

Functional Integrity of the Pelvis, and the Use of Hip External and Internal Rotators in Preventing Spine Related Injuries

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Low back pain affects a large percentage (80%+) of the population in the United States today.

Although this number may not be as high in athletic populations, the problem still exists and may be the cause of poor performance and/or injury. Sports such as ice hockey (biomechanics of the hockey stride, forward lean, flexed spine), tennis (bent over body position) and racecar driving (fixed seated position) may place a tremendous demand on the lower back and the abdominal complex. Much of the current research has been done in effective protocols in strengthening core musculature (deep transverse abdominus, internal/external oblique, rectus abdominus) in order to attain postural stability of the pelvis and prevent lower quadrant injuries through stabilization of the spine. However, hip musculature (i.e. hip external/internal rotators) may also aid in prevention of lumbar/thoracic spine injuries, sacroiliac joint stress and provide an increase in stability for the pelvic girdle. These muscles are of importance to all populations in attaining postural efficiency and preventing sports/activity related injury.

Hip Musculature

The hip muscles are of vital importance in transferring ground reaction forces from the legs to the trunk during functional activity. They also provide a stable base of support to the pelvis and spine. During activities such as ice hockey and tennis, these muscles are activated prior to any change of direction and/or lateral mobility/agility. If these muscles are tight and/or weak (decrease range of motion/ROM)

performance may be compromised and injury may result. Furthermore, this may lead to postural deficiencies that may affect the lumbar spine, SI joint, and create a situation where an athlete may be prone to injury in future sporting events. These muscles are also important to racecar drivers as strong hip rotators may correct postural deficiencies (anteverted pelvis, retroverted pelvis), which may place unneeded stress to the lumbar spine (Regan, 2000). Please view Table 1.0 for a comprehensive list of External and Internal Rotators of the Hip.

<u>External Rotators</u>	<u>Internal Rotators</u>
Psoas Major	Gluteus minimus
Iliacus	Gluteus Medius (anterior)
Sartorius	Tensor fasciae latae
Gluteus Maximus	Adductor longus
Piriformis	Semimembranosus
Quadratus femoris	Semitendinosus
Gemellus superior and inferior	
Obturator externus and internus	
Gluteus medius (posterior)	

Table 1.0

Hip Related Postural Problems

As mentioned in the above text, lumbo pelvic posture may be affected with tight and/or weak hip rotators. If the athlete/client experiences tight hip external rotators, pelvic positioning may be altered. This tightness may cause the pelvis to retrovert (posterior tilt) due to the insertion into sacrum, and the thoracolumbar fascia, which may further affect the positioning of the lumbar spine. Due to this posterior pelvic tilt, the lumbar spine takes on a flexed disposition, which is commonly referred to as

“flat back”. This affects the curvature of the lumbar spine (flattens back and decreases lordotic curvature of the lumbar spine). This postural distortion may place unwanted stress to the low back and cause future trauma to the lumbar region. This may be the cause of bulging and/or herniated disks (Regan, 2000).

In contrast, tight hip internal rotators may cause an anteverted pelvis (anteriorly tilted pelvis), which increases the lordotic curvature of the spine placing stress on this area. Injuries may occur to athletes via stress to the pars interarticularis and facet joints (Regan, 2000). Both of these compensatory factors affect the integrity of the lumbar spine. Tight hip rotators may pose to be problematic to athletes in sports such as hockey, tennis and auto racing. When the hip rotators are tight, the athlete many times compensates with rotation of the lumbar spine. The lumbar spine is composed of five vertebrae which increase in size superior to inferior. This area is built more for stability versus mobility as excessive rotation to this area may cause injury during athletic performance. Please view Table 2.0 for a look at the healthy spine.

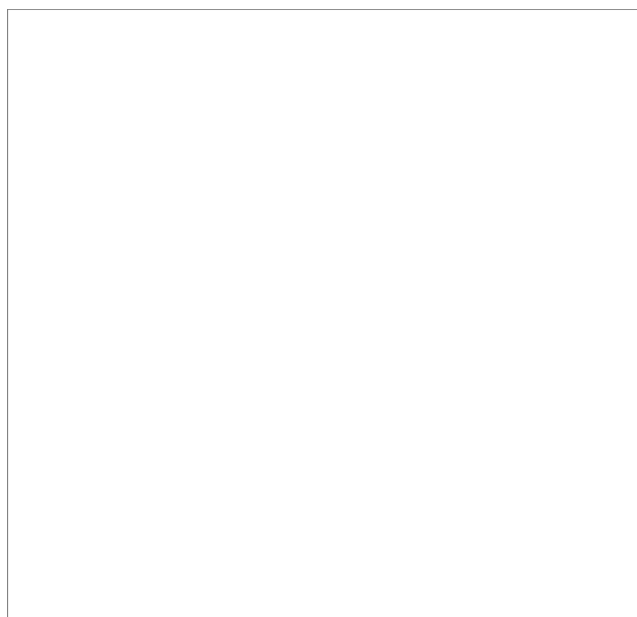


Photo courtesy of <http://www.spineuniverse.com>

Table 2.0 The Healthy Spine

Possible Solutions

A thorough evaluation should be performed on each athlete to assess hip ROM, which may include: a pelvic posture examination (looking for anteverted and/or retroverted pelvis), ROM tests (Hip internal rotation 45-65 degrees, External rotation 30-45 degrees recommended), strength tests, and an analysis of the athlete's movement patterns (Regan, 2000). It is very important to have a thorough understanding of these postural compensations, as a corrective exercise protocol is in order to fix these problems. Short/tight muscles need to be stretched, and the weak functional antagonist needs to be strengthened.

Not every athlete is the same so it is of utmost importance to analyze the athletes' movement pattern. During most daily activity and sporting events, the hip functions as part of a closed-kinetic chain so weight bearing activities/movement patterns are addressed using ground based exercise protocol. For example, a hockey player may need to address protocol to correct an anteverted (anteriorly tilted) pelvis due to tight overworked hip internal rotators (hockey players frequently overuse adductor musculature and skate in a crouched, flexed position which puts pressure on the lumbar spine). Movement analysis needs to focus on hockey specific movement patterns, not isolating the hip musculature in order to provide a well-structured corrective program. Exercises such as stretching the adductor complex while using a slide board (therapy setting, and off-season) to strengthen external rotators will aid in recovery and performance gains.

Not all sports are closed chain in nature. Racecar drivers sit in a fixed position and place tremendous pressure on the entire spine. Movement patterns need to be addressed for these individuals as well. During a Champ Car race, drivers may sustain 4-5 lateral G's in turns and between 0.7 and 1.5 G's while accelerating and braking. A force of 4-5 G's is similar to having a 40-50lb weight attached to one's head. These are tremendous demands placed upon the body in a confined cockpit. Having

adequate core stability, strength coupled with strong hip rotators can aid in performance. In this case a different protocol may exist to strengthen these muscles and ensure the functional integrity of the pelvis and lumbar spine. Both ground based and machine based (open chain) exercises may be addressed.

Having strong, flexible hip rotators can allow for optimum performance and decrease the strain/pressure placed on other regions of the body (lumbar spine, thoracic spine, and SI joint). This will allow movement patterns to occur more efficiently increasing performance standards and ensuring the integrity of the athletes' health in regards to preventing sports related injury.

References:

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