Pathologies from Sitting

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Outline

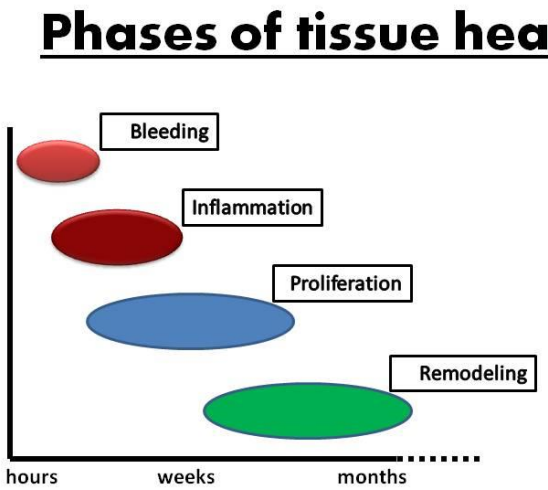
- Gain awareness on what goes wrong within our musculoskeletal system with prolonged sitting
- Understand the link between poor posture or poor ergonomics with common injuries related to the spine and hip.
- Introduce and gain understanding of common repetitive strain injuries in the office.
- How can the body heal itself from these injuries?
- How can prolonged sitting effect important systems in the body, such as the cardiovascular and endocrine system.

The Dangers of Prolonged Sitting

- Humans are built to stand upright. Your heart and cardiovascular system work more effectively that way.
- When you are physically active, on the other hand, your overall energy levels and endurance improve, and your bones maintain strength.
- Physical inactivity contributes to over three million preventable deaths worldwide each year (6% of all deaths). It is the fourth leading cause of death due to non-communicable diseases.

The Healing Process

- The bleeding phase is short and not always present depending on the extent of the injury.
- The inflammatory phase starts a few hours after injury and can continue for days. Inflammation is an essential part of the healing process.
- Scar tissue is then laid down in the proliferation stage. Cells called fibroblast are called to the area and lay down collagen. This initial collagen tends to be weak and is laid down in a haphazard manner with random orientation.
- During the remodelling phase stronger collagen replaces weaker collagen fibres and re-aligns fibres according to the areas of stress.



Stages of Healing

Stage1:The Acute Stage. (Day 1-3)

Immediately after an injury, inflammation occurs. Inflammation is characterized by pain, swelling, and redness that happens at the injury site. This natural response by the body is its way of protecting the injured part of the body and releasing chemicals that will help with the pain and discomfort. Scar tissue also starts to form at this stage of healing.

Stage 2: The Sub Acute Stage. (Day 4 - 3 Weeks)

In this stage the body starts to grow more tissues and starts repairing what was damaged. Mild exercises when done right can help to strengthen the damaged area.

Stage 3: The Chronic Stage (3 Weeks –Weeks, Months or Years)

The area that sustained injury is now well into healing and scar tissue has now been modified by the body. By this point, people usually will not feel any more pain, except when overusing the joint.

The Musculoskeletal System

Office related Repetitive Strain Injuries

- RSIs arise from arm and hand movements such as bending, straightening, gripping, holding, twisting, clenching and reaching.
- These common movements are not harmful in the ordinary activities of daily life.
- The risk in work situations is the continual repetition and lack of recovery time.
- RSIs associated with work patterns include:
  - Fixed or constrained body positions.
  - Continual repetition of movements.
  - Force concentrated on small parts of the body, such as the hand or wrist.
  - A pace of work that does not allow sufficient recovery between movements.
- Generally, none of these factors acts separately to cause injury but commonly occur as a result of a combination and interaction among them.

3 Types of Injuries

- Muscles
- Tendons
- Nerves

1. Muscles

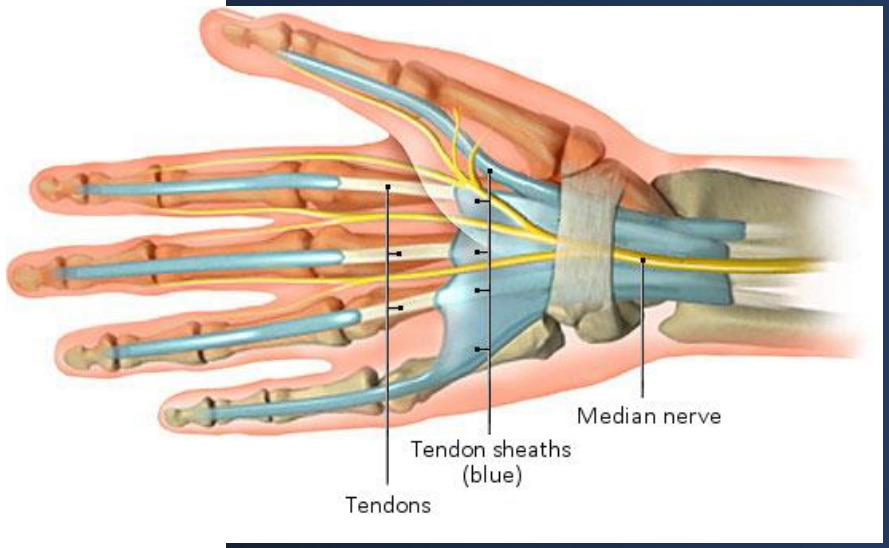
When muscles contract, they use chemical energy from sugars and produce by-products such as lactic acid which are removed by the blood.

A muscle contraction that lasts a long time reduces the blood flow as it puts pressure of its capillaries and these substances produced by the muscles are not removed fast enough.

The accumulation of these substances irritates muscles and causes pain. The severity of the pain depends on the duration of the muscle contractions and the amount of time between activities for the muscles to get rid of those irritating substances.

