PERFORMANCE VOLLEYBALL CONDITIONING
A NEWSLETTER DEDICATED TO IMPROVING VOLLEYBALL PLAYERS
www.performancecondition.com/volleyball

Postural Restoration Institute® Presents the New Off-Season: Balanced Regeneration Series #6 - Integrating AF IR and AF ER into Single Leg Dynamic Training

Lisa Bartels, Omaha Sports Center, Omaha, NE

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.


Lisa Bartels

BEG INT ADV

Welcome to part 6 of the new off season: Balanced Regeneration; a series of articles dedicated to promoting healthy/functional athletes who participate in a side dominant sport. A side dominant sport is defined as a sport in which skills are performed utilizing a preferred side of the body on a repeated basis. Athletes can easily become imbalanced because of these repetitive and asymmetric sport demands. Each issue of this publication has presented a new installment that serves 2 purposes; first it introduces various Postural Restoration and biomechanical concepts that build upon each other to help the reader understand the reasoning for specific muscle training emphasis; second it provides a progressive step by step plan in writing and carrying out a conditioning program that integrates Postural Restoration Institute® (PRI) methodology.

The first article explained specific performance testing used to identify imbalanced athletes and introduced the concept of AF IR. The second article initiated step 1 in the Balanced Regeneration Program; correct hamstring facilitation. The third article initiated step 2 in the Balanced Regeneration Program; facilitation of the left ischio-condylar adductor. The fourth article initiated step 3 in the program; facilitation of the left gluteus medius. The fifth article introduced the concept of AF ER and initiated step 4 in the program; right gluteus maximus facilitation. These 5 article installments have laid the groundwork to prepare athletes for progression to upright dynamic single leg training that will carryover and reproduce the demands of their sport. The biomechanical purpose of this article is to build upon the previous gait discussions and introduce the concept of paired muscular chains. The conditioning purpose is to describe and introduce single leg training activities.

Net Link: to see the five articles that precede in establishing postural restoration click **HERE**.

The Problem-Anatomy of Imbalance

The science of PRI is built around understanding both pathological and optimal patterns of tri-planar muscle integration and organization during upright functional activity, whether that activity be walking or various sports activities. Most competitive athletes that are evaluated with PRI methodology initially present with significant left side versus right side differences; differences in bony position, differences is muscle length/strength/function, and differences in the integrity of various joint sockets. The reasons for this are many, but mainly have to do with asymmetry in the right and left muscular chains of the thorax. These muscle

