pelvis. If this limitation is gross, true active hamstring flexibility will not be demonstrated.
3. A combination of both these factors will demonstrate an individual's relative bilateral, asymmetric hip mobility. This is similar to the relative hip mobility revealed by the Hurdle Step, however, this test is more specific to the limitations imposed by the muscles of the hamstrings and the hip flexors.





## Test #5 – Seated Rotation©

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**Purpose** -Examines the ability to rotate the upper torso left and right in a seated cross-legged position. To pass this screen, you need optimal upper-torso mobility as well as optimal hip mobility. The test is performed on the left and right sides.

**Description** – Sit upright on the floor, back straight, with legs crossed. One foot should be on each side of the doorjamb. Hold the dowel above your chest in front of your shoulders. It should touch your collarbone and the front of both shoulders at all times.



# Seated Rotation Criteria

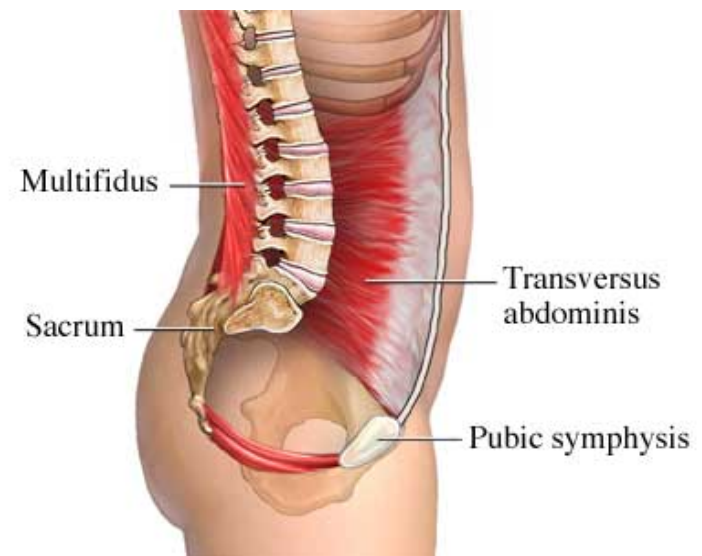
Passing Grade:

1. Dowel touches the door frame
2. Dowel remains level and in contact with the chest
3. Spine remains straight and upright



# The concept of "Drawing-in"

- '99 Australian researchers Richardson, Jull, Hodges and Hides showed that the transverse abdominus (TA) and multifidus muscles are the keys to unlocking low back pain
- They showed that the TA is the first muscle recruited when the extremities move
- These muscles along with the internal oblique serve as a natural weight belt to resist flexion of the lumbar spine





# Cues for Drawing-in

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- Belly button in towards the spine
- Slipping on tight pants
- Pulling your belly button away from your seatbelt while driving



# Progression for Drawing-in

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1. Supine with object on top of belly button
2. Prone with object pressed between belly button and floor
3. Quadruped (all fours) pulling up the internal organs against gravity
4. Kneeling (rope around waist)
5. Standing (rope around waist)



# Drawing in with Movement

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- Supine lower body deadbug (maintain pelvic neutral)
- Prone opposite arm/leg lifts
- Quadruped opposite leg lifts
- Kneeling physioball rollouts
- Standing diagonal medball/weight plate raise



# Dynamic Functional Warm Up

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- The concept of “warming up” has changed with the concept of functional training
- Many people confuse flexibility development and warm up
- Flexibility is important for long-term injury prevention
- Static flexibility work isn’t a critical part of warming up and may be counterproductive
- Static flexibility (20”-30” hold) should be done at the end of a training session, sending the message to the neuromuscular system of “cool down”



# Dynamic Functional Warm Up

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Think about warming up from a commonsense perspective and ask yourself these 3 questions...

1. Can I prepare to move by standing still for extended periods of time?
2. Should I move slowly, or not at all, to prepare myself to move quickly and powerfully?
3. Should I sit down and be motionless to prepare to be on my feet and moving?