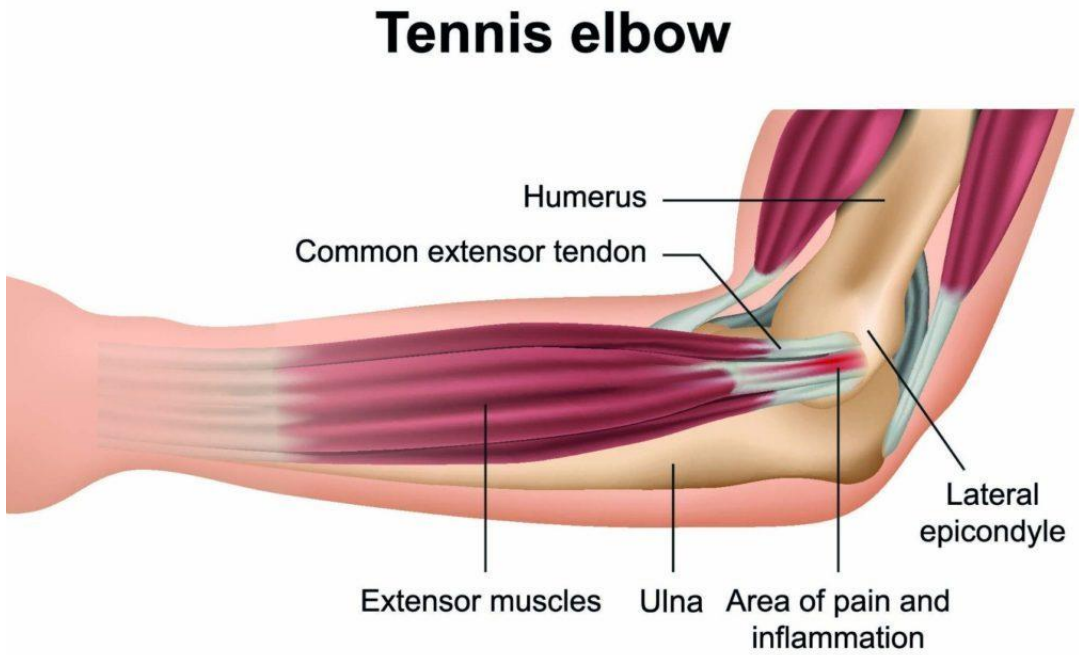
2. Tendon

- Tendons are bundles of fibres attaching muscle to bone. They are less elastic than muscle to maintain stability and limit extreme movement whilst providing attachment to the muscle.
- Tendons can either be surrounded by a sheath such as in the hand and wrist or without (elbow and shoulder).
- Repetitive strain can irritate both the tendon sheath or the tendon fibres themselves resulting in pain.



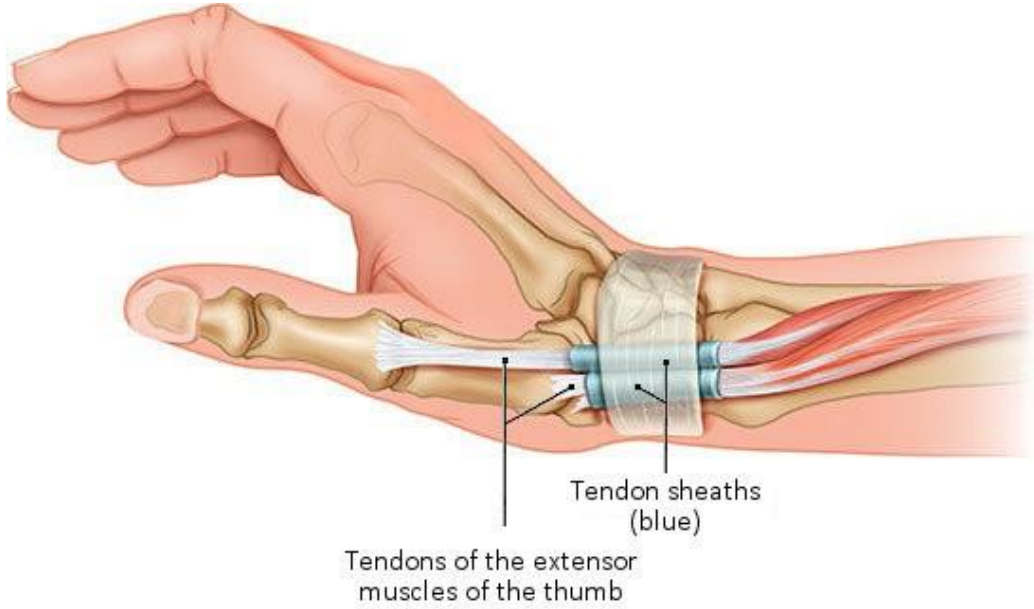
Tendonitis

- Tendons without sheaths are vulnerable to repetitive motions and awkward postures. When a tendon is repeatedly tensed, some of its fibres can tear apart. The tendon becomes thickened and bumpy, causing inflammation.
- Tendonitis is the general term indicating inflammation of the tendon.



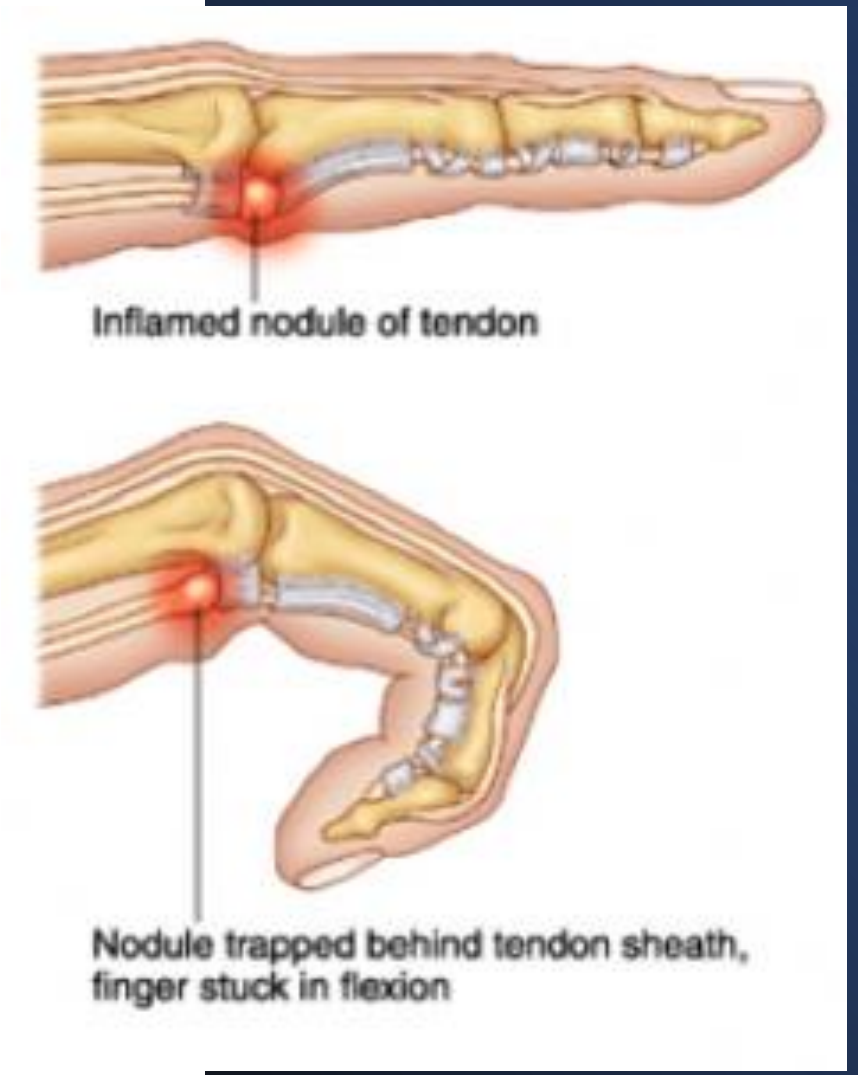
Tenosynovitis

- If the tendon sheath is overused it can become inflamed and swollen.
- It is a very painful condition most commonly affecting the hands, wrist, thumbs and feet. Pain starts on movement and if left untreated resting pain is also common.
- Tenosynovitis can cause the sheath to become too narrow, making it hard to move the affected area freely. If it affects the wrist or thumb, it’s known as De Quervain’s tenosynovitis.



