

**ITEC LEVEL 5 CERTIFICATE in
SPORTS MASSAGE THERAPY
iUSP158**

**Complex Assessments for Sports
Massage**

Deirdre Harris

ITEC NO. XXXXXXX

July 2017

Neurological Presentation

Peripheral Nerve Pathways

The peripheral nerve pathways include all the nerves in the body that lie outside of the spinal cord and brain. These nerves are seen as communication pathways from the central nervous system which enable them to provide complex functions to the rest of the body.

The peripheral nerve pathways include:

- The nerves that connect the head, face, eyes, nose, muscles and ears to the brain, known as the **cranial nerves**.
- The nerves that connect the spinal cord to the rest of the body, including the 31 pairs of **spinal nerves**.
- More than 100 billion nerve cells that run throughout the body.
- All spinal nerves except the 2nd to 12th thoracic nerves branch out and regroup to form plexuses which supply different parts of the body. (Image 1)
 - **cervical plexus** which contains the first four cervical nerves and supplies the muscles of neck and shoulder including the phrenic nerve with sends nerve impulses to the diaphragm telling it to contract.
 - **brachial plexus** which contains the lower four cervical nerves and the first thoracic nerve, it branches to supply muscles from the base of the neck to fingertips.
 - **thoracic (intercostal) nerves** supply the chest muscles and the main part of the abdominal wall.
 - **lumbar plexus** included the first three lumbar nerves and part of the fourth, it supplies the skin and muscles of lower abdomen, thighs and groin.
 - **sacral plexus** includes the fourth and fifth lumbar nerves and first four sacral nerves, it supplies the muscles and skin of the pelvic area, the main nerve being the sciatic nerve which runs down the thigh before splitting above the knee in the tibial and peroneal nerves supplying the lower leg.
 - **coccygeal plexus** is a second small plexus at the back of the pelvis, supplying the muscles and skin of the genitals and anus.

These nerve pathways or system is further divided into a **Sensory division** and **Motor division**, the Motor division further dividing into the **Autonomic nervous system** and the **Somatic nervous system**.

Autonomic Nervous System: Controls involuntary actions such as heart rate, respiration, digestion and perspiration. Subdivided into **Sympathetic and Parasympathetic** nervous systems.

Sympathetic Nervous System

- prepare the body for stressful, dangerous or emergency situations, commonly known as fight or flight.
- Increases heart rate, release of energy into liver, basal metabolic rate, muscle strength.
- widens airways to make breathing easier.
- causes sweaty palms, hair to stand on end.

- decreases functions which are less important, digestion and urination.

Parasympathetic Nervous System

- works in non-stressful situation or environment.
- Reduces blood pressure and slows heart rate by vasoconstriction of the arteries.
- Stimulates digestive tract by vasodilation of digestive system to process food.
- Contraction of bladder to process liquid

Somatic Nervous System: It allows the body or individual to receive sensory information and consciously react to environmental changes. It controls voluntary conscious movement such as contraction of skeletal muscles used in walking, running, smiling.(1)

