

Biomechanical Influences for the Runner

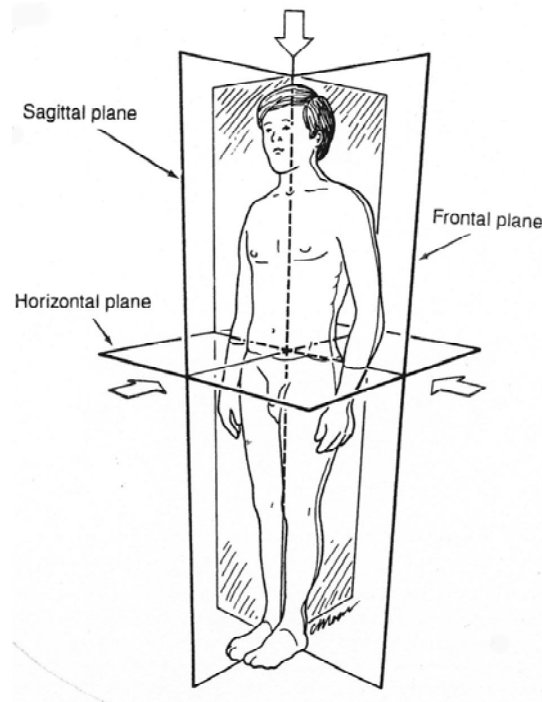
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Running requires the capability of muscles to work together in three biomechanical planes in the back, pelvis and hip. When these three planes are functional, the runner has the ability for muscles to turn "on" and "off." This allows for reciprocal alternating activity to occur in the back, pelvis, and hip. If control of all three planes is lost compensation, fatigue, strain, and injuries will occur.

Frequent Running Injuries:

- 1) Low back tightness and fatigue
- 2) Hip pain (IT band, hip pointers, hip bursitis, hip impingement and groin pain)
- 3) Knee pain
- 4) Shin splints
- 5) Ischial seat tendonitis

Planes of Back, Pelvis, and Hip Muscle Function



Sagittal

- Most common plane athletes workout in
- Hip flexors (IT band) and back extensors (paravertebrals) are a "family" of muscle that extend the back and flex the hip at the same time
- Trunk or back flexors (abdominals) and hip extensors (glutes and hamstrings) are a "family" of muscle that flex or round the back and extend the hip
- This plane is often overworked in professional and recreational runners

Frontal

- Most important plane to develop in order to restore triplanar activity in the runner
- Hip adductors (inner thigh) / hip abductors (outer thigh)
- Trunk side-benders (lateral abdominals / intercostals)

Transverse

- Hip rotators (glute max and glute med) and trunk rotators (abdominal obliques) are a "family" of muscle
- Depends on symmetry or neutral position of the pelvis to work correctly

Signs and Symptoms of Lost Triplanar Activity:

- 1) Inability to shift into the left hip
- 2) Inability to squat
- 3) Inability to touch toes from full standing or ability to place palms on the floor
- 4) Lack or excessive straight leg raise (normal 80-90 degrees)
- 5) Uneven shoulder height
- 6) Lack or excessive rotation of the hip (wear on outside border of shoes)

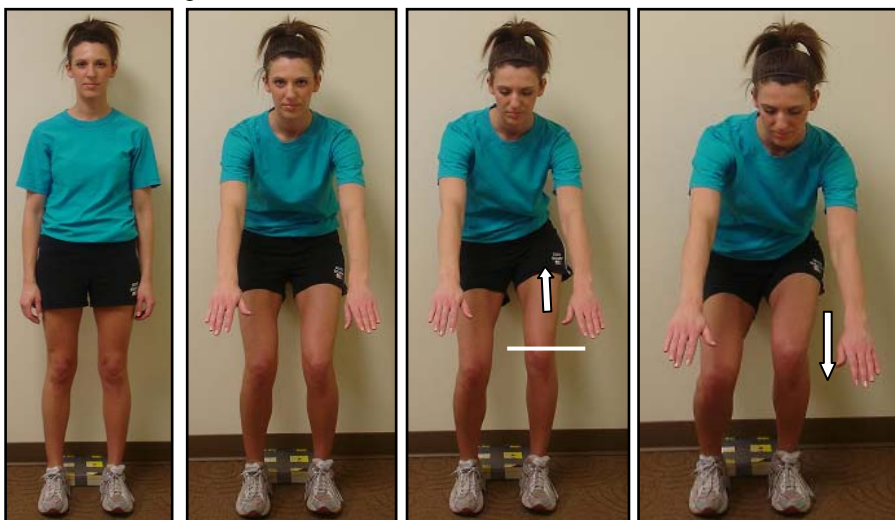
Treatment Recommendations

1) Re-set Sagittal Plane

- Emphasize exercises that keep the glutes and hamstrings working with activities that extend the hip, not the back, especially on the left side