# Dynamic Functional Warm up

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- Functional & fundamental way to get individuals to dynamically stretch muscle groups
- Encompasses multidirectional & multi-planar movement like real life!
- More emphasis on dynamic flexibility in the posterior side of the body (glutes, hamstrings, and calves) where most people need improvement
- Emphasizes “core” strength and balance
- Emphasizes foot forces (action vs. reaction)
- Emphasizes proper posture with movement

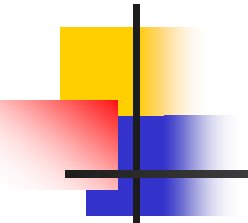
# Dynamic Functional Warm Up

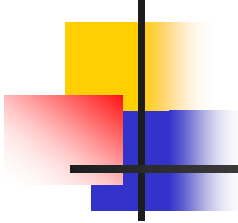
Purpose:

- Increases heart rate
- Increases blood flow to active muscle groups
- Increases neuromuscular excitability
- Increases coordination and body awareness
- Increases active flexibility
- Decreases chances for muscular imbalances
- Decreases chances for injury



# Common Key Points to Remember

- 
- Everybody is at different levels, some movements may be appropriate for some but not others
  - Modify when needed, don't force anything!
  - Listen to what your body is telling you, it will give you feedback if you listen
  - Remember there is always tomorrow so don't go beyond what you're capable of at this time



Start slowly: focus on core strength, balance, posture, foot placement, quality movement key

### **Linear Movement**

1. Leg swings (F/B & S/S)
2. Knee hug/opposite heel raise
3. Forward lunge elbow to instep
4. Inch worms (hand walks)
5. Reverse lunge with twist
6. Walking heel-up with straight leg dead lift

### **Lateral Movement**

1. Lateral lunge
2. Hurdle step over to duck under
3. Straight leg crossover stretch



# Progress Intensity Level Transfer to Speed & Power

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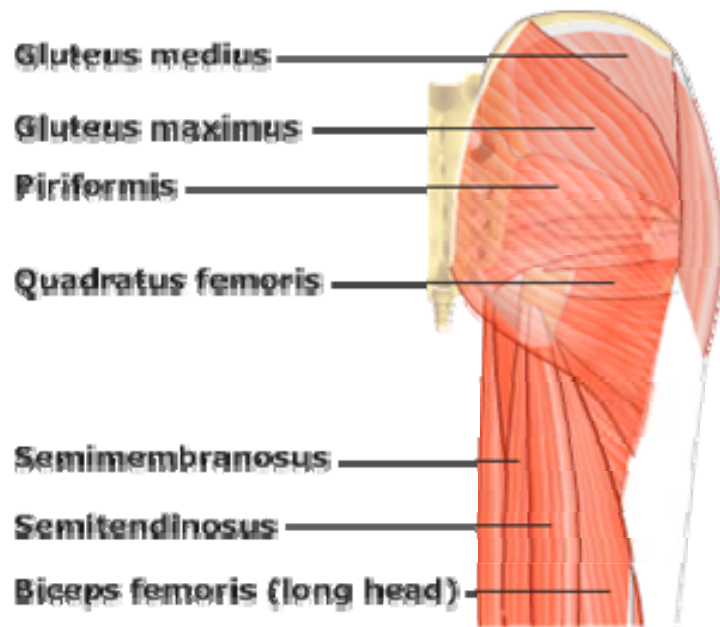
## Linear Movement

1. High knees
2. Power skip  
(fwd/back)
3. Deion Sanders  
Trot
4. Butt kickers

## Lateral Movement

1. Carioca
2. Side shuffle
3. High knees  
sideways
4. Two foot jumps  
sideways

# Functional Anatomy of the Hip



- Iliopsoas (hip flexors)
- Hip External Rotators
- Gluteus Maximus and Abductors
- Hip Adductors