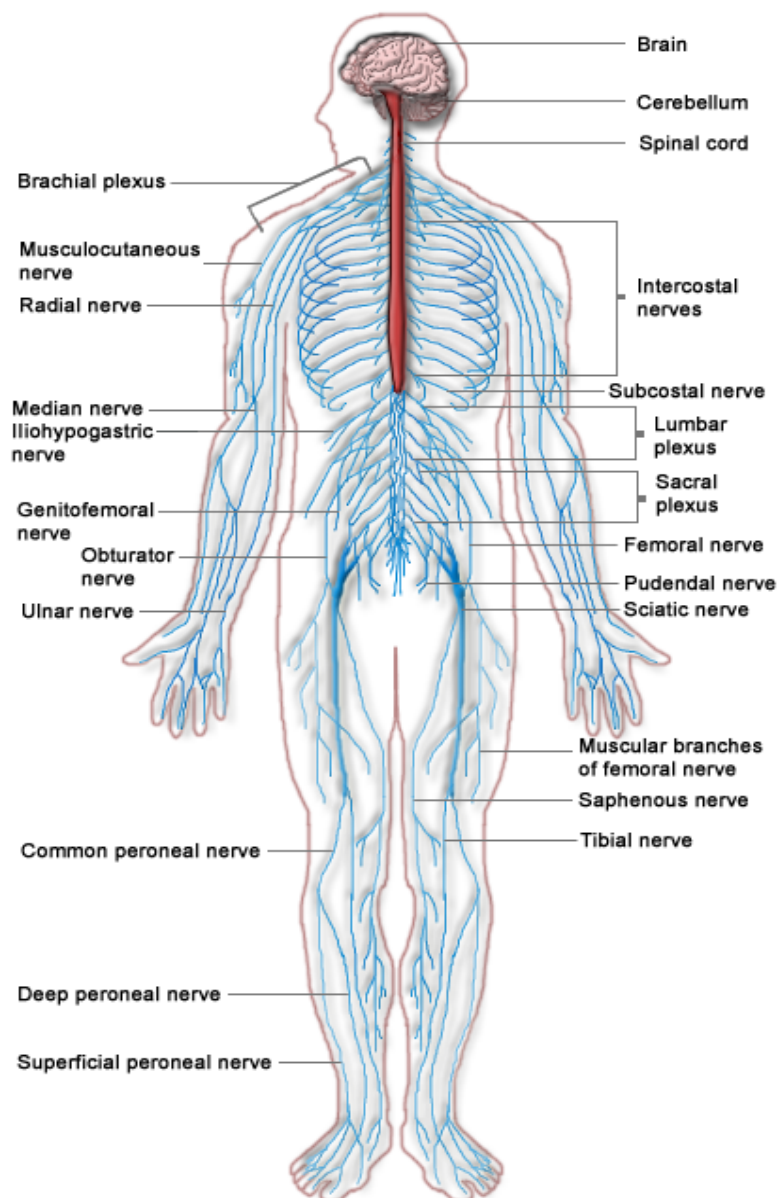


Image 1

Characteristics and organisation of Dermatomes

A dermatome is an area of skin that is mainly supplied by a single spinal nerve. There are 8 cervical nerves, 12 thoracic nerves, 5 lumbar nerves and 5 sacral nerves. Each of the nerves relay sensations such as pain or pressure from the particular region of skin to the brain.(Image 2)

