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Postural Restoration Institute™ Presents the New Off-Season: Balanced Regeneration

Series #2 Sagittal Plane Repositioning - Hamstring Facilitation

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Lisa Bartels

Lisa was a member of the University of Nebraska volleyball team from 1995-1997. She was introduced to the science of Postural Restoration as a patient under the care of Ron Hruska. She had suffered from long-standing injuries sustained during her collegiate volleyball career and found success with the treatment techniques she learned at the Hruska Clinic and later received from the Postural Restoration Institute. Lisa returned to practice physical therapy at the Hruska Clinic Restorative Physical Therapy Services in Lincoln, Nebraska after completing her Doctorate of Physical Therapy from the University of Nebraska Medical Center in Omaha. Lisa is a member of the American Physical Therapy Association.

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Welcome to the new off-season: Balanced Regeneration - a series of articles dedicated to creating balanced athletes participating in a side dominate sport. A side dominate sport is defined as a sport in which skills are performed utilizing a "preferred" side of the body on a repeated basis. Each issue of this publication will present a new installment that develops a progressive step-by-step plan designed to create a balanced athlete which will reduce pain and the chance of injury created by postural imbalances. The first installment of the Balanced Regeneration series discussed and explained specific performance testing that can be utilized to measure core stability and identify imbalanced athletes. The specific concept introduced was AF IR; the ability to single leg stand with contraction of the adductor and gluteus medius, a healthy triplanar skill or biomechanical strategy that is frequently lost on the left side of the body.

The Problem - Anatomy of Imbalance

If the members of an athletic team were instructed to stand shoulder to shoulder in a straight line with their arms at their sides, it would appear that the pelvis and trunk of all players was neutral, facing straight ahead. Despite appearances, the pelvis may not be in a neutral resting position in several of those athletes. Most competitive athletes that are evaluated with Postural Restoration methodology initially present with significant left side versus right side differences; differences in bony position, differences in muscle strength/function, and differences in the integrity of various joint sockets. The most common postural presentation is left pelvic torsion with compensation via the trunk and upper extremities. The most common functional strength impairment is inability to achieve left AF IR when the left leg and hip is loaded during upright activity. Unfortunately significant pain patterns can emerge if left vs. right differences become significant and the athlete continues to train and compete in this faulty position.

The Solution

Conditioning programs need to have a built in counter mechanism that significantly reduces an athlete's tendency towards left pelvic torsion. This type of integrated training prescription requires basic understanding of myokinematics. Myokinematics could be defined as the study of muscle function and force in the three cardinal planes of the body: sagittal, frontal, and transverse (Figure 1). Muscles can generate anterior rotation force or posterior rotation force in the sagittal plane, internal rotation force or external rotation force in the transverse plane, and adduction force or abduction force in the frontal plane. Most muscles function in at least two if not all three planes. The reason for this is the oblique orientation of muscles between their bony attachments. For example, in addition to flexing the hip, the tensor fascia latae muscle also internally rotates the hip. The important concept to understand is the likelihood of altered muscle function with changed bony position. The potential of a muscle to generate force across a joint in a given plane of motion depends upon its position and length. Paired muscles of the body