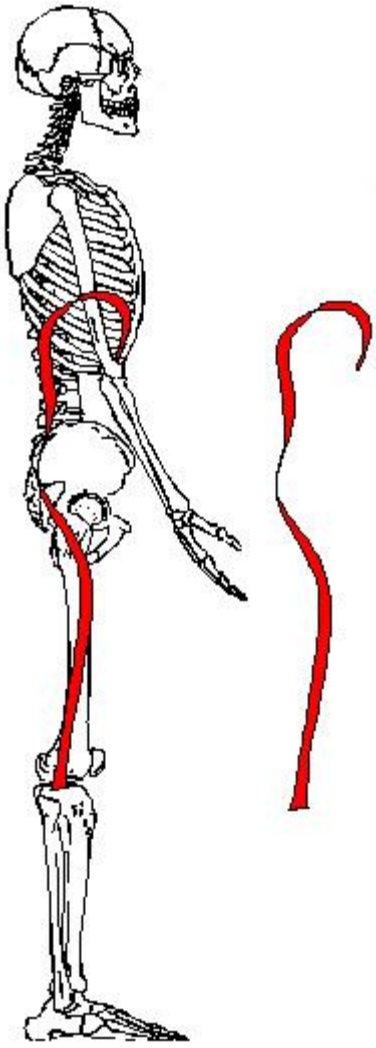

Figure 1

chains are polyarticular in nature and are composed of several muscles functioning as a unit. The bony attachments of the adjacent muscles in this chain are extensively intertwined, thus the position, length tension, and tone in one muscle strongly influences the function of the other. The Postural Restoration Institute® describes two anterior interior polyarticular muscular chains (AICs) in the thoraco-abdominal-pelvic cavity comprised of the psoas and diaphragm (Figure 1). There are also two posterior exterior muscular chains (PECs) overlying the ribcage and spine comprised of the quadratus lumborum and erector spinae, but for simplicity sake this article will focus on the AIC chains. These four tracts of muscles provide the support and anchor for trunk counter force and trunk rotation to enable upright dynamic activity. During gait the pelvis, spine, ribcage, and extremities should be rotating reciprocally. At the same time the four core chains should also be functioning reciprocally, turning off and on in terms of neuromuscular facilitation depending on the phase of gait. Right sided dominance and repetitive right extremity use can cause these chains of muscle to become imbalanced so that some are working too much and others not enough. Specifically the Left AIC chain and the Right PEC chain become overactive and tonic while the Right AIC chain becomes underactive. The result overtime as these chains become more imbalanced is acquired forward rotation/tipping of the left hemipelvis which directs or orients the sacrum and spine to the right. The center of gravity automatically shifts over to the right hip. Core stability is compromised and the athlete now must compensate in one or more areas of the trunk and upper extremities to remain balanced over the unlevel pelvis.

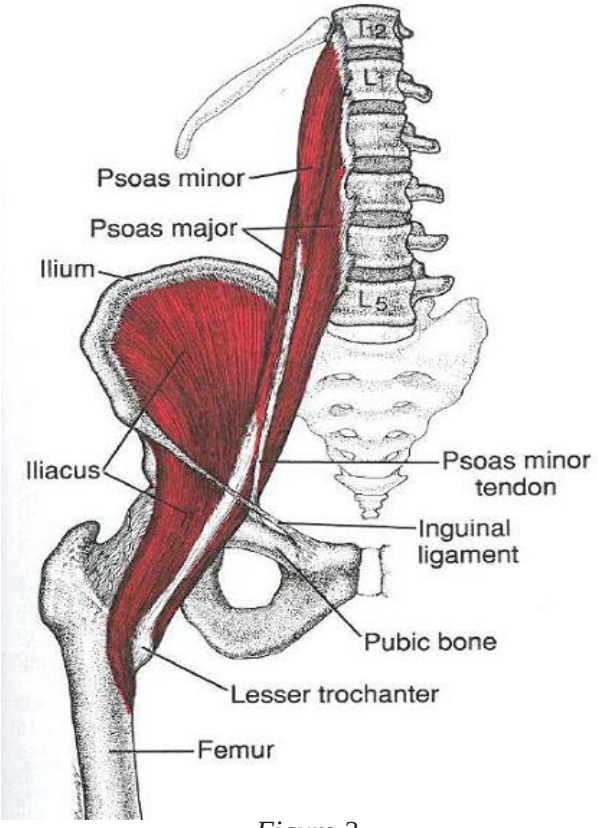

Figure 2

For simplicity sake and the purpose of this discussion you could equate the AIC chains with the psoas muscles. The psoas is a very powerful hip flexor that functions to advance the leg forward during swing in preparation for the next step, and to lift the leg to allow for toe clearance during swing. In addition to hip flexion, because of its proximal attachments to the lumbar spine, the psoas has the mechanical advantage to rotate the sacrum and spine the opposite direction (Figure 2). The left psoas rotates the spine to the right. The right psoas rotates the spine to the left. So, why is the left psoas, the AIC chain, so frequently overactive in athletes? To answer this question we need to relook at the AF IR and AF ER concepts that were previously introduced.

At right heel contact, a time of double limb support begins as does a move into right AF IR. During AF IR the sacrum and lower trunk/spine orients/turns toward the stance leg or same side, so during early right stance the spine turns right (Figure 3). As the right hemi-pelvis and femur achieve an increasing amount of AF IR, the time of double limb support ends as the left leg toes off and the left psoas turns on to prepare for advancing the leg forward during swing. Active right AF IR motion continues until roughly right midstance where the right hemi-pelvis is in a maximum amount of AF IR position (Figure 4). After right midstance the pelvis and femur reverse their direction and begin to externally rotate or AF ER because of right glute max facilitation. This includes the sacrum and lower spine which now rotate away from the stance leg. At the same time the right glute max is active from midstance to right heel off (AF ER), the left psoas is active to advance the left swing leg (Figure 5). Both the left psoas and the right glute max exert rotation torque on the sacrum and spine, but the applied torque is in opposite directions. The Left AIC/psoas exerts right spine rotation torque while the right glut max exerts left spine rotation torque. This is healthy muscle co-activity. These two muscle forces are supposed to oppose each other to prevent excessive rotation via the spine. Unfortunately in many athletes, the strong tendency to stand on the right leg coupled with asymmetric sports demands can create ineffective push off ability on the right leg. The Left AIC/psoas chain continues to function unopposed as the right glute max becomes adaptively weaker. The result is an acquired position of left pelvic torsion and the lost ability to perform active AF IR on the left and active AF ER on the right.