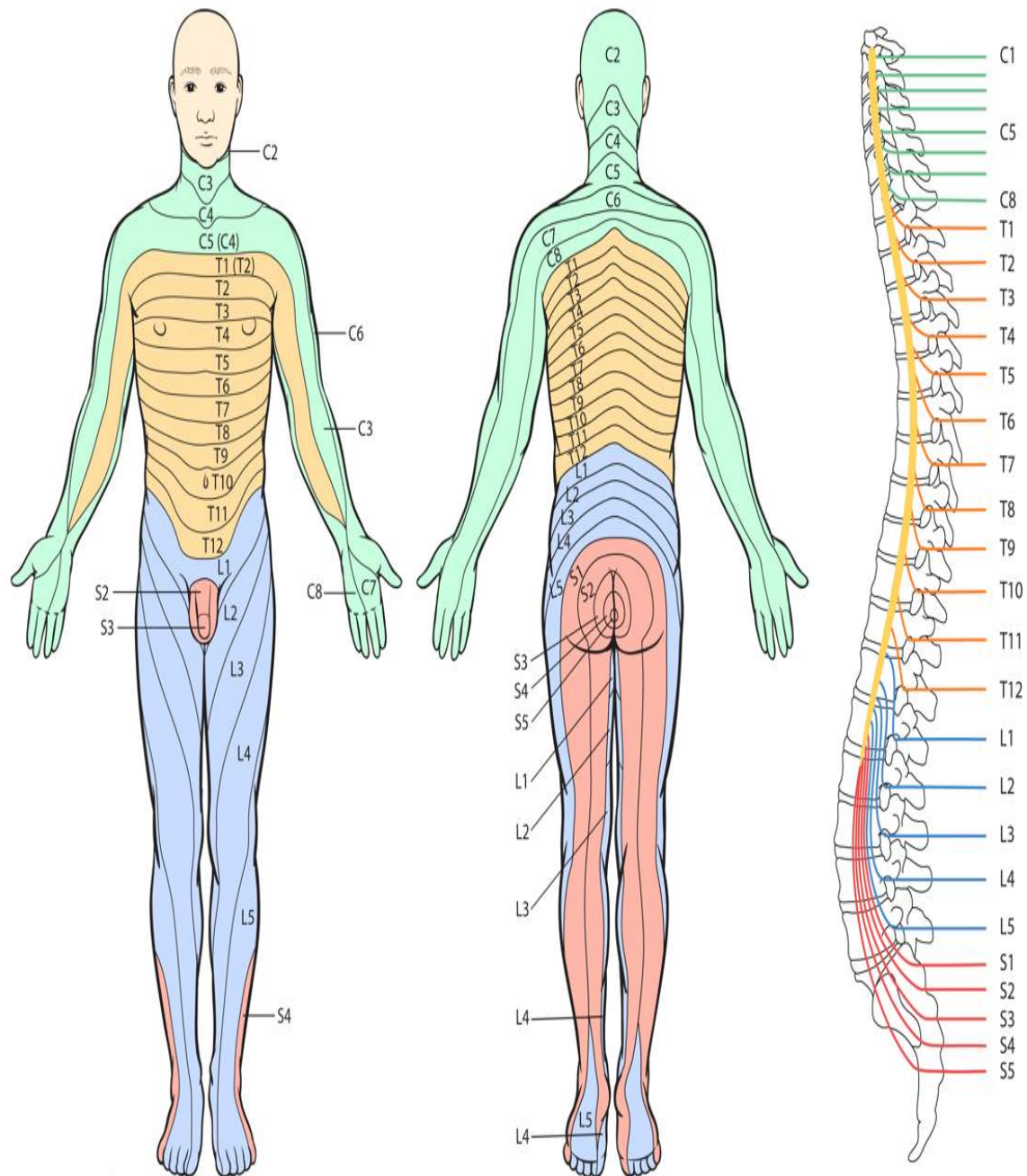


Image 2

Characteristics of Myotomes

Myotome is the group of muscles that a spinal nerve root or roots stimulates.

- Nerves from the neck level control the muscles in the arms
- Nerves from the thoracic spine control the chest and abdominal muscles
- Nerves from the lower back control the muscles in the legs.

Some, but not all of the nerve roots have reflex

Common causes of neurological damage

There are more than 600 neurological disorders (2). Neurological disorders are diseases that affect the brain and the central and peripheral nervous systems.

Common causes for neurological damage include:

- **Nerve compression** or **ischaemia** can cause a range of disorders from simply just temporary harmless pins and needles to the more prolonged discomfort of sciatica or carpal tunnel syndrome.
- **Nerve lesions** or **inflammation** caused by trauma/injury or repeated micro trauma which can either cause pain in the form of trigger points or more seriously damage the myelin sheath protecting the nerve and lead to stroke and spinal cord injury/paralysis.
- **Multiple Sclerosis** is also caused by myelin sheath degeneration but is an auto-immune disease.
- **Cancer, chemotherapy** and **radiation therapy** all affect the nervous system, causing neuropathy and in the case of chemotherapy, research has found it causes delayed damage to the myelin. (3)
- **Diabetes** commonly causes neuropathy or numbness and lack of full sensation in the hands and feet of the affected person as the increased levels of glucose in the blood damage the nerve.
- **Toxins** such as alcohol or drug abuse can also cause nerve damage.
- **Neuroma** or 'pinched nerve' is a benign growth of nerve tissue. A very common form develops in the foot, called Morton's Neuroma.

Common peripheral neuropathy patterns

Sciatica: The sciatic nerve is the thickest and longest nerve in the body, originating in lumbosacral plexus then running deep to the gluteus and the whole length of the leg (posterior thigh) and into the foot, it comprises 2 nerves within one sheath, the tibial nerve and the common fibular nerve. The 2 nerves separate at the knee and continue down lower leg and into foot.

