

# **Evaluation of Gait and Station – Assessing and Treating Asymmetry**

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## **Abstract**

Often many health care providers perform orthopedic and neurological testing without functional assessment. In depth assessment of acute, and chronic conditions is paramount to forming an accurate diagnosis. Complete assessment is equally important in designing an effective treatment plan. Accurate assessment, and an effective treatment plan enhance the chances of a favorable outcome.

## **Key Words**

Functional assessment, gait, station, mobility, asymmetry, rehab prescription, vibration therapy, core and postural stabilization, functionally integrated training

## **Introduction**

The evaluation of gait and station, which is a component of the musculo-skeletal exam, can reveal significant structural defects. This will help you correctly identify the etiology, or root cause of a patient's acute or chronic symptoms. Further, your ability to identify these defects through objective assessment will provide some of the information necessary to develop an appropriate rehabilitation prescription, and to justify the necessity of care. Your functional analysis, in both acute and chronic cases, should begin with a visual assessment of the lower quarter. One of the most important functional deficits to identify is movement incompetency. One key component of movement incompetency is asymmetry. The importance of identifying asymmetry, and movement incompetency is to avoid building stability over poor mobility. Movement incompetency may demonstrate altered motor control, a neurodevelopmental component, or regional interdependence. Exercising a dysfunctional joint creates greater dysfunction resulting in a poor outcome to treatment. These are important concepts and considerations when designing a treatment plan.

## **Functional Movement Screen**

Functional Movement Screen is a system of seven simple tests designed to evaluate movement patterns demonstrating asymmetry and deficits. The seven tests consist of the Deep Squat, Hurdle Step, In-line Lunge, Shoulder Mobility, Active Straight-Leg Raise, Trunk Stability Push-up, and Rotary Stability. The FMS screens are scored from three to zero. The patient or athlete has three attempts to successfully perform the screen. A score of three is given if the individual can perform the screen without compensation. A score of two is given if the individual can successfully perform the screen with compensation. A score of one is given if the individual is unable to perform the screen. A score of zero is given if pain is precipitate during performance of the screen. If a patient has a score of one or pain during the screen, this would indicate the SFMA or Selective Functional Movement Assessment, to be performed by isolating the functional movement deficit and regional interdependence. The Active Straight-Leg Raise demonstrates tight muscle imbalances of Hamstrings, Gastrocnemius, and Soleus. Positive findings indicate core and pelvic stability deficits. The Deep Squat demonstrates weak or inhibited pelvic, core, and postural stabilizers. Positive findings indicate core and postural stabilization deficits. The Hurdle Step demonstrates instability on the stance leg, side bending with the stick, internal or external rotation of the hip, knee, ankle or foot, or lumbar flexion of the spine. Positive findings would indicate asymmetrical or bilateral mobility. It would also indicate stability deficits of the torso, hip, knee ankle, or foot. This includes deficits in stride mechanics, proprioception, balance, or the patient's kinesthetic sense. The In-Line Lunge demonstrates

deficits in split stance mechanics, asymmetry, muscle tightness, or weakness. Positive findings indicate deficits in torso, shoulder, hip and ankle mobility, stability, quadriceps flexibility, and knee stability. Rotary Stability demonstrates balance deficits, proprioception deficits, flexibility deficits, muscle tightness, muscle weakness, and pain. Positive findings indicate deficits in neuromuscular coordination, weak or inhibited core, pelvic and postural stabilizers, global muscle imbalances, and deficits in upper or lower extremity motion. Shoulder mobility demonstrates pain, compensation, and flexibility deficits in internal rotation. Including adduction and external rotation with abduction of the shoulder. Positive findings indicate shoulder impingement, glenohumeral mobility deficits, scapular thoracic mobility stability deficits, and thoracic extension deficits. Trunk Stability Push-Up demonstrates pain, global muscle weakness, hyperextension of the lumbar spine, and "winging of the scapula". Positive findings indicate weak or inhibited core pelvic, and postural stabilizers including a lack of symmetrical trunk stability.