Standing Supported Left AF IR, Bilateral Squat, Un-Resisted Wall Reach

1. Stand 7-10 inches from a wall.
2. Place your bottom on the wall and slide down by slightly bending your knees.
3. Keeping your back rounded, reach forward with both arms.
4. Shift your hips to the left so that your left knee is behind your right.
5. Keeping your hips shifted squat down by bending both knees attempting to maintain an equal amount of weight through both legs. You should feel the muscles on the front of your thighs engage.
6. Hold this position while you take 4-5 deep breaths in through your nose and out through your mouth.
7. Relax and repeat 4 more times.



Squat

1. Stand away from a wall.
2. Squat down until your knees are maximally bent.
3. Rest your hands on the tops of your knees and attempt to maintain your bodyweight through your heels not your toes. Your back should be rounded and relaxed.
4. Hold this position while you breathe in through your nose and out through your mouth.
5. Relax and move forward, place your hands on the floor, straighten your knees and then stand up.

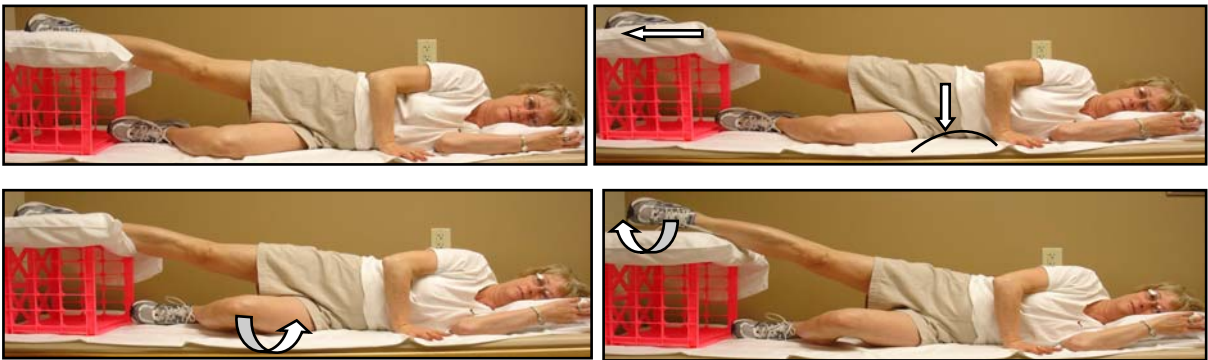


2) Strengthen Frontal Plane

- Keep left adductors and lateral abdominals with right abductors working together

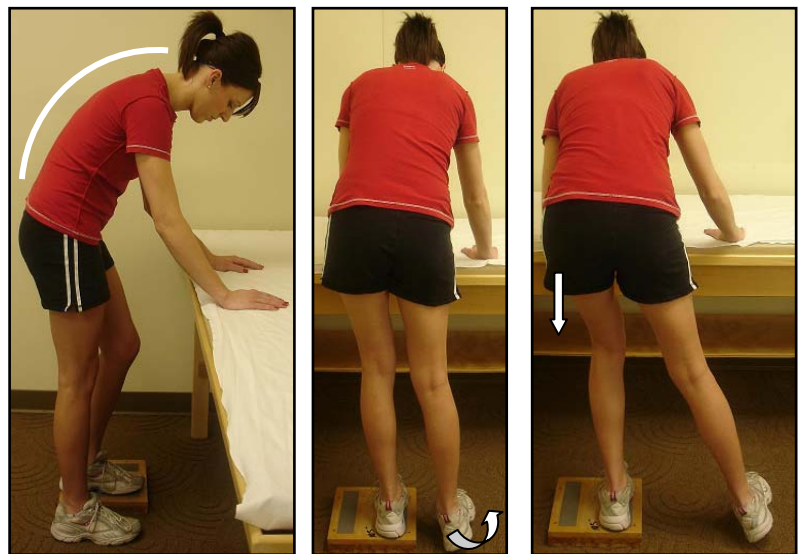
Left Sidelying Left Flexed Adduction with Right Extended Abduction and Left Abdominal Co-Activation