Caused by: herniated/bulging disc in lower pack compressing nerve and causing inflammation. Similar symptoms can also be caused by the piriformis muscle, one of the deep six hip rotators, compressing the sciatic nerve, sensation originating deep underneath gluteus. **Symptoms:** Pain for both can be mildly uncomfortable to severe. Sensation can travel down leg into foot or vice versa, feeling either numb, tingling or burning.

Femoral Neuropathy: The femoral nerve is the one of the largest nerves in the leg and the largest in the lumbar plexus, it travels through the psoas major into the pelvis and from there through the femoral triangle and into the anterior and posterior thigh.

Caused by: direct injury or trauma in the area. Prolonged pressure on nerve resulting in ischemia. Compression or entrapment of nerve by nearby body parts or disease. Sensation changes in thigh, knee and leg, feeling either numb, tingling or burning. Knee buckling or weak particularly going down stairs. (4)

Carpal Tunnel Syndrome: The median nerve is a major peripheral nerve of the arm whose roots originate in C6-T1 and tracks its course through the axilla, descending down the arm, initially lateral to the brachial artery then crossing the artery and becoming medially situated. It then enters the anterior compartment of the forearm via the cubital fossa. In the forearm it branches to supply the flexor muscles, then continues inferior to the retinaculum or carpal tunnel into the hand where it supplies the skin of the radial half of the palm and the lateral digits, it terminates here.

Caused by: Prolonged compression of the median nerve either at the carpal tunnel or just as likely further up the nerve pathway. A feeling of numbness or paresthesia may be felt in fingers, hand weakness, burning or tingling in thumb, index and middle fingers, pain/sensation that moves up your arm to your elbow, inability to grip objects, swollen feeling in fingers.

Trigeminal Neuralgia:

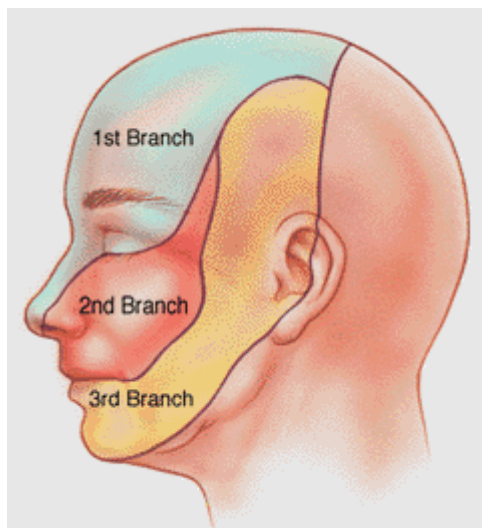


Image 3

The 3 branches of the Trigeminal nerve, the 5th cranial nerve.

Caused by: Abnormalities in the arteries of blood vessels in the face causing compression of nerve, injury to the face or surgery. Herpes Zoster also known as shingles, a viral infection affecting the nerves. Autoimmune disorders such as Lupus, Multiple Sclerosis or Scleroderma. Tingling or numbness followed by severe pain may be felt in the face, usually on one side.

Other common peripheral nerve neuropathies:

Bell's Palsy: Temporary facial paralysis due to trauma or damage to facial nerves.

Ulnar nerve palsy: Damage to ulnar nerve from illness/injury/compression causing loss of sensation to fourth and fifth finger.

Cervical Spondylosis: Degeneration of disc or bone in neck area, a prolapsed disc or bone spur may press on a nerve root coming from spinal cord, causing neck pain or radiating numbness, tingling, pain down arm.

Vestibular neuritis: Swelling of the vestibulocochlear nerve in the inner ear affecting balance, causing dizziness, vertigo, nausea, vomiting, caused by viral infection.

Intervertebral disc prolapse: Prolapsed or herniated disc pressing on a nerve coming from spinal cord at any junction in the back but most commonly L4, L5, causing pain locally or referring pain down leg.