### **Pelvis Assessment:**

The first signs of most postural and muscular imbalance usually develop in the patient's static pelvic positioning. Anterior tilting of the pelvis suggests shortening of the hip flexors (iliopsoas, rectus femoris and tensor fascia lata) and/or the lumbar spinal extensors. Posterior tilting of the pelvis suggests tightness of the hamstrings. Lateral pelvic shifts suggests unilateral shortening of the hip adductors, but may also be associated with lumbar motion segment pathology. Thus including weakness of the lateral pelvic stabilizers or leg length inequality. Pelvic obliquity secondary to functional shortening of one leg is common. The muscles, which are most commonly related to leg shortening, are the hip adductors, the iliopsoas, and the quadratus lumborum. A shortened latissimus dorsi may also elevate the pelvis from the trunk and result in a short leg. The piriformis, when tight, lengthens the leg. Primary pelvic obliquity due to structural leg length inequality, is rarely observed in practice as the body usually shifts the pelvis laterally in order to level the sacrum and hips.

### **Buttocks Assessment**

A generalized visual assessment of the glutei musculature should reveal muscles which are well rounded, symmetrical, and contain a horizontal gluteal line. Flattening of the upper, outer quadrant of the buttock, or a loosely hanging appearance of the muscle, suggests weakness of the gluteus maximus. This will suggest inhibition due to tightness of the hip flexors or sacroiliac joint dysfunction as well. In the case of sacroiliac joint dysfunction, a typical pattern of changes in muscle activation occurs. There is arthrogenic inhibition of the gluteus maximus on the side of the blocked joint, and on the contralateral side of the gluteus medius. In addition, painful spasms of the iliacus, piriformis, and rectos abdominis are common.

### **Lower Extremity**

In assessing the hamstrings, focus on the area about two-thirds down the posterior thigh and compare the muscle bulk bilaterally as well as to the gluteal muscles. Increased bulk of the hamstrings suggests hyperactivity compensatory to a weak or inhibited gluteus maximus on the same side, as the muscles are synergists for hip hyperextension. The contour of the inner thigh normally forms a very shallow, S-shaped curve as you activate the hip adductors to tension. A distinct increase in muscle bulk in the upper one-third of the inner thigh suggests tightness of the short, or one joint, hip adductors. The inner thigh, where the fibers of the one and two joint hip adductors cross look for a visible depression. Where this abnormal finding is evident, this is known as an 'adductor notch' and results from long standing tightness of the short hip adductors. A more distal position of an adductor notch suggests poorer function of that hip joint. Thigh adductor tightness may be associated with leg length deficiency, lateral shift of the pelvis or hip joint pathology such as arthrosis. Observe closely the size, shape and symmetry of the

calf muscles and, for each leg, notice any difference in tone between the gastrocnemius and the soleus. Increased bulk in the inner, lower one-third of the calf suggests soleus hypertrophy. This creates a cylindrical shape to the lower leg, which contrasts, with the normal inverted bottleneck shape. Soleus hypertrophy is of paramount importance as it may be the only, hidden cause of low back pain and is also suggestive of ankle or foot dysfunction that should be investigated further.

### **Lower Back Assessment:**

Observing initially the general postural attitude, quality of the lumbar lordosis, symmetry of body landmarks and muscular contours. Compare the quality of the spinal extensors in the lumbar and thoracolumbar region bilaterally. Ideally the sides are symmetrical and the muscle is slightly thicker and broader in the lumbar region. Predominance of the thoracolumbar musculature suggests overactivation in gait, poor stabilization of the lumbar spine and is associated with a weak gluteus maximus. Hip hyperextension, the most important movement for a normal gait pattern, should range from five to fifteen degrees. Normal hip hyperextension takes place in relation to a pelvis stabilized by activity of the abdominal and lumbar extensors. When it is limited due to hip flexor tightness, the patient tilts the pelvis anteriorly, replaces extension of the hip with extension of the low back and activates the thoracolumbar extensors as a point of fixation. This impaired stabilization of the lumbar spine is a poor sign for the lower back. The next step is to perform a visual assessment of the anterior body.