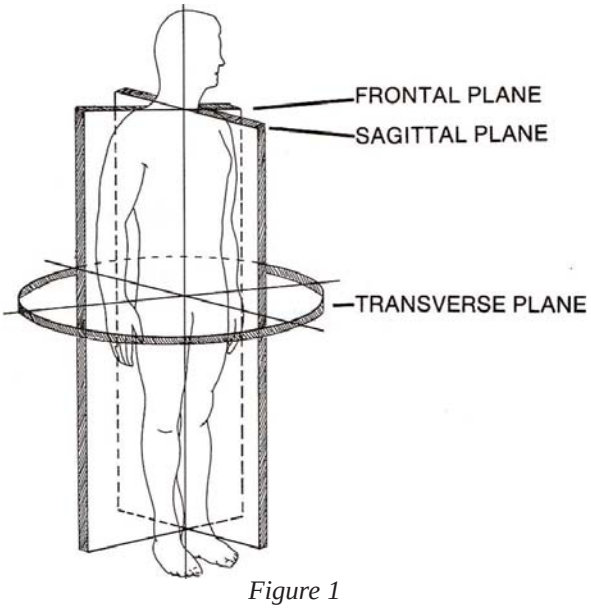

Figure 1

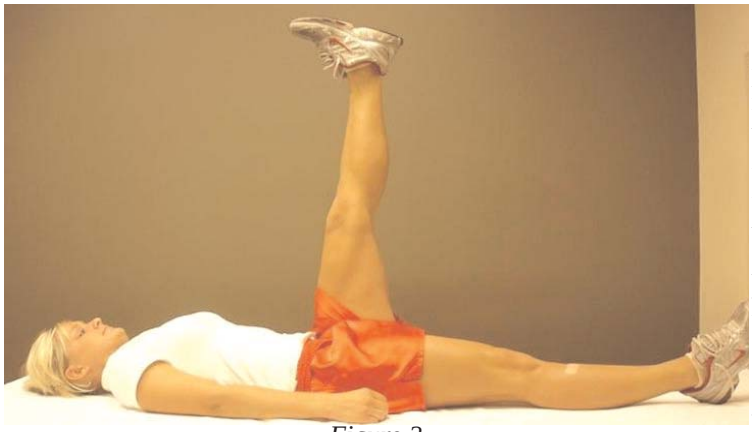

Figure 2

may have significant differences in levels of strength, tone and endurance relative to one another if bony position has altered the position and length of one of them. In the case of left pelvic torsion, the left hemi-pelvis has become stuck anteriorly in the sagittal plane, externally in the transverse plane, and abducted in the frontal plane. Lumbo-pelvic musculature such as the hamstrings, gluteals, and adductors lose their optimal mechanical advantage to correctly function. The solution is to turn on muscles that generate posterior rotation force, internal rotation force and adduction force on the left hemi pelvis. So, which muscles and which plane of motion do we go after first?

The initial training focus should emphasize posterior pelvic rotation, i.e. sagittal repositioning via hamstring facilitation. You will automatically begin to influence other key muscle groups in other planes of motion as you recruit the hamstrings. Most people don't think of the hamstrings as "core stabilizing muscles", but actually they are the longest and could be argued the most influential core stability muscles we have. What is ironic about that statement is so many athletes are always trying to keep these muscles stretched out. On the contrary, they need to be short and tight enough to be able to oppose or counteract all the muscles that have anterior rotation force/leverage on the pelvis, such as the back extensors and hip flexors, which tend to be very strong on most athletes. They also need to be short and tight enough to oppose excessive anterior translation force of the tibia (lower leg) during jumping activities, which has huge implications for ACL integrity. Optimal hamstring length for athletes is 90 degrees of straight leg raise when the pelvis is in a neutral position (Figure 2).

The hamstring muscle group is comprised of three separate muscles: biceps femoris, semitendinosus, and semimembranosus, all attaching proximally to the ischial tuberosity (Figure 3). The bones we sit on are the ischial tuberosities. The biceps femoris is positioned outside or laterally which allows this muscle to assist in hip external rotation in the transverse plane. The semitendinosus and semimembranosus are positioned inside or medially which allow these muscles to assist in hip internal rotation in the transverse plane. All three of the hamstring muscles work together to extend the hip and flex the knee during gait.

The Postural Restoration Institute™ has developed numerous activities that incorporate the hamstring group. There are two techniques in particular that emphasize hamstring recruitment. Of those, Prone Adduction Alternating Reciprocal Hamstring Curls is probably the best hamstring facilitation technique. It requires some set up time and equipment, but it is worth it (Figure 4). The pillows keep the lumbar spine passively flexed so the back extensors can not be recruited as easily. The ankle weights provide some resistance but primarily function to keep the Theraband loop at the ankles. You should start with 1-2 lbs and go no higher than 5 lbs. The Theraband loop is the integral piece that facilitates correct concentric hamstring contraction. This resistance method is similar to Nautilus weight training technology. Because the loop is attached to both ankles, the resistance actually increases as knee flexion increases, and the leg that remains extended must contract the knee extensors simultaneously. You don't have to tell your athletes to do this, it will just happen because of feed forward activation. You can not get the same effect with a traditional hamstring curl machine. Make sure your athletes perform this activity slowly. The pelvis can not move. Instruct them to keep their tailbone tucked as they pull the ankle up. The ankle should be pulled up as high as possible without moving the pelvis and then held for approximately 15-20 seconds on the left, 5 seconds on the right. If you see the low back extend or the rear end move up, they are cheating and you probably need to decrease the resistance. Most athletes will initially perceive a significant difference in strength, with the left hamstring being weaker. I would recommend utilizing this activity 3-4x/week for 6-8 weeks, increasing the loop resistance as appropriate, and then decrease the frequency to 1-2x/week for maintenance. Information regarding the specific Theraband loops the Postural Restoration Institute™ uses is provided on their website. Many athletes will need to start with the red loop, the lowest resistance. You can try and make the loop yourself from a roll of Theraband, but it is very difficult to maintain consistency in resistance.