Presentations that require neurological testing

Radicular pain is pain that radiates into the lower extremity directly along the spinal nerve root, e.g. Cervical Radiculopathy.

Paraesthesia is a pins and needles like sensation caused by compression along the nerve at some point. **Formication** is similar but feels more like insects crawling along or under the skin.

Sensations such as **Tingling, Tickling, Prickling** or **Burning** are all indications that there is nerve damage, impingement or compression.

Muscular Weakness is another indication that nerves may be damaged.

Muscular Flaccidity or **Hypotonicity** is where muscles weaken to a point that they no longer move when you want them to, resulting in a loss of mobility and becoming a form of paralysis, caused by toxins, infections to the nervous system, e.g. Polio, Botulism.

Loss of sensation or **numbness** can be felt particularly in the extremities such as hands and feet, e.g. Diabetes.

Pathophysiology of common neurological injuries/soft tissue dysfunction

Foot/ankle/lower leg injuries:

Anterior talofibular ligament sprain – full ROM in ankle limited, immobility, weakness in local area. **Syndesmosis injury** – instability in ankle, particularly in weightbearing, stiffness. **Osteochondritis dissecans of the talus** – ankle joint pops or locks, joint weakness. **Tibialis posterior syndrome** – dropped arch in foot, decrease in walking ability and balance and ache on walking long distances (5) **Calcaneal bursitis** – painful limp. **Plantar fasciitis** – stiffness in area on awakening, painful limp, initial pain on activity that wears off as warms up, occasionally numbness in outside sole of foot. Tarsal Tunnel Syndrome – Tingling, burning sensation when walking, weakened toe flexion. **Stress Fractures in Metatarsals** – pain on increased activity and weightbearing. **Pes planus** – the fallen arches position of the foot can lead to foot stiffness, uneven wearing of shoes, imbalance. **Pes cavus** – the high instep can lead to imbalance/instability of foot region, stiffness in lower leg and foot joints, can develop into hammer toes. **Medial tibial stress syndrome (shin splints)** – Increase of pain on lower shin with continued activity.

Thigh/Knee injuries:

Medial & lateral collateral ligament sprain – Instability, feeling of knee giving way. **Anterior cruciate ligament** – instability, limited ROM in knee, discomfort whilst walking. **Osgood-Schlatter's**

disease – (only applies to adolescents) bony prominence at tibia tuberosity, limping after exercise, tight muscles of thigh, quads and hamstrings. **Meniscal tears** – difficulty bending and straightening knee, knee feels locked or stuck. **Chondromalacia patellae** – pain and difficulty walking up and downstairs, particularly down. **IT band syndrome** – Pain becomes worse with activity after a pain-free start.

Hip region injuries:

Ilio-psoas strain – pulling sensation at front of hip/groin when knee pulled to chest, going upstairs or walking. **Hip dislocation** – unable to move leg, if nerve damage may not be able to feel lower leg and foot. **Inguinal hernia** – discomfort or pain in groin, especially when straining, lifting, coughing or exercising normally improving with resting, heaviness, burning or aching in groin. **Sacroiliac inflammation and dysfunction** – Feeling of leg instability, unable to sit for long periods or sitting on one side, discomfort going from sitting to standing.

Shoulder region injuries:

Shoulder dislocation – arm sitting in an extended anterior position, numbness if nerve damage. **Rotator cuff tears** – weakness when lifting or rotating arm, pain on lifting arm in certain movements and pain at rest/night-time. **Acromioclavicular injury** – inability to raise arm overhead, significant loss of function depending on extent of injury. **Impingement syndrome** – pain and weakness when lifting arm overhead. **Axillary nerve palsy** – Weak anterior deltoid and sensory loss below shoulder.

Elbow Injuries:

Lateral epicondylitis – weak grip strength, pain /weakness in forearm extensors. **Medial epicondylitis** – pain when flexing wrist palm down, pain on shaking hands, weak grip, numbness from elbow to little finger and ring finger. **Osteochondritis dissecans** – feeling of joint giving, instability, stiffness.

