FEATURE

Elaine Pomerantz, MS, Editor

Evaluating Sacroiliac Joint Play with Spring Tests

by Jerry Hesch, PT

The sacroiliac joint (SIJ) has been implicated as a source of low back pain (LBP) by many clinicians and researchers including Greenman (1995), Lee (1989, 1992, 1996), and Vleeming, et al (1992). There is an increasing interdisciplinary interest in the role of the SIJ and LBP (Vleeming, et al 1992, 1995). The "Second Interdisciplinary World Congress on Low Back Pain: The Integrated Function of the Lumbar Spine and Sacroiliac Joint" was held on November 9-11, 1995 in San Diego, California. The Congress proceedings total 860 pages. In 1994, the Canadian Athletic Therapist National Conference was dedicated entirely to the SIJ. There is ample evidence that many disciplines are experiencing strong interest in the role of the SIJ and LBP. While there is a considerable body of literature regarding the SIJ, there is also considerable debate regarding this complex articulation, its role in LBP, and the value of its clinical evaluation and treatment. During the peripartum state, it is certainly relevant to evaluate and treat the SIJ. However, the consideration of the SIJ should not be limited to the childbearing years; women can suffer lumbopelvic pain and biomechanical dysfunction during any life stage. The purpose of this article is to present information on the SIJ, and introduce joint spring tests to qualitatively evaluate motion.

The SIJ may cause pain due to disease, inflammation, or movement dysfunction. However the pain model can be limiting as biomechanical dysfunction of the SIJ and pelvis is commonly present in the absence of pain (Hesch 1996). The important relationship of the SIJ and pelvis to the rest of the musculoskeletal system should not be ignored in the absence of pain.

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Movement dysfunction may exist as hypermobility or as hypomobility. The normal SIJ functions as a tri-plane shock absorber which transfers upper body weight into the pelvis and lower extremities and assists absorption of the force of heel strike (Porterfield & DeRosa 1991). If the SIJ is hypomobile or hypermobile it cannot effectively dissipate stress from activities of daily living. Confusion exists as to how hypermobility and hypomobility are defined. True hypermobility can be hereditary or traumatic. It can occur with pregnancy in response to the hormonal changes and mechanical trauma of altered posture, weight gain, and delivery (Mens, 1992). True hypomobility can exist in the elderly due to degenerative changes and in disease processes such as early stages of Reiter's disease or ankylosing spondylitis; complete fusion can occur in later stages. Apparent hypermobility and apparent hypomobility are mutable properties of dysfunction which respond readily to treatment (Hesch 1996).

Apparent hypermobility and apparent hypomobility often co-exist. Spring testing of the pelvis reveals one or several direction(s) of decreased mobility, whereas testing in the opposite direction(s) reveals increased mobility. This is quite common, and treatment directed at restoring normal movement in the direction of hypomobility usually restores normal movement in the direction of the apparent hypermobility as well.

SIJ dysfunction during pregnancy is not limited to true hypermobility. Macro or micro trauma, activities of daily living or "creep" (defined by Greenman as a decrease in tissue resistance to a load because of previous load application) may create a fixation and apparent hypomobility with a background of true hypermobility. The former can be more symptomatic and after reducing the acute strain pattern the background hypermobility can be managed more readily.

The SIJ has a small amount of functional motion as does the symphysis pubis (Vleeming, et al 1992). Bernard (1992) has demonstrated through fluoroscopy that the SIJ moves with manually applied loads such as those that are utilized in evaluation and treatment. Brooks et al used realtime sonograms to demonstrate movement in vivo with spring tests (1995). Physical therapists recently demonstrated the predictive value of a SIJ evaluation regarding instability (Graham-Smith, et al 1996). The physical therapy evaluation indicated suspected SIJ instability. This was validated when a tear in the anterior capsule was discovered with dye injection into the SIJ under fluoroscopy. What has not been established is whether or not manual clinical tests and treatments specifically affect *only* the SIJ. It may be that mobility is evaluated and treated manually as part of the integrated system of the spine, pelvis, and hip. The SIJ is part of this system, and it does not function in an isolated fashion. Mobility tests that attempt to

isolate actual joint play may yield useful information about the system, however, we cannot say with certainty that mobility tests exclusively isolate *only* the SIJ. The SIJ is unique in that it is surrounded by some of the largest and most powerful muscles of the body, and many have part of their origins or insertions on ligaments or capsule of the SIJ. Muscle tension indeed can decrease SIJ mobility, as has been demonstrated by Vleeming, et al (1989).

