

# ENHANCING FUNCTIONAL PERFORMANCE OF THE DEVELOPING ATHLETE

PRESENTED BY:



SPEAKERS:

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*Ron Hruska, MPA, PT*

*"Biomechanical Influences on the High School Basketball Player"*

*Ryan Watson, MPT, ATC*

*"Screening Athletes: Performance Tests & Measurements"*

*Jason Masek, PT, ATC, CSCS, PRC*

*"Functional Resistance Training"*

# BIOMECHANICAL INFLUENCES ON THE HIGH SCHOOL BASKETBALL PLAYER

RON HRUSKA, MPA, PT

Functional performance of the high school basketball player reflects functional capability of certain specific muscle and muscle groups of the back, pelvis and hip to work cooperatively in three biomechanical “planes”. The presenter will outline the muscles and patterns of muscle function that lead to strain, overuse syndromes and sprains of the ankle, knee, hip and back. Suggestions will be offered on how to avoid:

1. **Ankle sprains** by maximizing adduction and abduction activity in the frontal plane at the hips and trunk when landing.
2. **Patella-femoral pain, medial knee strain and meniscal tears** of the knee by optimizing rotational activity in the transverse plane at the hips and mid back when reaching, squatting, and passing on one “loaded” leg.
3. **Hip flexor and low back tightness** by engaging back flexors and hip extensors, activity in the sagittal plane, during passing, shooting, tipping and dribbling.

Demonstration of specific tests and performance enhancement techniques should assist the high school basketball coach, parent and trainer in minimizing the above injuries and future development of asymmetrical biomechanical “learned” patterns.

## Planes of Lumbar Pelvic Femoral (Back, Pelvic, Hip) Muscle Function

### Frontal

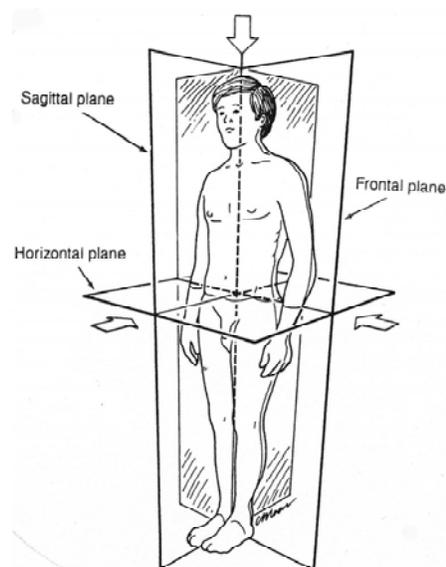
- ❖ Hip adductors (inner thigh) / abductors (outer thigh)
- ❖ Trunk side-benders (lateral abdominals / intercostals)

### Sagittal

- ❖ Hip flexors (IT band) and back extensors (paravertebrals or muscles along spine) are a “family” of muscle since they extend the back and flex the hips at the same time.
- ❖ Trunk or back flexors (abdominals) and hip extensors (glutes and hamstrings) are another “family” of muscle that flex or round out the back and extend the hip and leg when you dribble on the move, pass low, or shoot from a squatted position (free throw position).

### Transverse

- ❖ Hip rotators (glute max externally rotate leg and glute med internally rotate leg) and trunk rotators (abdominal obliques) are a “family” of muscle that depend on symmetry or neutral position of the pelvis to work correctly. Without good adductor and abductor control, trunk flexion and hip extension, and trunk sidebending capability, compensation, fatigue, and strain will occur in the high school basketball player and control at all three planes will be lost at the hips and lower extremity joints.



# PERFORMANCE TESTS & MEASUREMENTS

RYAN WATSON, MPT, ATC

## Ober Test

Patient lies on their side with knees & hips bent at 70-90°. Stand behind the patient & passively flex the upper hip & knee to 90°. Abduct & extend the hip to a neutral position while keeping knee bent. Passively stabilize the patient's hip from falling backward. Slowly allow the patient to lower their leg to the table. Repeat test on the opposite side.

**Positive test:** Indicated by a restriction that does not allow sufficient adduction (the medial side of the top knee should touch the heel of the bottom leg).



Positive



Negative

## Modified Thomas Test

Patient lies on their back with both thighs half off the table. Stand in front of the patient & flex both knees to his/her chest until back is flat. Passively lower one leg over the edge of the table. Do not allow the leg to "turn out". Hold the opposite leg close enough to the chest to maintain the low back against the table. Repeat test on the opposite leg.