Wrist and hand injuries:

Colles' fracture – wrist hangs in odd or bent way. **Carpal Tunnel Syndrome** - A feeling of numbness or paraesthesia may be felt in fingers, hand weakness, burning or tingling in thumb, index and middle fingers, pain/sensation that moves up your arm to you elbow, inability to grip objects, swollen feeling in fingers. **De Quervain's disease** – pain when extending thumb. **Mallet finger** – end of finger is bent and won't straighten due to torn or damaged tendon.

Back and neck injuries:

Torticollis – common term for various conditions of head and neck dystonia, results in fixed or dynamic posturing of head and neck in tilt, rotation and flexion (6). **Spondyloysis** – broad descriptive term, not clinical diagnosis, meaning pain and degeneration anywhere in the spine, e.g. disc degeneration or osteoarthritis (bone degeneration). **Spondylolisthesis** – A vertebrae slides forward out of place, most common in lumbar vertebrae - back, buttock, leg pain on twisting or bending, if compression of nerve occurs, numbness or weakness in legs. **Ankylosing Spondylitis (Bechterew's disease)** – stiffness in back caused by inflammation and fusion of vertebrae, impaired breathing if ribs affected, blurred vision if eyes affected, heart problems if aorta is affected. **Scoliosis** – Lateral C or S curve in spine, uneven shoulders and pelvis, reduced ROM, change in walking pattern, impaired breathing. **Kyphosis** – Exaggerated outward curve of thoracic spine, stiffness in upper back and pain in lower, head in a forward position. **Lordosis** -exaggerated inward curve usually of the lumbar region of back, back pain, if nerve compression, possible numbness down legs.

Spinal Stenosis - narrowing of spinal canal, usually in cervical or lumbar spine, tingling, numbness, weakness from lower back into buttocks and legs.

Importance of referral for neurological testing

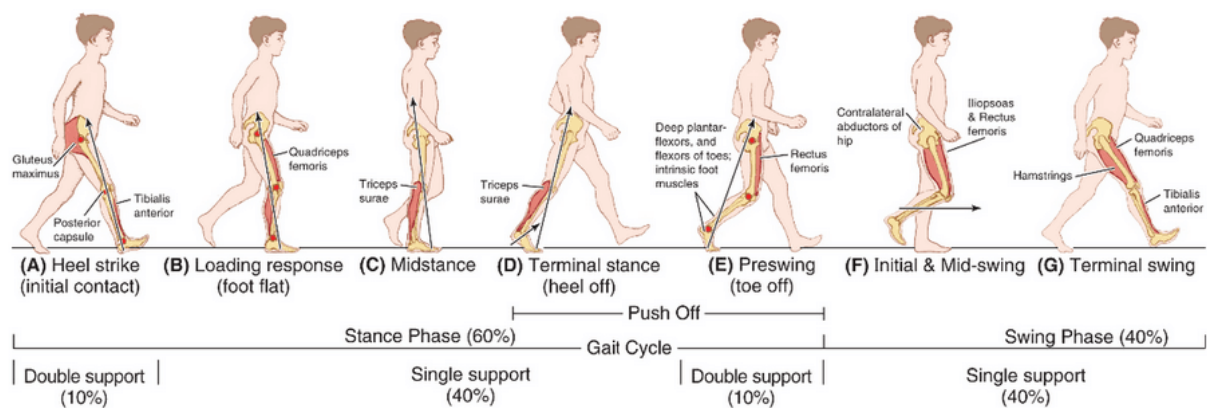
On objective testing client may feel radiating pain or paraesthesia, in fact that may be the reason they have come to you. However, the aim is to keep all treatment pain free, if their pain is increased or aggravated by your testing, even with modifications such as slowing down and reducing pressure, it is impertinent that they see their doctor who can refer them to a neurologist. Anything that is outside your scope of practise should be referred out. Similarly, if their nerve function does not fit the specific peripheral nerve pattern, it could be a case of neuropathy that would need to be investigated by a medical professional.