Trigger Finger

- An untreated tenosynovitis in the fingers can develop ‘trigger finger’. Overuse causes the tendon to become inflamed and swollen so that it “catches” on the tendon sheath where it crosses over a joint. If left untreated this inflammation can develop into a small nodule in the tendon which causes the finger to get stuck in a bent position and then suddenly straighten with a painful pop.

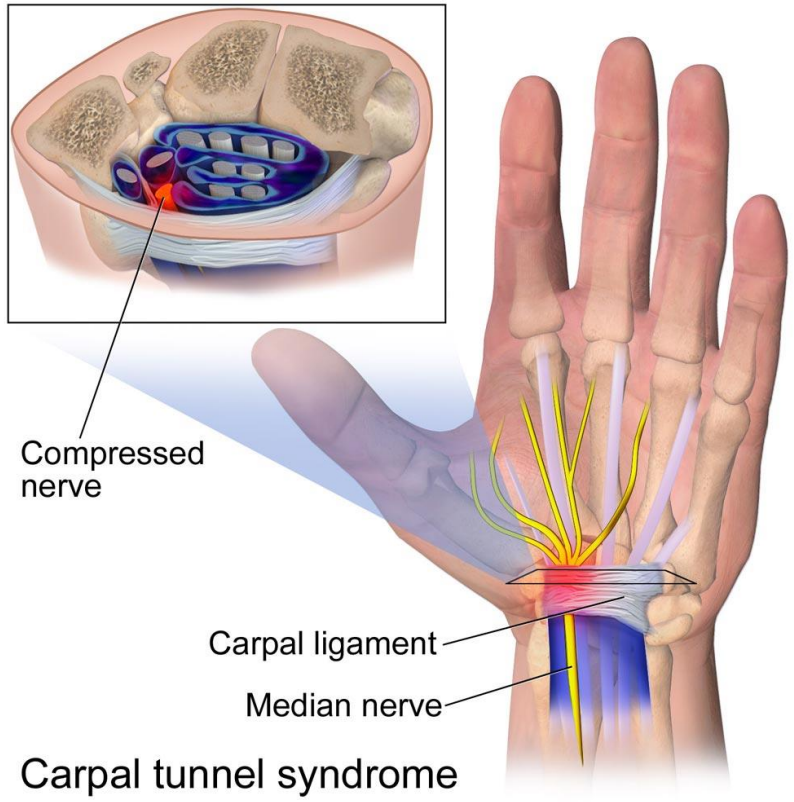


Bursitis

- In some cases, such as in the shoulder, tendons pass through a narrow space between bones. A sac called the bursa filled with lubricating fluid is inserted between the tendons and the bones as an anti-friction device. As the tendons become increasingly thickened and bumpy, the bursa is subject to a lot of friction and becomes inflamed. Inflammation of the bursa is known as bursitis.

3. Nerves

- Nerves carry signals from the brain to control activities of muscles. They also carry information about temperature, pain and touch from the body to the brain, and control bodily functions such as sweating. Nerves are surrounded by muscles, tendons, and ligaments. With repetitive motions and awkward postures, the tissues surrounding nerves become swollen, and squeeze or compress nerves.
- Compression of a nerve causes muscle weakness, sensations of "pins and needles" and numbness.



Carpal Tunnel Syndrome (CTS)

- Carpal tunnel syndrome corresponds to compression of the median nerve through the wrist. This nerve provides sensation to the thumb, index, long and half of the ring finger.
- The carpal tunnel is an area between the carpal bones and the annular carpal ligament. The median nerve passes through this channel together with the 9 tendons of the fingers.
- Any condition that makes the area inside the carpal tunnel smaller or increases the size of the tissues can lead to symptoms of CTS.
- The carpal tunnel cannot expand so any condition that causes abnormal pressure in the tunnel can produce symptoms of CTS.
- Any increase in pressure within the carpal tunnel can reduce blood flow to the nerve, leading to loss of nerve function.

Neck Pain

Neck Pain

- Normal neck in the general population, affects up to 67% of the general population at some time during their life. Neck pain may arise from any of the innervated structures in the neck, such as intervertebral discs, muscles, ligaments, facet joints, dura or nerve roots. However, in most cases, the pathophysiological mechanisms are a mix. Such "non-specific" neck problems are costly in terms of disability and work loss. Estimates indicate that the economic consequences of treating disabling chronic neck pain are significant.

- Many studies have investigated the relationship between neck pain and working conditions. Research has identified that office workers are a specific population at high risk of developing neck pain, with one year prevalence rates much higher than in the general population.

- Physical risk factors such as prolonged sitting and neck flexion have been identified as the major risk factors of neck pain.

Risk Factors

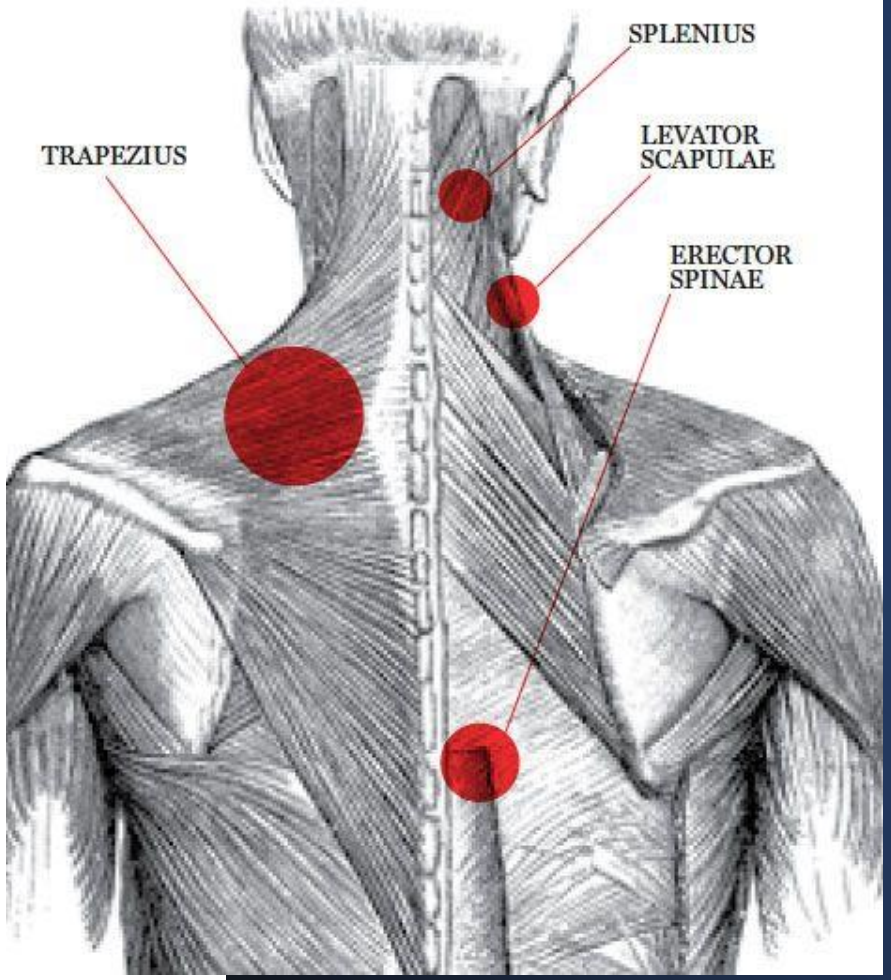
- **Gender**: Females
- **Age**: Up to 50 years
- **Exercise frequency**: Exercising at least 3 times a week may reduce the risk of developing neck pain by 1.5 times. The lower the mobility the higher the risk.
- **Prolonged sustained posture**: Holding the neck in a semi-flexed position for a long duration increases the risk of developing neck pain. Prolonged sitting posture affects the natural curvature of the spine, while also increasing the pressure on vertebral discs, ligaments, and muscles.
- **Workstation design and sitting posture/ ergonomics**
- **Psychological stress**: Slightly elevated stress levels can increase the risk of developing neck pain by 1.6 times.