1. Lie on your left side and place a 2-3 inch bolster under your left abdominal wall and 1-2 pillows under your head so that your neck is slightly side bent to the right.
2. Place a crate or a stool that is about 13 inches in height under your right ankle and bend your left knee. Your right ankle hip and shoulder will be lined up.
3. Inhale through your nose and as you exhale through your mouth reach down with your right foot.
4. Push your left hip down firmly into the mat and try to arch your left abdominal wall. You should feel your left abdominal wall engage.
5. With your left abdominal wall engaged and your right leg reaching down, push the outside border of your left foot down into the mat and “turn” your left knee up. You should feel your left inner thigh engage.
6. With your left inner thigh engaged, attempt to pick your right foot off of the stool with your toes turned out to the side. You should feel your right outer hip engage.
7. Hold this position while you take 4-5 deep breaths in through your nose and out through your mouth.
8. Relax and repeat 4 more times.



Standing Supported Left Squat Lateral Dips

1. Stand against a desk or counter and place your left foot on a 2-inch block.
2. Place your hands on the surface in front of you and round your back.
3. Begin to straighten your left knee as you raise your right foot off the floor and turn your right ankle out to the side finding contact with your right shoe arch.
4. Maintaining the above position, slowly squat down by bending your left knee as you bring your right foot out to the side keeping your right foot lower than your left. You should feel the muscles on the front of your left thigh and left hip engage.
5. Hold this position while you take 4-5 deep breaths in through your nose and out through your mouth.
6. Relax and repeat 4 more times.

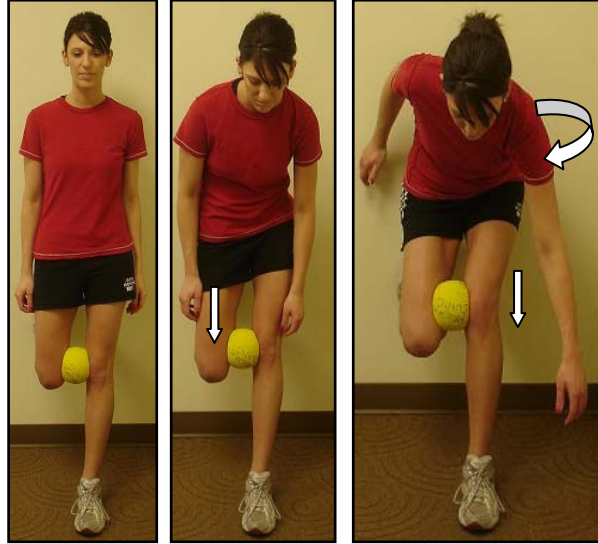


3) Perform Functional Triplanar Activity

- Work the left glute med, right glute max and left obliques along with the transverse plane if sagittal and frontal plane already exist

Standing Supported Left AF IR Squat with Right Trunk Rotation

1. Stand with your feet shoulder width apart and a ball between your knees.
2. Place your right foot on the wall behind you.
3. Shift your right knee down and sidebend your trunk to the left.
4. Maintaining the above position, begin to squat down by bending your left knee as you reach forward with your left hand and back with your right. You should feel the muscles on the front of your left thigh engage.
5. Hold this position while you take 4-5 deep breaths in through your nose and out through your mouth.
6. Relax and repeat 4 more times.



Standing Supported Right Squat in Left Hip Extension and Knee Flexion

1. Stand against a desk or counter and place your right foot on a 2-inch block.
2. Place your hands on the surface in front of you and round your back.
3. Maintaining contact with your right shoe arch, begin to straighten your right knee as you raise your left foot off the floor.
4. Keeping your left leg straight, hike your left hip up above the level of your right. Your left foot will be higher than your right.
5. Keeping your left hip hiked, bring your left thigh back and bend your left knee.
6. Maintaining the above position, squat down by bending your right knee. You should feel the muscles on the front of your right thigh engage.
7. Hold this position while you take 4-5 deep breaths in through your nose and out through your mouth.
8. Relax and repeat 4 more times.