On a specific test such as the slump test, where disc pathology may be present and acute it is important to refer out if it is positive. Anything that requires medical intervention is a red flag. Whilst yellow flags deal more with the person's attitude and beliefs towards their particular situation, they may still need referring out if they are progressing to long-term distress, disability and pain.

Sports specific posture and gait

Gait Cycle

The gait cycle is the continuous repetitive pattern of walking or running. One gait cycle is equal to one stride. The gait cycle is divided into 2 phases, **stance phase**, the phase where the foot stays in contact with the ground and **swing phase**, the phase where the foot leaves the ground. The **stance phase** is further divided into four categories as displayed in image 5 below. The swing phase can be divided into three categories as displayed below.



Methods used to analyse gait

Older: motion capture systems on treadmills – unreliable, believed to encourage gait adaptations that would not be present in overground gait. Pressure mats, force platforms, Non-wearable sensors NWS

Newer methods: wearable sensors WS (small portable sensors) accelerometers, electrogoniometers, gyroscopes, and in-sole pressure sensors.

Effect of foot deformities on gait

Hallux valgus – commonly called a bunion, a deformity at the base of the big toe joint in which the big (hallux) is deviated or points towards the lesser toes. **Effect:** overpronation due to instability of big toe region. Degraded toe off.

Hammer Toe – deformity of the toe or toes where the end of the toe is bent downwards, it is a contracture of the MTP joint, dorsiflexed PIP, and plantarflexed MTP. **Effect:** Loss of balance and adjusted gait to compensate.

Achilles tendonosis – pain on resisted plantar flexion. **Effect:** pain on heel strike, decreased propulsion on toe of on affected side .

Gait Abnormalities

Myopathic gait – weak pelvis girdle muscles, either on one side leading to a drop on the contralateral side whilst walking or if both sides are weak a waddling walk will develop.

Neuropathic/equine gait – weakness of foot dorsiflexion leads to foot drop and to prevent foot dragging on ground the leg is lifted high.

Hemiplegic gait – unilateral weakness on affected side. Circumduction of affected leg and foot drop, weaker distally.

Stomping/stamping gait – Lack of awareness of body in space, poor proprioception, leading to heavy stomping gait, the person slams the foot hard into the ground in order to sense it.

Parkinsonian gait – universal flexion, every joint flexed and very small steps known as “marche a petit pas.

Effects of postural deformities on sporting performance

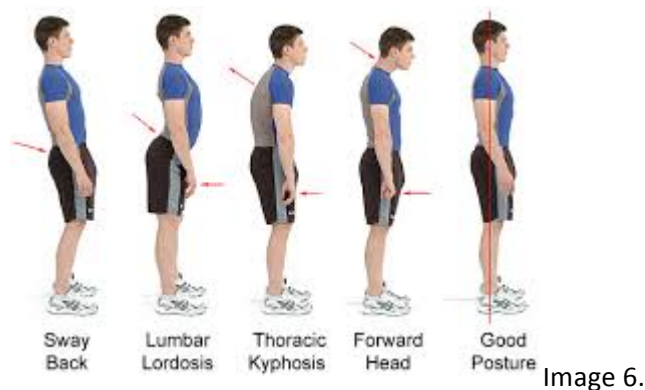


Image 6.

The postural deformities presented in Image 6 above are among the most common postural deformities we see in the modern population.

- These can lead to inefficient movement, leading the athlete to move more in order to compensate for his poor posture, leading to more energy expended and hence tiring quicker.
- Prolonged overload on inefficient or weak positions is more likely to lead to injury.
- Endurance capacity is restricted, as trunk muscles used in respiration may be compromised by poor posture. (8)

Principles of sports specific posture analysis

- To achieve healthy aligned static posture first, once established can adopt the healthy habits during dynamic posture.
- Then assess whether sportsperson can move in efficient and safe manner when completing dynamic movements such as changing direction at speed, jumping, landing.
- Assess how major muscles groups impact on personal performance.