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SIJ spring tests may indicate perceived motion that may be greater than the actual movement occurring within the SIJ. As bony landmarks used are at a distance to the joint, they can amplify the perception of motion. The spring test may be applied in one plane and yet may produce tri-plane motion in the joint. A spring test may induce motion at both SIJ's and the symphysis pubis in spite of our efforts at isolation. Spring testing might induce a small degree of cartilage and bone deformation. Lastly, in spite of our best efforts to isolate only the SIJ, the entire lumbopelvic-hip region might participate to some degree. These reasons do not detract from the clinical utility of the spring tests, as they evaluate an important and often overlooked aspect of joint function which is joint play.

Mobility tests can be general or specific. Palpating pelvic bony landmarks during trunk or hip flexion is a general mobility test as many joints and many muscles come into play. In contrast, a posterior rotational force applied to the anterior superior iliac spine in supine is a spring test that evaluates joint play. Bark, et al (1990) defined joint play as the motion that occurs within the joint as a response to an outside force but not as a result of voluntary movement. General and specific mobility tests are important in evaluating clients with suspected SIJ dysfunction. The spring tests give more specific information about joint and ligament function and integrity. The general mobility tests will give more information about whole patterns of motion influenced by several joints and several muscle groups. The following general mobility tests are presented in the literature and are in fairly common use: long sit test, standing hip flexion (Gillet) test, standing trunk flexion test, sitting flexion test (Potter & Rothstein 1985). These gross motion tests implicate faulty motion of the pelvis as a unit but are not very specific, yet are often utilized to evaluate purported faulty "SIJ motion." The SIJ is within the pelvis and a more appropriate description might be "faulty lumbo-pelvic-hip" motion. The spring tests and gross motion tests evaluate very different emergent properties of the SIJ and pelvis. The gross motion tests cannot be performed in prone and supine and the spring tests cannot be performed in sitting or standing. The use of the term *spring* seems very appropriate when testing the quality of pelvic joint play as there is a very discernable elastic feel in loading the pelvic joints, imparting the actual spring test, and in the quality of recoil. This elastic property is distinctly different from other joints in the body.

Walker (1992) asks a relevant question with regard to motion testing:

> "Is the motion present adequate in total range to be detected by observation and manual palpation, as extensively described by several clinicians?. . .The minimal range of motion present in probably most of the population casts doubt on whether therapists can detect 1 to 3 degrees or 1 to 3 mm of motion occurring specifically at the SIJ. Perhaps the term *play* (joint play) should be used when referring to the SIJ, as *motion* implies quantity of motion similar to other synovial joints, which does not appear to be the case." pp. 911, 913

The SIJ does not exist in isolation with regard to anatomy and function. Perhaps more important than the fact that motion occurs within the SIJ, is the concept that it occurs *through* the SIJ. Proper function of the pelvic articulations requires the ability to translate forces through these articulations and to dissipate intrinsic and extrinsic forces.

Spring tests are performed on both sides of the pelvis. As movement dysfunction can exist within a symmetrical pelvis they are always utilized as a general screening tool. The clinician applies firm and continuous pressure to the bony landmark until motion no longer occurs. At this point the soft tissue slack is taken up. The actual spring test is then performed when an additional force is imparted. When performing the spring test, it is important to note the quality of the initial load, the endfeel, the quality of recoil, as well as the client's subjective response. Retest if unsure. Do not abruptly let go but rather allow the recoil to return to the point where the slack is taken up. The quality of joint play is rated as normal, hypomobile or hypermobile. A zero to six scale can also be utilized:

0 = Ankylosis or no detectable movement
1 = Considerable limitation in movement
2 = Slight limitation in movement
3 = Normal (that is for the individual)
4 = Slight increase in motion
5 = Considerable increase in motion
6 = Unstable (Paris 1991).

Of course there is a degree of subjectivity in

rating the joint play. Skill in joint spring testing comes with practice and training. The primary intent of the spring tests is not to reproduce and isolate pain, but rather to qualitatively assess joint play. It is not uncommon for clients to have biomechanical dysfunction that is sub-threshold, and therefore pain is not provoked with spring testing. If pain does occur with spring testing, it is important to modify technique and attempt interpretation.