Work Station

- The height and the distance of the computer monitor, chair, and desk has a direct impact on neck pain.
- The chair influences the pressure distribution and the curvature of the spine, which may lead to increased pressure through the vertebral bodies, compensation, muscle fatigue and asymmetry.
- If the monitor is too far away, the individual is required to extend their neck forwards and slouch to see better.
- When the arms aren't supported on the armrests or the desk it provides an excess load on the neck and scapula stabilizers leading to muscle fatigue and strain.
- The sustained position of the neck also fatigues or strains the neck muscles.
- The angle of the gaze also affects the neck position - whether the neck is extended or slightly flexed.

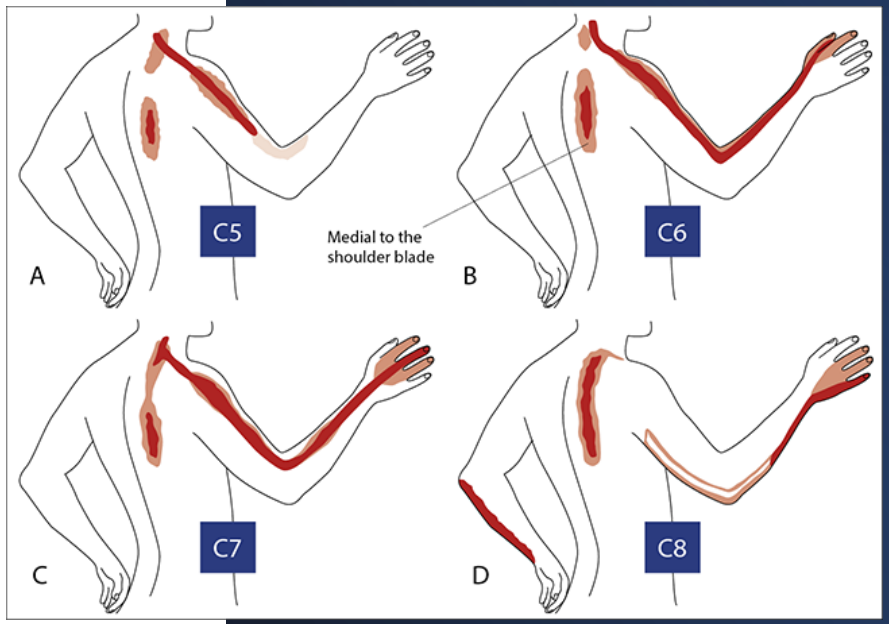
Muscular Neck Pain

- Often making the same movements per minute is significantly associated with neck pain. When performing work with the hands and fingers, the muscles in the neck/shoulder region must usually act as stabilizers. Static contraction of the trapezius and other shoulder muscles is needed to keep the arms at right angles, a necessary posture when using the keyboard. This contraction is accentuated when there is also rotation or bending of the neck when the computer screen is placed to the side of the worker, not in front which is the recommended position.



Radicular Neck Pain (nerves)

- Radicular neck pain arises when a nerve root in the cervical spine becomes inflamed or damaged, resulting in a change in neurological function. Symptoms are usually numbness, altered reflexes, or weakness and may radiate anywhere from the neck into the shoulder, arm, hand, or fingers.



Psychological Stress

- Different work-related psychosocial factors showed an association with neck pain. Factors such as mental tiredness at the end of the day and shortage of personnel are related to neck pain. Shortage of personnel may be an indirect reflection of work (over) load. Breaks are important as they allow a reduction in computer exposure and permit muscle relaxation.

Headaches

Headaches are a common complaint in office workers due to prolonged computer exposure. Eye strain is a common cause due to work for long hours on the computer.

1. Tension Headaches- Caused by both physical and emotional stress. This type of headache occurs due to spasm of the muscles around the head due to stress. The affected person suffers from tight band like sensation over the head. The site of pain is vague.
2. Migraines- an intense one-sided throbbing headache comes with dizziness, nausea, light sensitivity, visual disturbances, and difficulty thinking and concentrating that can halt whatever activity the sufferer is engaged in when it occurs. Each episode lasts several hours to days. Prolonged computer exposure, flickering bright lights and noise may be triggers to migraines.

