The Examination Model of Regional Interdependence of the Spine and Hip

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• The theory of regional interdependence is that seemingly unrelated impairments in remote anatomical regions of the body may contribute to and be associated with a patient’s primary report of symptoms.
• The clinical implication of this premise is that interventions directed at one region of the body will often have effects at remote and seeming unrelated areas.


• Examination of proximal and distal joints in the same region of the reported pain and dysfunction is vital to the concept of regional interdependence.
• It is important to remember, that regional interdependence is different than referred pain.
• The regional interdependence model focuses primarily on impairments present in proximal or distal segments and is distinct from the phenomenon of referred pain.

• There are numerous examples in the literature of the concept of regional interdependence being a viable option for PT examination and intervention planning.

• Regional Interdependence, Tyler Shultz
  • http://www.physio-pedia.com/Regional_Interdependence#cite_note-Reg-1

• When the foot hits the ground everything changes

• In the lower quadrants, literature demonstrates that the feet affect the proximal kinetic chain.

  • Barton et al. Sports Med. 2010
  • McPoil et al. JAPMA. 2011


• The objective of this clinical commentary is to discuss the potential link between hip impairments and LBP using current best evidence and the concept of regional interdependence as tools to guide decision making and offer ideas for future research.
Interdependence of hip and low back

• Patients who complain of hip pain may actually be suffering from disorders of the lumbar spine.

• Patient with back pain may actually be suffering from disorders in the hip.

Interventions aimed at the SI have been used to treat:

• Weight distribution
• Immediate and lasting improvements in weight distribution seen in baropodometry following a high-velocity, low-amplitude thrust manipulation of the sacroiliac joint


• Immediate and lasting improvements in weight distribution seen in baropodometry following a high-velocity, low-amplitude thrust manipulation of the sacroiliac joint

• Data revealed significant reduction only in peak pressure immediately after manipulation and at follow-up when compared to pre-manipulative values ($p < 0.05$).

• The results suggest that sacroiliac joint manipulation can influence peak pressure distribution between feet, but contact area does not seem to be related to the biomechanical aspects addressed in this study.
The relationship between hip ROM and SI dysfunction


• RESULTS: The patients with low back pain but without evidence of sacroiliac joint dysfunction had significantly greater external hip rotation than internal rotation bilaterally, whereas those with evidence of sacroiliac joint dysfunction had significantly more external hip rotation than internal rotation unilaterally, specifically on the side of the posterior innominate.

The relationship between hip ROM and SI dysfunction


• The patient was a 53-year-old male whose chief complaint was right low back pain (LBP) that interfered with work and leisure activities. Physical therapy consisted of manual therapy, stretching, and postural education to address SJJ and hip motion abnormalities. At the conclusion of 6 visits, the hip-joint rotation range of motion was more symmetrical. The patient reported self-correction of unilateral standing and sitting postures. He returned to full-time work and to playing golf, and he rated pain at 0-1/10. This patient’s asymmetrical hip-joint rotation range of motion may have been associated with SJJ.

Relationship between hip dysfunction and low back pain


• Results: Hip range of motion is a factor in identifying patients with low back pain that would benefit from spinal manipulation.
Relationship between hip dysfunction and low back pain:


• Results. When assessing the relative motion of the lumbar spine and hips in standing forward flexion, there was a measurable difference between asymptomatic men and a group of chronic low back pain patients. In particular, two subgroups of individuals with chronic low back pain appeared; one moved relatively similarly to the asymptomatic group, whereas the other subgroup demonstrated reduced hip mobility. These findings indicate the importance of assessing the lumbar and hip flexion motion in chronic low back pain patients to determine if a movement abnormality is present.

Relationship between hip dysfunction and low back pain:


• Found systematic differences in movement of the hip and lumbopelvic region with the clinical test of active HLR in two subgroups based on hip mobility. These findings are potentially important because such differences in movement patterns between subgroups of people with LBP suggest different contributing factors and may require different treatments to affect the movement patterns.

Relationship between hip dysfunction and low back pain:

• Low back pain

• Results: (LBP) is a multifactorial dysfunction, with one of the potential contributing factors being the hip joint. The objective of this clinical commentary is to discuss the potential link between hip impairments and LBP using current best evidence and the concept of regional interdependence as tools to guide decision making and offer ideas for future research.
Relationship between hip joint range of motion and low back pain:


- RESULTS:
  - 33% of golfers had previously experienced low back pain. A statistically significant correlation (P <.05) was observed between a history of low back pain with decreased LEAD hip internal rotation, FABERE's distance, and lumbar extension. No statistically significant difference was noted in nonlead hip range of motion or finger-to-floor distance with history of low back pain.

Relationship between hip joint range of motion and low back pain:


  - The LBP group had significantly reduced lead hip passive (LBP 21.14+/‐10.17 degrees; controls 31.06+/‐8.06 degrees, t=4.228, 95% CI -14.621–5.205) and lead hip active medial rotation (LBP 21.46+/‐10.01; controls 28.06+/‐7.49 degrees, t=2.908, 95% CI -11.147–2.036) compared to controls. No between group differences were found in non-lead hips or any passive or active lateral rotation measures.