# Lower Body Exercises

1. Body Weight Squats
2. Weighted Front Squat
3. Dumbbell or Barbell Deadlift
4. Theraband shuffle and monsterwalks



# Progress to Single Leg

1. Lunges (multi-directional)
2. Single Leg Bench Squat
3. Single Leg Dead Lift
4. Single Leg Bridge

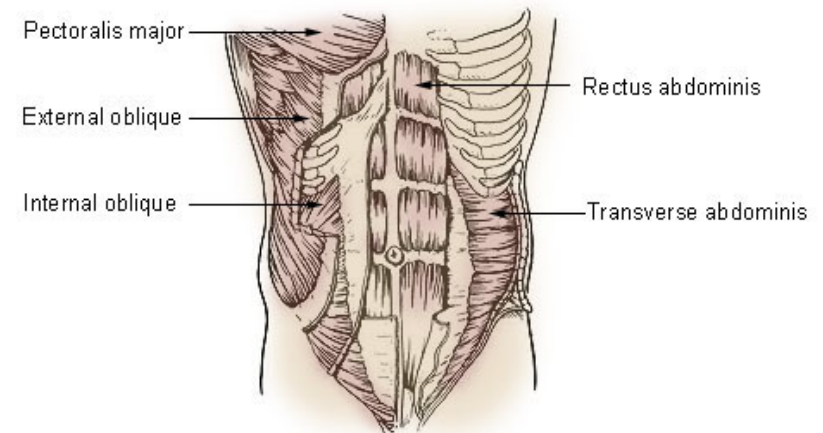




# Functional Anatomy of the Trunk

- Spinal Erectors
- Deep Spinal Muscles
- Abdominals
- Pelvic Floor

**Muscles of the Trunk**

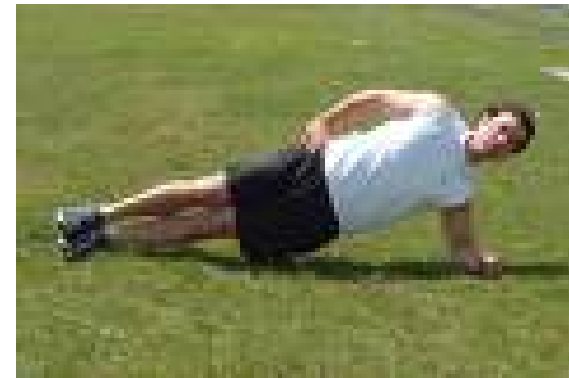




# Torso Training Favorites

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1. Prone & Sidelying Planks (reps or static hold)
2. Back Extensions
3. Physioball Opposite Arm/Leg
4. Physioball Knee Tucks/Pikes



# Don't Forget Rotation!

1. Standing Trunk Rotations
2. Supine Physioball Russian Twist
3. Three Point Lawnmower Starters
4. Quadruped Same Side Elbow to Knee Flexion/Extension





# Rotational Progressions

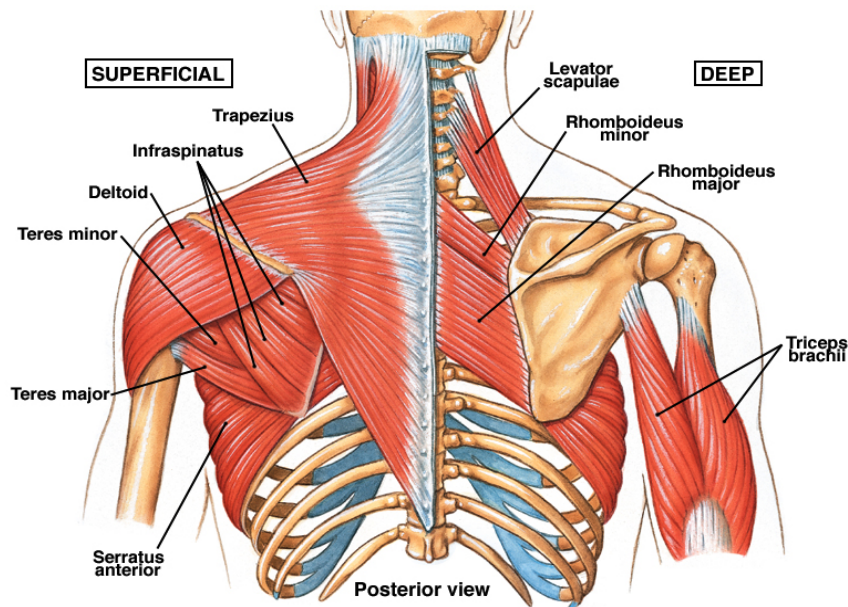
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## Medicine Ball Exercises:

1. Partner Rotations
2. Partner Tap n Toss
3. Wall Front Throw
4. Wall Side Throw
5. Lifts & Chops



# Functional Anatomy of the Shoulder



- Latissimus Dorsi via the thoracolumbar fascia
- Scapular Stabilizers (low, mid, upper traps, rhomboids)
- Serratus Anterior

# Upper Body Exercises

1. Dumbbell Y's, T's, W's
2. Barbell Inverted Rows
3. Single Arm/Leg  
Dumbbell Rows
4. PB Single Arm Chest  
Press
5. SL Dumbbell Curl Press

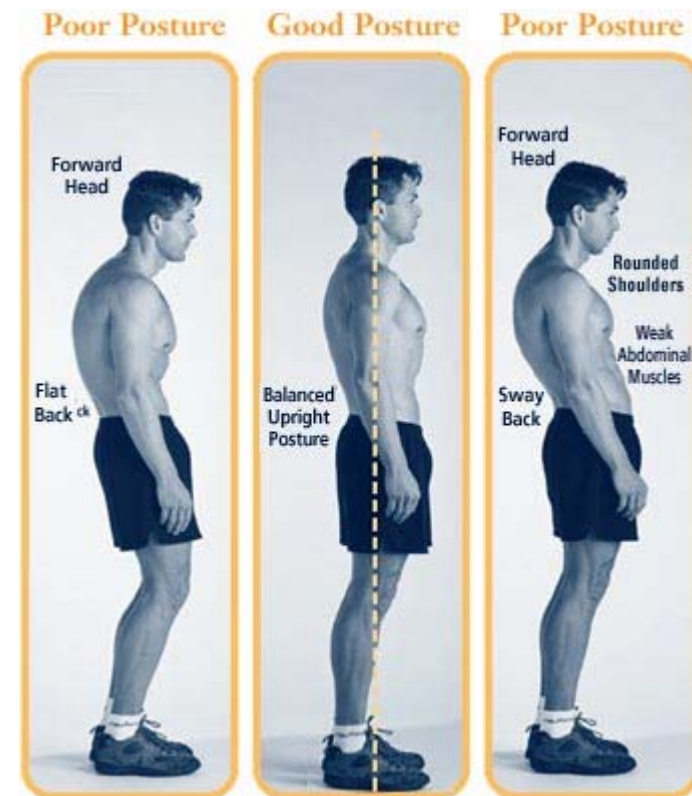


# Postural Habits

- The way the body is held or positioned has a lot to do with the way it moves
- The starting position influences the movement that is to follow
- If beginning in a suboptimal position the brain tries to make up by altering body mechanics in an attempt to correct the posture or movement

## Mother Knows Best So...

1. Stand up straight
2. Tuck in the chin
3. Hold those shoulders back
4. Draw in those abdominals





# In Summary

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## **Athletes Need to Train Functionally**

- First thing to remember “Draw In” the TA and stabilize the spine with all movement, work to subconscious effort
- Incorporate exercises involving multiple joints/muscles in multiple planes/positions simultaneously
- Emphasize working in a closed kinetic chain environment challenging mobility, stability, strength, balance and power
- Integrate the inclusive concept of “Pillar” or Core strength & stability
- Progress to single extremity exercises when able
- Don’t forget to practice good posture...your starting point will determine the movement to follow