Headache -or- Migraine

Pain around forehead

Mild, dull pressure

Incidental, non-recurring

Typically short-lived

Not usually accompanied by other symptoms

Treatable with medicine, rest, and water

Pain on sides of head

Intense, pulsing, or throbbing

Can last for DAYS

Nausea and dizziness

Flashing lights and blind spots

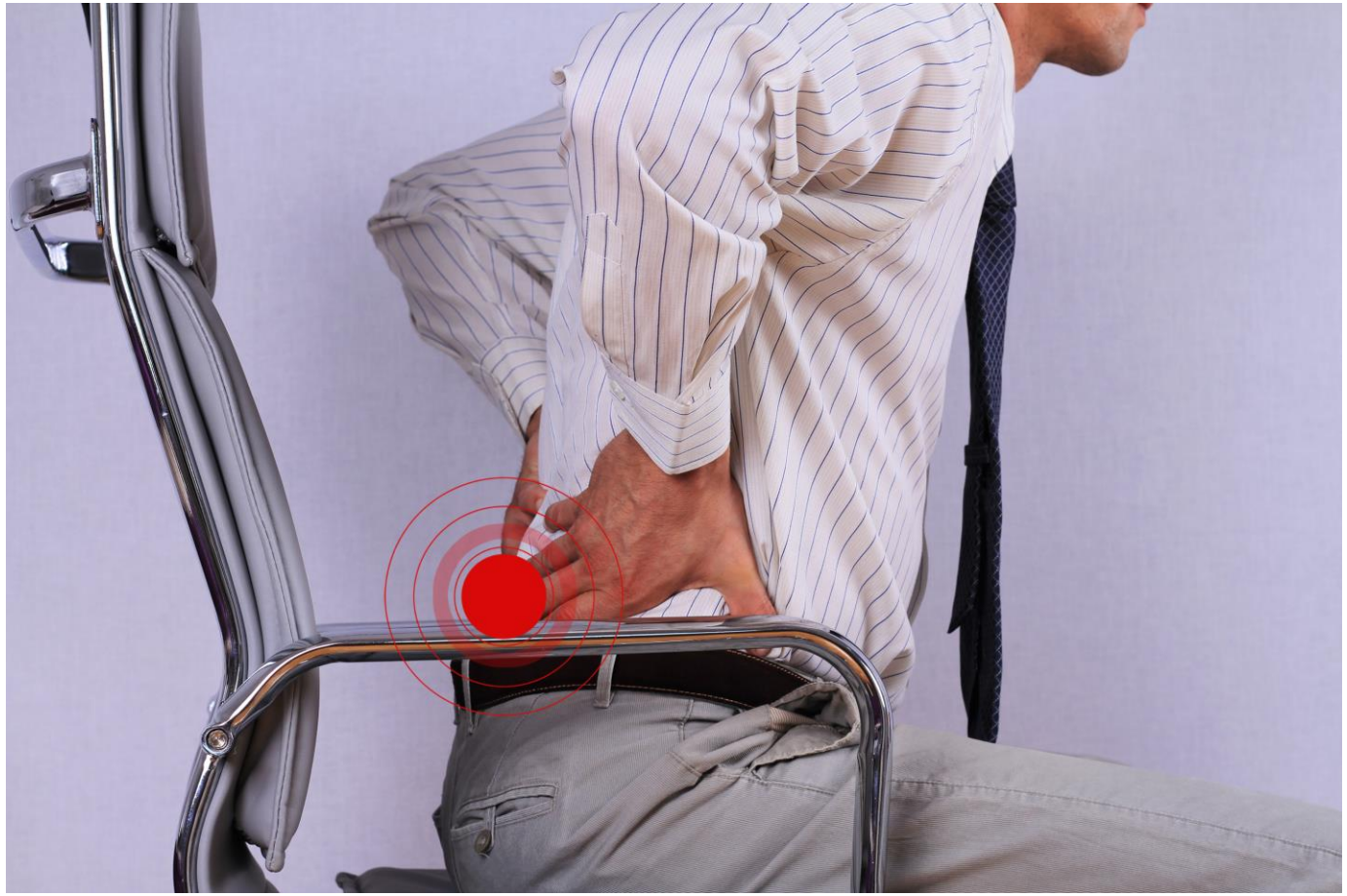
Commonly recurring

Headaches can be a symptom of illness

Migraines ARE the illness

AXONOPTICS
therapeutic eyewear

Low Back Pain



Low Back Pain

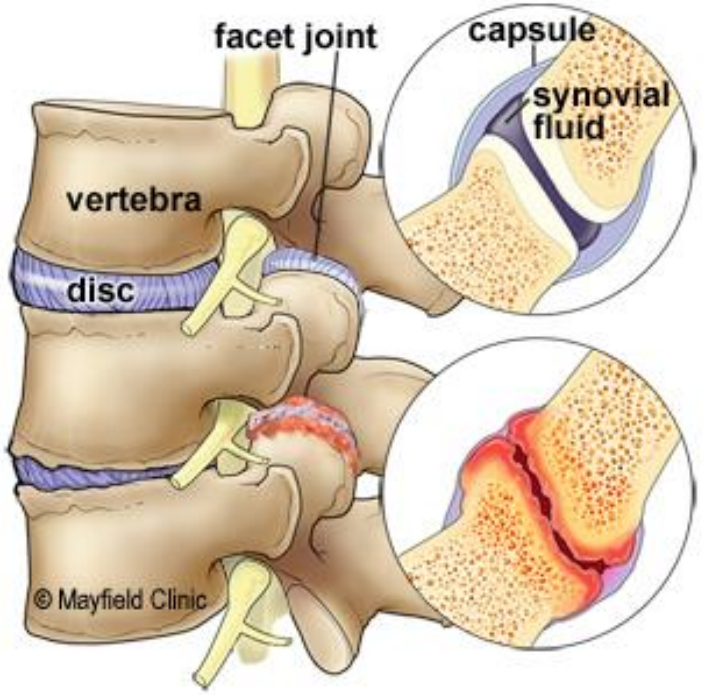
- Low back pain is possibly the most common causes of musculoskeletal disorders related to office work. In Europe, 30% of the general worker population, namely 44 million workers suffer from LBP. The loss of 600 million working days annually, lower production rates, the financial compensation of the injured workers, and the cost of hiring and training new personnel are only a few of the consequences of LBP.
- Common factors for LBP include:
  - Sitting time
  - Body position in sitting
  - Chair type and adjustments
  - Body position and distance away from screen
  - Job repetitiveness
  - Job stressors and satisfaction

Main Areas of Dysfunction

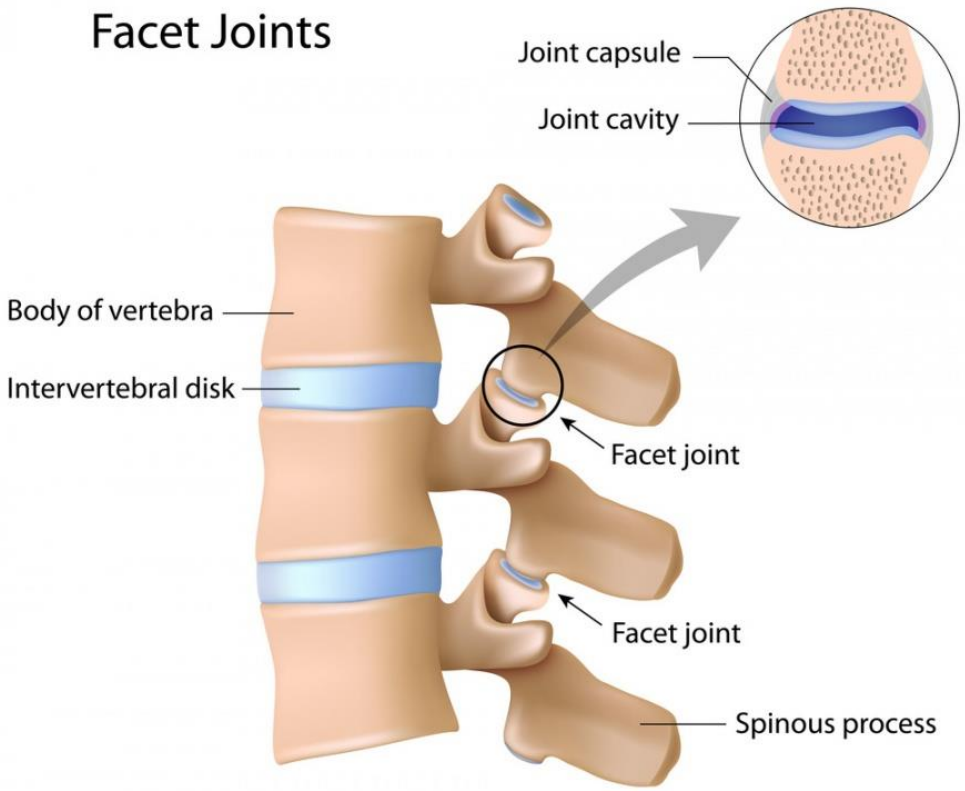
- Joints
- Discs
- Ligaments
- Muscles
- Nerves