### **Abdomen:**

Postural analysis of the anterior body begins with evaluation of the abdominal wall, whose role in stabilization and protection of the spine is crucial. Compare the upper quadrants of the abdomen to the lower and the rectus abdominis to the obliques. Ideally the abdominal wall should be flat. Increased tonus of the upper quadrants relative to the lower may be associated with a faulty paradoxical respiratory pattern. A groove lateral to the rectus suggests predominance of the obliques over the recti with poor stabilization of the spine in the anteroposterior direction. A bulging, hypotonic waistline reflects poor function of the whole abdominal wall and poor protection of the low back during both normal, physiological and sudden, unexpected movements.

### **Lower Extremity Assessment**

The quality of the anterior thigh musculature may provide further insight into the patient's lumbopelvic posture, and reflect the status of the lower extremity joints. The tensor fascia lata is a slender muscle, and is normally not visualized. The contour of the lateral thigh should be flat in males and rounded in females. Compare bilaterally the contour of the anterior tibialis while observing the posture of the patella, ankle, foot and toes. Normally there should be no movement of the patella or toes, nor should there be tendon play on the dorsum of the foot in standing. A groove on the lateral thigh in males or a flattened lateral thigh in females suggests shortening of the tensor or iliotibial band, and may be accompanied by a superolateral shift of the patella. Where such a groove is apparent, this is commonly known as tibial band syndrome. Superior deviation of the patella alone suggests shortening of the rectus femoris. Tightness of either the rectus femoris or tensor fascia lata, may result in an attitude of hip flexion, and anterior pelvic tilt as previously described. An 'unquiet patella' displays short, jittery up and down movements, due to rectus femoris hyperactivity. This is compensatory to altered proprioception from the knee. Knee joint pathology involving, for example, the medial meniscus or cruciate ligaments is most often responsible for such proprioceptive changes. Hypotrophy of the vastus medialis may also result from altered proprioception from the knee. Unilateral hypertrophy of the vastus may be due to repetitive forced lie extension, or may be a sign of the patient overextending and overstressing the knee during gait. Anterior tibialis precedes

weakness of the toe extensors as a very early sign of L5 nerve root lesion. Regular movements of the dorsi flexor tendons may reflect imbalance between the dorsi flexors, and plantar flexors. This impairs proprioception from the knee, ankle or foot. It may also be observed in S1 root syndromes. Presence of this sign may be helpful in differentiating root lesions from pseudo syndromes such as piriformis syndrome, or tensor fascia lata syndrome. Microgate's Optogait Computerized Human Performance Analysis equipment data is objective criteria that will validate the functional testing results.

## **Treatment**

The treatment progression consists of Passive care, Transitional Care, Core Training, Endurance Training, Functionally Integrated Training, Strength Training, Final and Supportive Care. Passive Care may consist of Manipulation, Applied Kinesiology, Sacral Occipital technique, Active Release Technique, Graston, Neuro Mobilization, Flexion/Distracton, Decompression, McKenzie, Laser, Ultrasound, Interferential, High Volt, Microcurrent, Anodyne Therapy, Cryocuff Compression Therapy, ATM, PIR, and Nutrition support for injury recovery. Transitional Care may consist of Manipulation, Modalities, PNF, Flex Building, Sparring Strategies, Stabilizing Strategies, and Nutrition. Manipulation and therapeutic modalities would be performed on a PRN basis. Sequential therapy might be used to resolve muscle imbalance. Sequential Therapy consists of three types of electric stimulation to reduce pain, inflammation, and muscle spasm. This can be performed on a device unique to the Vitality Depot. The Core Training progression consists of proprioception exercises performed with eyes open and closed. They begin on the floor transitioning to Thera Pads, Rocker Board, Round Board, and Bosu Ball. The next level of training involves core, pelvic, and postural stabilization. This training is performed on the IJOY Board, IJOY Ride, and Zen Pro. The progression is from levels one through four. Nutrition for this training is based on soft tissue development. Passive Care is performed PRN. The ZenPro is used to overcome the neurodevelopment component from pain resulting in abnormal motor patterns. The vibration therapy from the ZenPro creates dynamic stability, increased proprioception, awareness, kinesthetic sense with improved dynamic, and static posture. Now you can integrate Endurance Training. The progression is from HIIT(High Intensity Interval Training), to Aerobic training(20min), followed by weight Loss Training(30min), and Optimization Training(45min). The Nutrition is based on aerobic conditioning. Passive Care is performed PRN.