A second training strategy for the hamstrings is 90-90 Hip Lift with Hemibridge (Figure 5). This is a more convenient exercise to perform if time is short, but not as effective as the Prone Adduction Alternating Reciprocal Hamstring Curls. In the 90-90 position the athlete digs down via the heels as they rotate the pelvis posteriorly. This activity reproduces correct hamstring function during heel strike phase of gait. Once in the pelvic tilt position, the right foot is lifted off the wall. The left hamstring, via the left heel pull down, holds the pelvis up off the surface the athlete is lying on. The low back must stay flat. If an athlete can not strongly perceive their hamstrings or they have a difficult time disengaging the back muscles or hip flexors, utilize the Prone Adduction Alternating Reciprocal Hamstring Curls solely for several days before re-attempting the 90-90 Hip Lift with Hemibridge.

Once appropriate hamstring position and function is achieved utilizing supine (back lying) and prone (stomach lying) activities, the athlete can attempt adductor retraining techniques. Most athletes will quickly learn how to perceive and engage the adductors, but the hamstring training needs to continue regularly for several weeks to allow for muscle development, neuromotor learning, and progression to upright dynamic activity. Biomechanical reasoning for adductor facilitation and adductor exercise prescription will be the topics of discussion in the third article installment. **O**

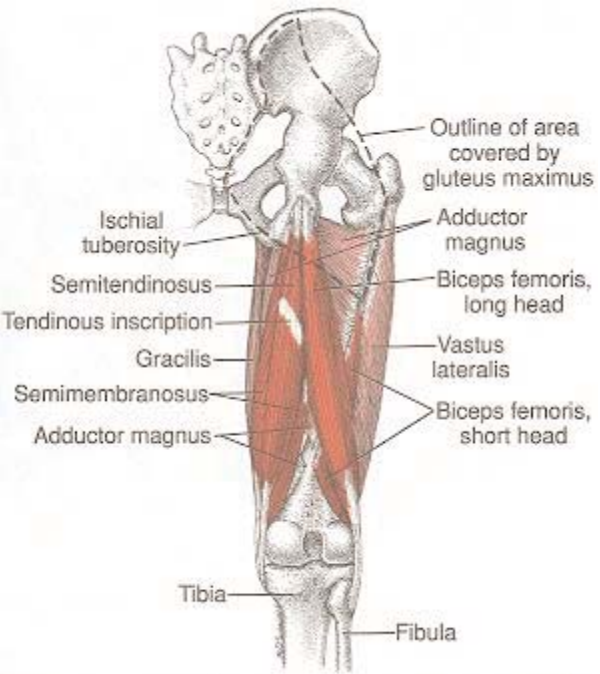

Figure 3

Figure 3 credit: Myofascial pain and dysfunction, the trigger point manual, the lower extremities, Volume 2, Travell and Simons, 1992, by permission of the publisher Williams & Wilkins.

Please note that techniques provided in Figures 4 and 5 are only examples of the many non-manual Postural Restoration Institute™ techniques that could be considered appropriate for addressing the underlying biomechanical deficit described. For more information and references, please visit www.posturalrestoration.com.