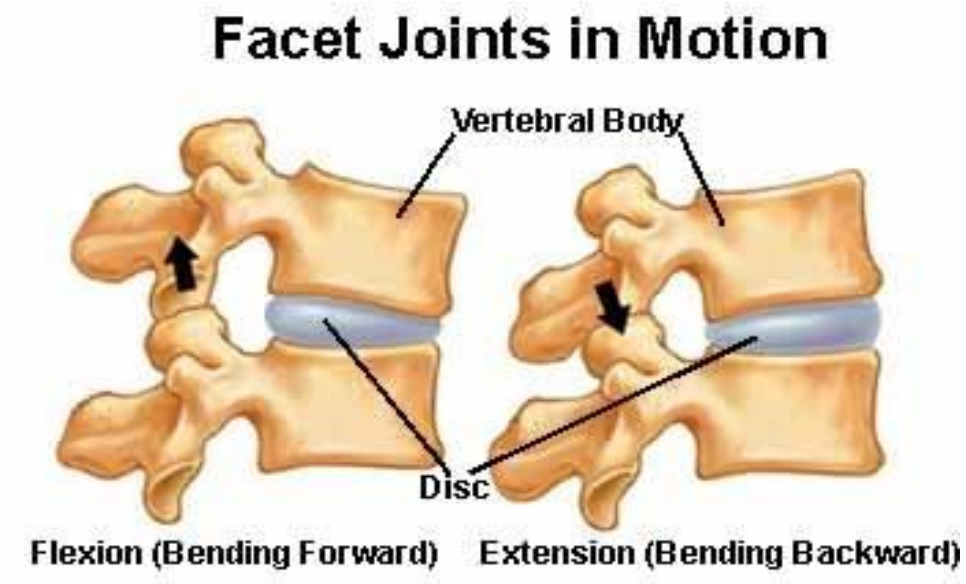
Pathology and Dysfunction

- Facet joints are synovial joints enclosed in a capsule supported by ligaments. Mechanical stresses on these joints cause development of dense fibrous tissue and hence begin to restrict movement.
- A common problem is a locked-back mechanism when entrapment of these capsules occurs.
- Common injuries-
  - Facet sprain as a history of trauma resulting in swelling of the joints, muscle guarding and pain
  - Arthritis – OA and RA resulting in decreased mobility and compensatory movement
  - **Postural impairment.**



Facet Joints

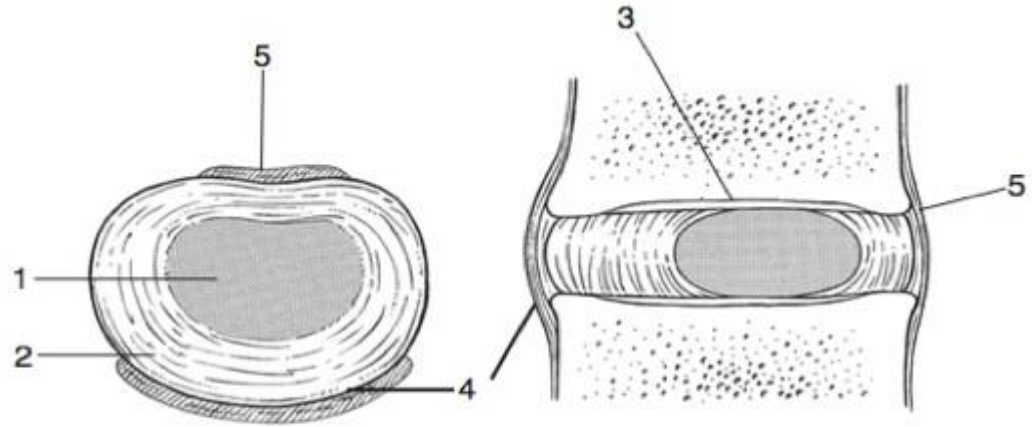




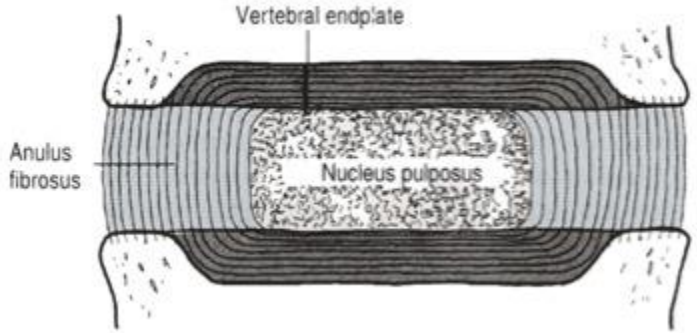
- Facet joints allow for the extension and flexion of the spine.

Retrieved from Spine Universe, 2022

Intervertebral discs



The intervertebral disc: 1, nucleus; 2, annulus; 3, cartilaginous endplate; 4, anterior longitudinal ligament; 5, posterior longitudinal ligament.

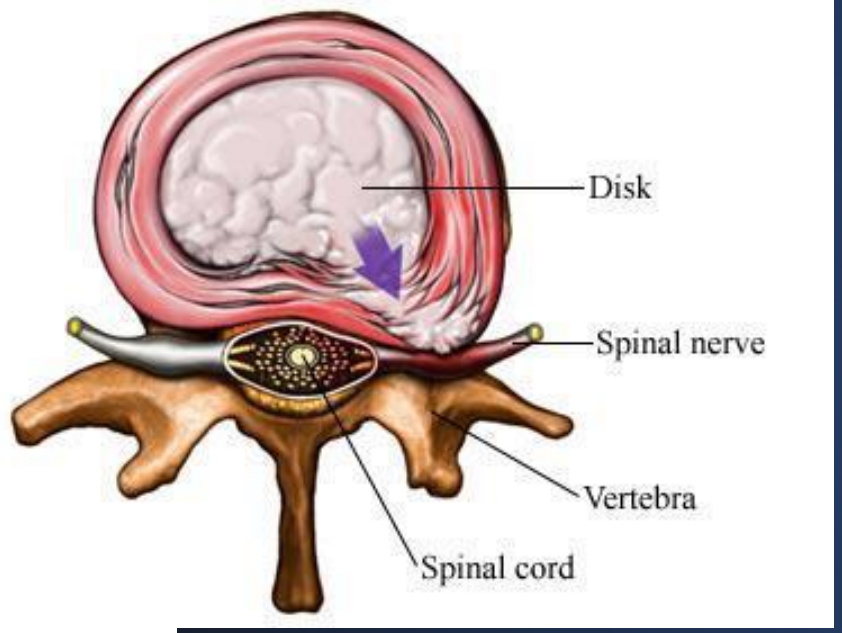


- The IVD is the main joint between one vertebra and the next. It is made up of fibrocartilage allowing flexibility to the spine without a great deal of strength.
- A secondary function is it acts as a shock absorber to decrease grinding of vertebrae together.