Spring tests can be measured with force transducers e.g., MICROFET* muscle testing device. It is a hand held instrument that measures the amount of force applied by the clinician. After taking up the slack in the joint the clinician can then apply an additional force and determine how much force is applied when joint play is perceived. Both sides are

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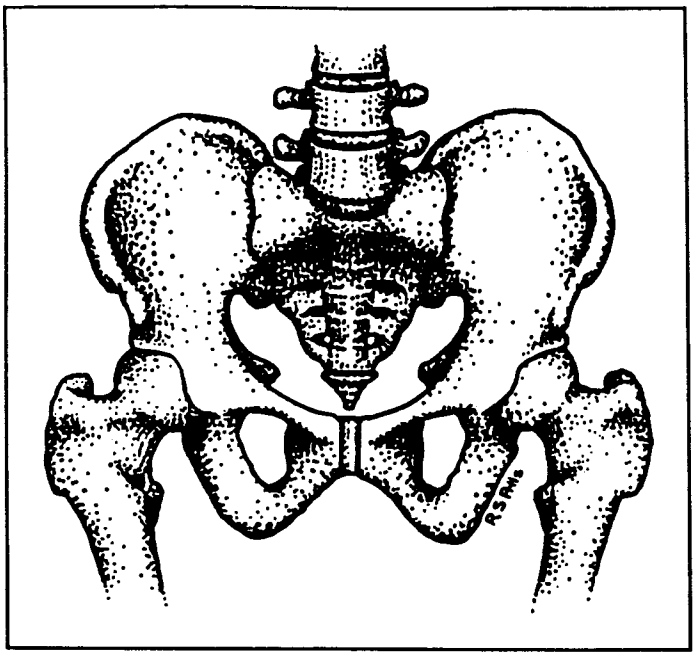
compared. The clinician can measure pre-treatment and post-treatment force. Most force transducers used in the clinic describe force in pounds (lbs) or kilograms, though force described in newtons accounts for the influence of gravity. The spring tests average 20 lbs for taking up the slack and up to 40 lbs to apply the spring test. The force needed may vary from person to person. The above averages serve as a guideline with which to develop the skill of applying the spring test. However, the appropriate amount of force is the least amount that provides useful information without provoking pain. The initial load takes from 2-3 seconds and the spring test takes 1-2 seconds as does assessing the recoil.

A study was performed to determine whether therapists could learn to accurately produce specific forces to the lumbar spine (Keating, et al 1993). Therapists practiced applying specific forces by pushing on a bathroom scale. They then attempted to apply specific forces on the participant's lumbar spine (prone lying). The practitioner stood on a force platform while they imparted the force. The reduction in weight measured by the force platform equalled the force applied to the lumbar spine. The authors concluded that therapists can learn to quantify applied forces and that a bathroom scale (non-digital) can be an adequate learning tool.

Joint play tests are part of a standard orthopedic physical therapy evaluation of synovial joints of the body (Bark, et al 1990). The SIJ is appropriately described as a synovial joint as it has 5 of 6 synovial characteristics according to Bowen and Cassidy (1980). Unfortunately, joint play testing of the pelvis is not considered as a standard physical therapy evaluation of the pelvis as evidenced by current literature and educational seminars. Physical therapists can utilize an expanded evaluation that maximizes palpatory assessment, utilizes general mobility tests, incorporates testing of ligamentous tone, and adds basic and advanced spring tests. I believe that we will



then discover that the SIJ behaves somewhat differently than has been proposed in the literature. In utilizing this evaluation scheme, clinicians will have the tools to evaluate the movement characteristics and decide for themselves how it moves in individual clients. In some ways the SIJ seems to move (according to spring tests) in very simple and predictable ways, which renders treatment to be rather straight forward. In a small portion of clients who have suspected SIJ dysfunction, the pelvis can behave in a much more complex fashion as has been presented with the traditional model. What is important is that the clinician has tools available to make decisions on an individual basis.

Research on evaluation and treatment of this complex region is very important. Over the past decade there has been a lot of research and information sharing regarding this topic. There is presently ongoing research in many parts of the world. Rather than wait for the "final word" before addressing this clinical syndrome, we must utilize existing knowledge and continue to ask new questions regarding this complex problem, even as answers come forth. We must approach our clients with openness and diligence in attempting to assist with their complex and multifactorial presentations.

*MICROFET is manufactured by Hoggan Health Industries and distributed by EMPI® Inc., 1275 Grey Fox Road, St Paul, Minnesota 55112

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