The principles and practice of complex assessment methods for sports massage

Range of complex assessment methods

Visual observation – observing how client holds themselves in static and functional movement patterns, such as gait analysis, squats, lunges and balance. The visual test can be enhanced using a postural grid chart.

Active and Passive and Resisted ROM tests – first observing how the client moves unaided through their range of motion. Passively assisting then to find their true range of motion. A goniometer can also be used to measure joint ROM.

Special tests – these are special regional orthopaedic tests used to isolate a specific condition, such as Anterior Drawer Test for knee, Thomas Test for hip flexors and Slump Test for lower back.

Palpation – initial palpation can detect tissue dysfunction and anomalies.

Potential impact of yellow flags on prognosis

Yellow flags are psychosocial indicators that suggest the risk of developing or perpetuating long term disability leading to work loss or change of lifestyle.

They are particularly pertinent with regards to back pain, where the client's **beliefs, appraisals** and **expectations** can have a direct impact on their recovery outcome.

These may be **unhelpful beliefs** about pain, believing it to be harmful or disabling so avoiding any functional movement, further impacting on their road to recovery as muscles become more locked down and stiff. **An appraisal** that the injury is uncontrollable and inevitable and likely to worsen with any activity also acts like a road block to a successful outcome. **Expectation** of poor treatment outcome and a delayed return to their regular lifestyle perpetuates these beliefs.

Emotional responses, such as worry, fear and anxiety can lead to low mood and social withdrawal. This isolation coupled with low mood can lead to overeating and further inactivity and therefore potentially delay any recovery further.

The **expectation** for passive treatment and an over reliance on this rather than take an active participation in their recovery is something the therapist must be aware of as a healthy outcome is less likely if the client does not become actively involved in their own recovery.

Red flags and the importance of urgent medical referral

Red flags are clinical indicators used to assess whether there is a possible serious underlying pathology, such indicators on physical examination could be:

- Unexplained deformity/swelling
- Significant weakness not due to pain

- Suspected malignancy
- Fever
- Sensory/motor deficit
- Recent trauma
- Unexplained weight loss

Any of these indicators are potentially serious and outside the scope of practice for the massage therapist and therefore it is imperative to refer out to a medical practitioner.

However, a recent review looked at the effectiveness of using red flags to screen for malignancy in the low back pain population. The review assessed 8 cohort studies that specifically addressed 11 red flags in the patient's subjective interview and physical examinations. Conclusion of the 8 studies which looked at over 6,000 patients, the symptom of low back presented as a more serious pathology less than 1% of the time. (9)

Process of clinical reasoning and stages of problem solving

On observation, assessment and integration of information provided by the client, the therapist can start the cognitive process of understanding the client's needs and manage their diagnosis through their own clinical reasoning.

Clinical reasoning is a thought process that guides practice and leads to the stages of problem solving.

Stages of Problem Solving:

- Evaluation
- Test interpretation
- Treatment planning
- Re-evaluation (10)

Bibliography/Reference List

- (1) Mercke Manual, Philip Lowe, MD, Mayo Clininc College of Medicine.
- (2) University of California, San Francisco.
- (3) PubMed, How Chemotherapy damages the Central Nervous System, Christina A Meyers
Apr 2008
- (4) *Neurology in Clinical Practice* . 5th ed. Philadelphia, Pa: Butterworth-Heinemann; 2008:chap 33.
- (5) Mann RA. Acquired flatfoot in adults. *Clin Orthop Rel Res* 1983;181: 46-51. [[PubMed](#)]
- (6) Medscape Updated: Jul 08, 2016 Author: Michael C Kruer, MD; Chief Editor: Selim R Benbadis,
MD
- (7) Department of Exercise Science, Gonzaga University, Spokane, WA
- (8) *European Journal of Applied Physiology*. 99(5):457- 66. (2007)
- (9) 2013 Cochrane Review Nicholas Henschke, Christopher G. Maher, Raymond WJG Ostelo,
Henrica CW de Vet, Petra Macaskill, Les Irwig 28 February 2013
- (10) *Clinical Reasoning for Manual Therapists*, Saurab Sharma, MPT