Retrieved from Physiopedia, 2022

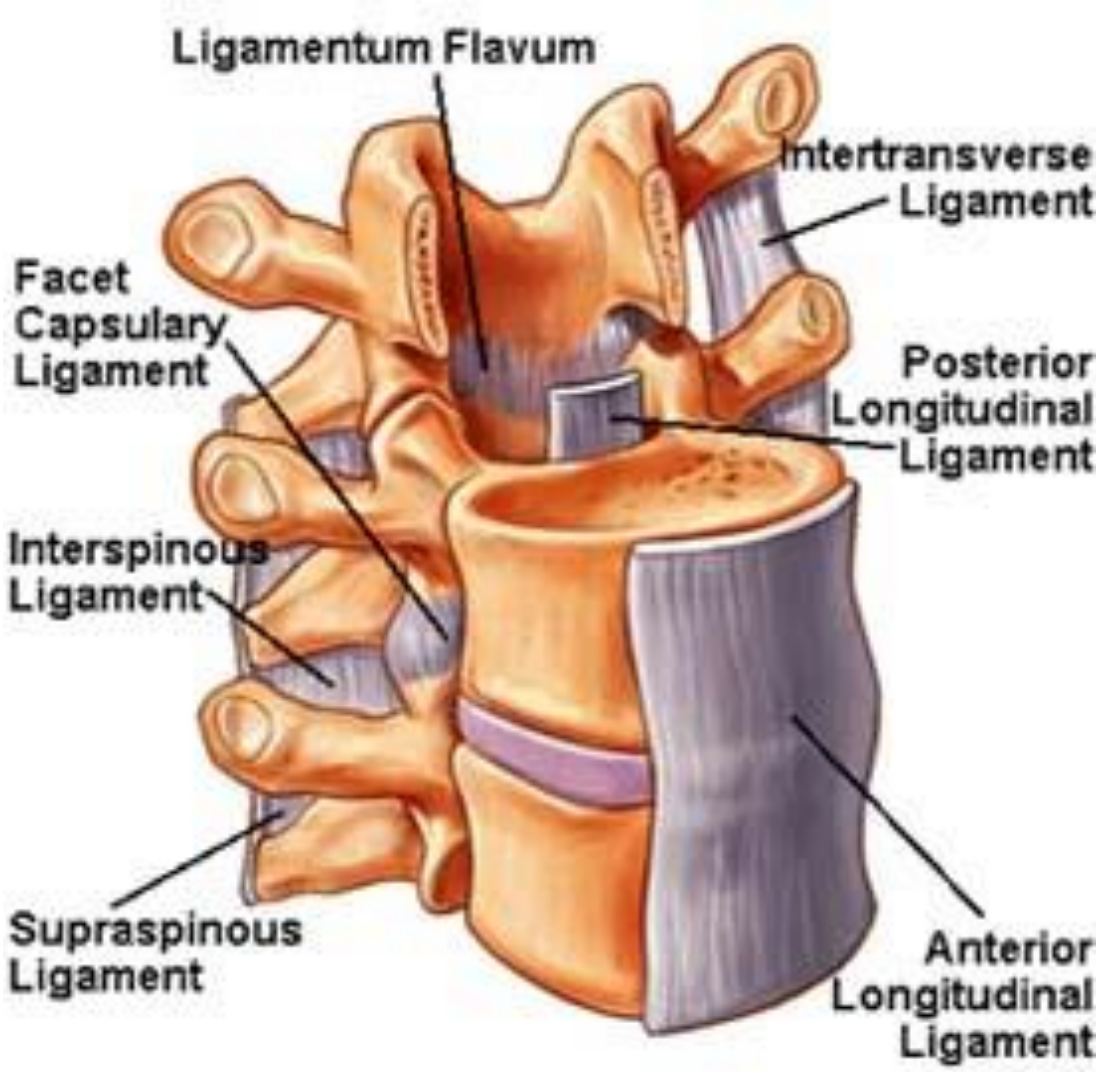
Pathology and Dysfunction

- Fatigue Loading and traumatic rupture.
- Over time the annulus will break down as a result of overloading of the spine in a flexed or rotated positions.
- The annulus becomes distorted and the fibrous layers begin to separate from each other leading to tears. The nuclear material leaks out of these tears/fissures pressing on the nervous tissue.
- Healing is very limited due to the poor circulation in the discs.



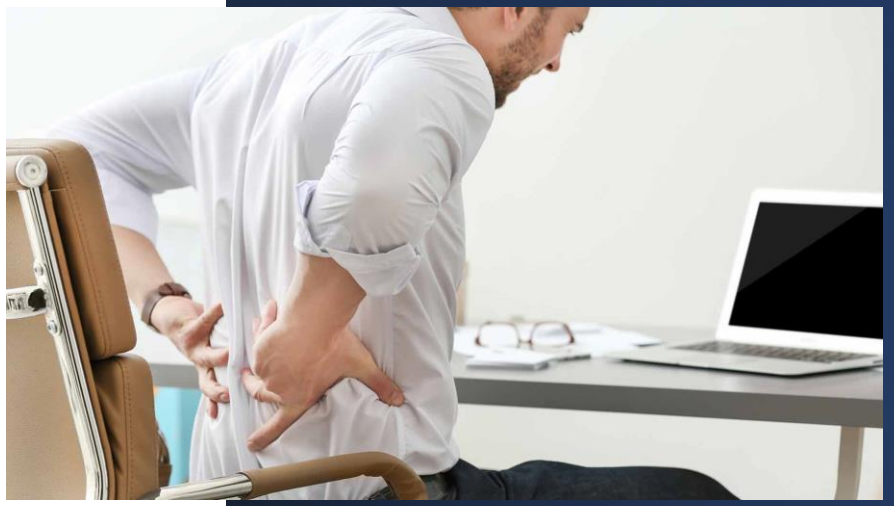
Ligaments

- **Three major ligaments :**
  - The Ligamentum Flavum forms a cover over the dura mater: a layer of tissue that protects the spinal cord. This ligament connects under the facet joints to create a small curtain over the posterior openings between the vertebrae.
  - The Anterior Longitudinal Ligament attaches to the front (anterior) of each vertebra. This ligament runs up and down the spine (vertical or longitudinal).
  - The Posterior Longitudinal Ligament runs up and down behind (posterior) the spine and inside the spinal canal.