More Information Please! Contact Lisa @ lbartels@lovemyback.com

Prone Adduction Alternating Reciprocal Hamstring Curls

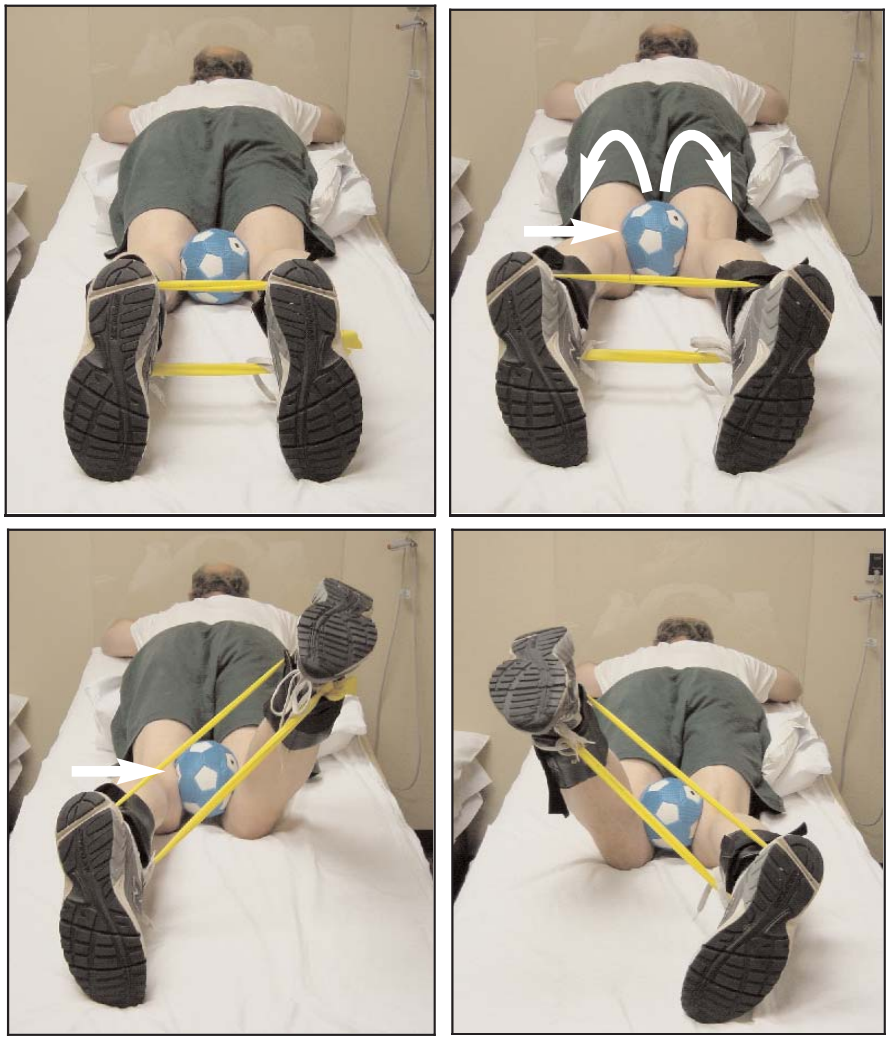

Figure 4

1. Place 3 to 5lb ankle weights on each ankle. Place a band around ankles, below the ankle weights.
2. Lie on your stomach with pillows placed underneath you.
3. Place a 5-inch ball between your knees and squeeze your left knee into the ball.
4. Pull back your right ankle towards the outside of your right hip. Your left leg should remain on the mat with your left knee squeezing into the ball. You should feel your right outside hip engage.
5. Hold this position while you take 4-5 deep breaths in through your nose and out through your mouth.
6. Slowly lower your right leg as you simultaneously pull back your ankle towards your left outside hip. You should feel your left outside hip engage.
7. Hold this position while you take 4-5 deep breaths in through your nose and out through your mouth.
8. Continue this sequence until you have completed 5 reps on each leg holding each position for 4-5 breaths in and out.

90-90 Hip Lift with Hemibridge

Figure 5

1. Lie on your back with your feet flat on a wall and your knees and hips bent at a 90-degree angle.
2. Inhale through your nose and exhale through your mouth performing a pelvic tilt so that your tailbone is raised slightly off the mat. Keep your back flat on the mat.
3. Maintain your hip lift with your left leg on the wall and straighten your right leg.
4. Slowly take your straight right leg on and off the wall as you breathe in through your nose and out through your mouth. You should feel the muscles behind your left thigh engage.
5. Perform 3 sets of 10 repetitions, 1-2 times a day.