- CONCLUSION:
  - Although there is lack of causality between LBP and hip rotation, the deficit in lead leg medial hip rotation in amateur

Relationship between hip joint range of motion and low back pain:


  - This case series suggests that treating the hips may lead to improvements in disability in patients with chronic LBP.
  - A larger trial is needed to determine if there is a possible subgroup of patients with chronic LBP that may respond to hip mobilizations.
Relationship between hip joint range of motion and low back pain:


- RESULTS:
  - The mobility of the spine and hips was significantly limited in back pain subjects. It was observed that LBP subjects employed various strategies to compensate for the limited motions at the hips and lumbar spine. The contribution of the lumbar spine relative to that of the hip was found to be reduced for subjects with LBP. The lumbar spine-hip joint coordination was significantly altered in back pain subjects, in particular, those with positive straight leg raise sign.

- CONCLUSION:
  - Back pain was related to changes in the kinematics and coordination of the lumbar spine and hips during sit-to-stand and stand-to-sit. Assessment of back pain patients should include kinematic analysis of the hips as well as the spine.

Relationship between hip joint range of motion and low back pain:


- In the low back pain group, no laterality was noted in the ROM of the external rotation. However, ROM of the internal rotation was significantly smaller on the left side than on the right side. The range of rotation was significantly smaller on the left side than on the right side. [Conclusion] The ROM of hip rotation on the left side was significantly diminished (less than 90 degrees) only in the low back pain group, and the laterality in ROM of left hip rotation was significantly greater in the low back pain group than in the non-low back pain group (p<0.05). These findings suggest that small ROM of left hip rotation is a factor responsible for the onset of lower back pain.

The relationship of Hip muscle function and low back pain:


- Subjects with no LBP had significantly stronger hip abductor muscle strength compared to subjects with LBP with ITB tightness (P < 0.001) and those with LBP without ITB tightness (P < 0.001).

• Joint stiffness was determined from the joint moment-angle profiles. Differences were observed in knee joint stiffness, with the LBP group exhibiting the greatest stiffness values. No differences in ankle or hip joint stiffness were observed. These data suggest that the LBP group of runners may not attenuate the foot–ground impact to the same level as the other groups. The decreased attenuation may increase the level of the shock to the low back region, thus potentially increasing the load on the low back.

The relationship of Hip muscle function and low back pain:


• In this case report, the authors demonstrate how stretching the shoulder and hip can decrease the subjective complaints of back pain during daily and gymnastic activities. The subject was a 14 year old female, level 10 USA Gymnastics Junior Olympic gymnast with a 2-year history of low back pain. The authors explain why hip and shoulder flexibility is a vital component to gymnastics activities and provide examples that include descriptions as well as pictures to support their hypothesis.

Interventions aimed at the SI have been used to treat the knee:

• Examination of the patient's knee and hip did not reveal any abnormal findings and there was no reproduction of pain with any test procedures except for medial knee joint tenderness to palpation. Additional, more proximal examination suggested significant asymmetry of sacral bony landmarks of the pelvic girdle without significant findings on the provocation tests of the sacroiliac joint. A single session of manual therapy procedures directed to the pubic symphysis and sacroiliac joint ipsilateral to the side of knee pain was provided.

Interventions aimed at the SI have been used to treat the knee:

• Outcomes: The patient was able to return to running without further incident of knee pain after a single therapy session.

• This case suggests the importance of regional interdependence in the examination of patients with an apparently common clinical problem. Furthermore, the case describes a previously unreported presentation of local knee pain possibly attributable to sacroiliac joint dysfunction.

Interventions aimed at the Hip have been used to treat the Knee:


• RESULTS:
  • Intraclass correlation coefficients for all tests were greater than 0.87. Composite and individual test pain scores and ROM scores improved significantly following hip mobilization. All clinical test findings were more frequent in the group with knee OA, except for those of the FABER test, and the number of subjects with painful test findings following hip mobilization was reduced for all tests except the hip flexion test.

• CONCLUSIONS:
  • Patients experienced increases in ROM, decreased pain, and fewer subjects had painful test findings immediately following a single session of hip mobilizations. Examination and intervention of the hip may be

Treatment implications

• Evaluation of hip joints in patients with LBP
  • Joints should have a normal end feel and position

• Joint manipulation:
  • Passive movements of a joint performed to have a mechanical AND neurological effect.
  • These techniques can be performed as a sustained stretch or with an oscillatory movement
  • Afferent input = impact TONE and DYSFUNCTION
So how does it work?

- MT is believed to have impact on at least 3 levels:
  - Biomechanical
  - Neurophysiological
  - Psychophysiological

Mechanical Effects

- Normalization of hip joint mobility has direct mechanical effects on surrounding joints

Neurophysiological

- MT has a profound but transient impact upon neurophysiology. This can be divided into 3 components:
  - Peripheral
  - Spinal
  - Supraspinal
• Manual Therapy techniques for the Hip

Hypertonicity

– Our best influence on muscle length is by addressing TONE

– Is the muscle in a relaxed state when it should be?

Detonification

• When combined with a program of joint mobilization and strengthening, there can be lasting effects in muscle length

• Detonify: lateral bending/active & passive pump