FIT(Functional Integrated Training) is next on the progression. Challenge the patient with Otis Rings or Bodyblade exercises on the ZenPRO. The Nutrition is based on exercise support. Passive Care is still performed PRN. Strength Training is the final phase of rehab performed with Thera Bands, Kettle Bells, free weights, PACE weight training stations, or Nautilus cable weight stations. Final Care can consist of Home Exercise, Nutritional recommendations, Orthotics, or Passive Care on a PRN basis. Once the functional are identified, active care should begin as soon as possible. The sooner the healthcare provider can transition a patient from passive care to active rehabilitation, the greater the chance for a favorable outcome. The treatment plan initially should focus to resolving asymmetry, movement incompetency, and regional interdependence. Stability should never be created over poor mobility. Once mobility is achieved treatment should focus on core and postural stabilization. Functional Integrated training is performed once mobility and stability are achieved. FIT is designed to turn short term response into long term adaptation. Aerobic conditioning including endurance training can now be performed when core, postural, and pelvic stabilization is established. Strength training encompasses the final part of the treatment plan. Each phase of the treatment plan is performed until progress reaches a plateau. Initially, it may be necessary to begin rehab with Post Isometric Relaxation (PIR). This technique should be performed to the involved (shortened) structures identified in the functional assessment. This phase of treatment will lay the groundwork for an effective joint stabilization rehabilitation program. The goals of PIR should be

to increase physiologic end range, relax tight muscles and activate inhibited muscles. Once these goals have been achieved, the “Flex Building” muscle energy technique, which involves isokinetic resistance to patient comfort throughout the full range of motion in both directions, should be performed if possible. The Flex Building technique increases range of motion beyond the impeded end range, increases the muscle tone in “weak” muscles, stretches “tight” muscles, and activates inhibited muscles hence resolving “Tightness Weakness” syndromes as described by Janda. A contraindication to this technique would be pain or increase of symptoms at one or more discreet points in the range of motion. If this occurs, Proprioceptive Neuromuscular Facilitation (PNF) should be performed prior to utilization of the Flex Building technique, and transition of the patient to Active Care. Ultimately, your goal is to prepare the patient to transition into a comprehensive conditioning program focused on functional restoration. The transition to Active care can occur once asymmetry, regional interdependence, and movement incompetency is resolved restoring proper mobility. Vibration therapy is one of the best methods to achieve this goal. I use the ZenPro to perform core and postural stabilization with Functionally Integrated Training. The transition to FIT can occur when identified muscle imbalances and joint stability are improved. This can be achieved using the ZenPro abdominal and lower body protocols. The rehabilitation prescription throughout the various phases of care should include proprioception, flexibility training, stability training, endurance training, aerobic conditioning, and strength training. This should be performed using all of the ZenPro protocols, integrating otis rings, body blade, medicine balls, and thera-bands. Rehabilitation should always be directed at restoring the patient’s capacity to perform work, recreational or daily activity, and should be terminated when the patient’s functional progress plateaus. The patient should then be released from treatment with instruction. Final instruction should consider maintenance care, and continuation of rehabilitation in a home-based program.

## **Conclusion**

Restoration of function is the key component to development of an effective outcome-based treatment program. Being able to develop an outcome-based treatment program is the key to receiving appropriate reimbursement. To demonstrate appropriate functional outcomes, you must first document functional deficit. In many cases, orthopedic and neurologic assessments fail to reveal the source of the patient’s symptoms. In these circumstances, functional assessment will lead to accurate diagnosis, and development of a treatment program designed to improve the patient’s functional abilities.

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Note \* References are available upon request