Figure 3

Figure 4

Figure 5

The Solution

Conditioning programs need to have a built in counter mechanism that significantly reduces an athlete's tendency towards left pelvic torsion. The first 4 steps in the balanced regeneration program lay the ground work in preparing athletes for progression to upright dynamic single leg activity. The side lying, back lying, prone lying positional exercises serve two purposes; first they restore optimal resting position of the pelvis, and second they introduce correct muscle facilitation for AF IR and AF ER without anti-gravity demands. Now you want to begin utilizing intense static single leg activity with resistance and perturbation in multiple planes. It is the single leg squatting activities that build strength and proprioceptive awareness needed to carry over and reproduce the demands of the athlete's sport. The Postural Restoration Institute® has developed numerous single leg activities that incorporate AF IR and AF ER motions. For reasons previously discussed you will want to emphasize maintaining a position of AFIR during left single leg activity, and a position of AF ER during right single leg activity. There are 4-5 exercises I utilize frequently with my higher level athletes that integrate conveniently into a weight room setting. This is ideal because strength coaches can then superset single leg PRI activities with traditional lower body lifts. Following is a description of two of those activities.

Figure 6

The first activity I would suggest is a Left Single Leg Squat with Right Lateral Dip (Figure 6). This activity is basically a progression of the Retro Stairs activity that was presented in article 4. The athlete can be standing on stairs, a 4-6 inch box, or a squatting platform. The athlete positions themselves sideways with the left foot on the step and staggered behind the right. They will need upper extremity support but don't let them lean via their arms. The first step is to shift into left AF IR by pulling the thigh/knee straight back. The zipper/seam, knee, and foot should align vertically. The left quads will engage but the athlete should strongly feel the left inner thigh with the left outer hip. Without losing the left AF IR position cue the athlete to barely lift the right foot off the ground. Instruct the athlete to abduct the right hip by dragging the right foot along the floor until the foot clears the floor. The right knee will naturally extend. At this point the athlete should perceive both right and left lateral/posterior hips engaging in addition to the left quad and left inner thigh. Initially just holding this position will be very challenging, but later you can progress your athlete by removing upper extremity support, placing a resistance band around the ankles, and/or adding stove pipe squats. You could have your athletes reverse the activity and perform on the right, but don't have them do many. The majority of them will perceive a significant difference in strength ability, with the left side more difficult.

Figure 7

The second activity I would suggest is a Right Single Leg Squat with Left Hip Approximation and Left Knee Flexion. Have your athlete begin by standing with 90% of their weight on the left side with the right knee very bent and the right foot on a 4-6 inch step or box or they can be standing on a squatting platform. Instruct them to pull or hike the left hip straight up as the right knee straightens and their weight shifts to the right. At this point the left foot should be off the ground and higher than the right foot, and they should technically feel the left inner thigh because they just performed open chain left AF IR. At the same time they are in right AF ER single leg support, therefore if they keep the left hip hiked the right glute max should engage. They may feel some right quad working which is fine, but make sure they have not locked the right knee. If you tell them to push gently through the right heel as they keep the left hip hiked, the right glute max will engage. To increase right glut max facilitation have the athlete extend the left hip and flex the left knee without losing the left hip hike. The final step is to add a squat which will further increase the right glute max activity. Have the athlete push through the right heel and pull the right knee forward into more flexion or bend. The pelvis and trunk position should not have changed. Have them hold the position for 20-30 seconds making sure they don't lose the left hip hike. Initially just holding this position will be very challenging, but later you can progress your athletes by removing upper extremity support, placing a resistance band around the knees, and/or adding stove pipe squats.

Article 7 will serve to provide readers with an actual week by week Balanced Regeneration program that will specifically direct and explain which exercises to be performed first or last and when new exercises should be added, and how to integrate with agility, plyometric, or power lifting activities. O

Figure 1 credit: Postural Restoration Institute®

Figure 2 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.
Figure 3, 4 & 5 credit: **http://me.queensu.ca/people/deluzio/GaitAnalysis.php**
Figure 6 & 7 credit: Postural Restoration Institute®

Please note that techniques provided in Figures 6 and 7 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****.*

Contact Lisa at **lisabartels@earthlink.net**