**Positive test:** Indicated by an inability to rest the thigh on the table.



Positive



Negative

## Standing Reach Test



Positive



Negative

## Bilateral PRI Squat

Place your heels 7-10" from the wall. Place a 4-6" ball between knees. Keeping your back rounded, begin to squat until your bottom touches the wall. Squeeze the ball between your knees and shift to the left so that your nose is lined up over your left toes. Keeping your back rounded, bring your right arm out in front of you and keep your left arm back as you exhale. Repeat on opposite side.

**Positive Test:** Buttocks come off wall or heels come off floor or the back extends (arches) while keeping nose over toes.



## Single Leg Stance Upward Reach

Patient stands with left foot on a 2" block and both hands touching above head to keep shoulders level. Keeping both legs straight, patient lifts right foot off the ground so that right hip is higher than the left. Repeat test on the opposite side.

**Positive test:** patient bends trunk, leg comes out to the side or they are unable to keep their hands directly above their head.



## Top Four Goals: Achieve & Maintain

1. Full standing reach to floor capability (sagittal)
2. Symmetrical reach with arms on contralateral flexed hips (transverse)
3. Ability to balance on single leg with contralateral abs (frontal)
4. Ability to flex trunk without hip extension (sagittal)

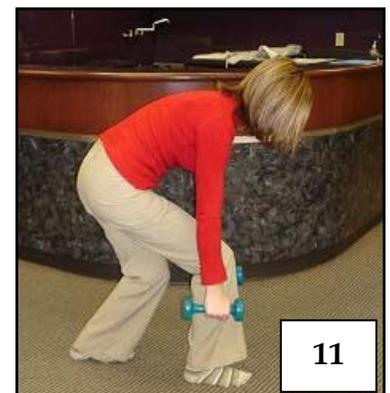
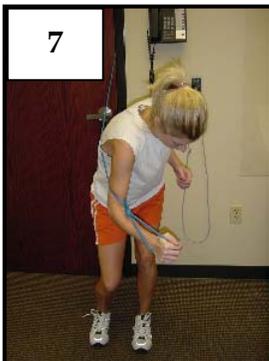
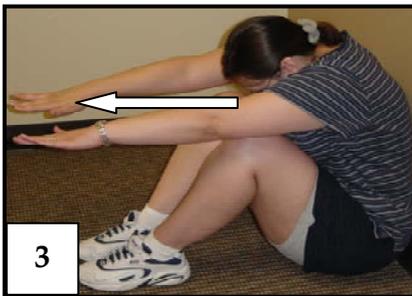
## Functional Performance Equipment

- ❖ 4-6" Ball
- ❖ Stairs
- ❖ Dumbbells
- ❖ Dowel
- ❖ 2" block or phonebook



## Active Functional Performance Tests / Drills in Sagittal & Transverse Planes

1. 90-90 Reach with Exhalation
2. Right Sidelying Apical Expansion
3. Short-Seated Reach
4. Long-Seated Press Downs with Abs
5. Standing Wall Reach
6. Retro Stairs
7. Standing Trunk Around
8. Standing Step Around
9. PRI Squat
10. Single Leg Stance Upward Reach
11. Gorilla Walk



# FUNCTIONAL TRAINING

## Integrated, Multi-Planar Movements that Involve Joint Acceleration, Stabilization & Deceleration

JASON MASEK, PT, ATC, CSCS, PRC

### Traditional Training

- Less emphasis on kinetic chain integration
- Focus upon body building techniques
- Force production
- Joint isolation & single plane movements
- Often utilizes external stabilizers (chairs, benches)

### Functional Training

- Facilitates motor learning & neuromuscular adaptations
- Force reduction (deceleration of joints)
- Multi-joint & multi planar movements
- Recruit body's stabilizers & neutralizers to facilitate movements

### Goals of Functional Training

1. Train movement patterns, not isolate muscles. "Integrate, not isolate"
2. Not to develop aesthetically pleasing muscles, but rather to help athletes better meet the demands of the specific sport. "Function is always relative"
3. Emphasis upon quality of movement over the quantity of movement.

### Multi-Planar Movement

- Functional tasks typically involve movement in three planes: sagittal, frontal, transverse
- Most exercises are performed in only one plane, the sagittal plane.
- If the hip does not extend properly in the sagittal plane, does not rotate properly in the transverse plane, or does not move in the frontal plane, the stress is transferred to the back.
- Many skills rely on lower body movements (running, multi-directional changes, throwing, batting, and kicking) that are performed entirely or predominantly from a unilateral weight-bearing phase.

### One Versus Two Legs

- The hip & knee extensors are recruited during unilateral & bilateral closed kinetic chain exercises.
- Single leg squat requires greater recruitment of the hip abductors (glutes)
- Hip abductors provide the necessary force to stabilize the pelvis in the frontal plane, preventing sagging of the pelvis toward the non-weight bearing leg.
- The contralateral leg in the double-leg squat provides this frontal plane, pelvic stabilization.