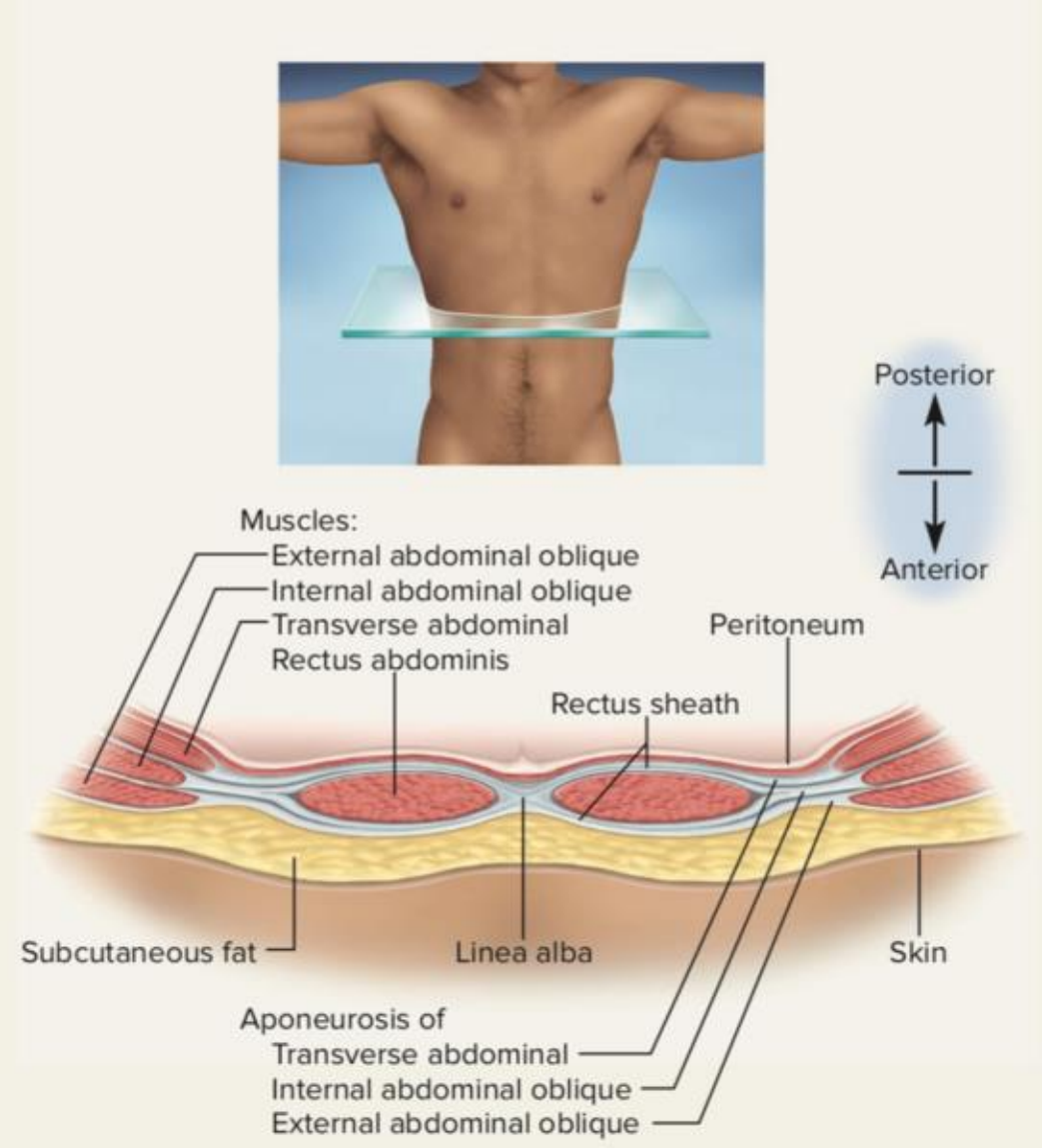
Spinal Ligament Strains

- Types of jobs that are the worst for back and ligament strain include office workers, nurses, manual laborers, construction and factory workers, dentists, drivers, and mechanics.
- Another source of ligament damage is poor posture. Slumping over while standing for long periods of time is the result of muscle fatigue. Slumping over places the entire weight of the body on certain regions of the spine which affects the pressure on the ligaments. The ligaments overstretch and become weakened. Muscles compensate causing walking and posture to become more abnormal. Standing becomes even more difficult and painful.
- Workplace hazards such as lifting items repeatedly or lifting heavy objects incorrectly as well as computer work with poor posture all contribute to muscle and ligament damage which over time may become permanent.



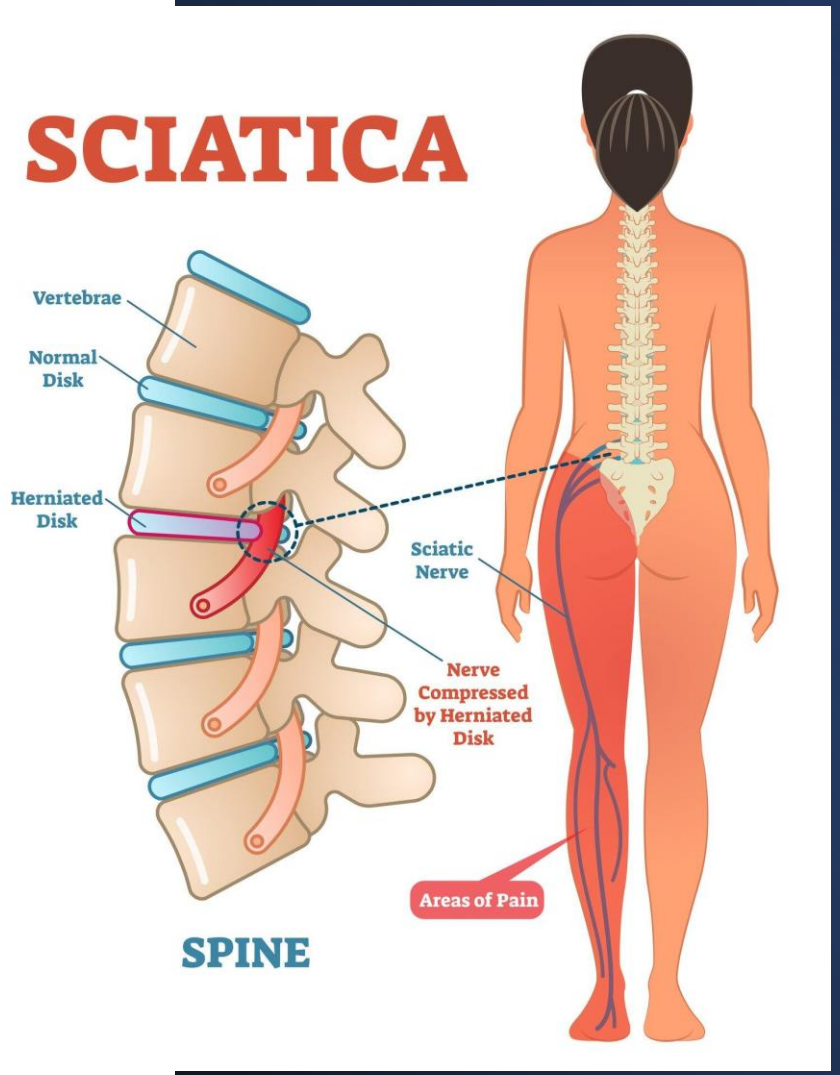
Spinal Muscles

- The muscles of the spine do not only act as prime movers but also as primary stabilisers of the spine against dynamic movement and by gravity.
- The upright posture cannot be maintained without dynamic stability.
- The nervous system controls neck and trunk muscles via the peripheral and central mechanisms as a response to fluctuating forces and activities.
- Most muscle fibres are type I (slow twitch oxidative fibres) rather than type II (fast twitch) reflecting the postural and stabilisation function.
- Inactivity changes the muscle type composition leading to decreased function.



Nerve Pain

- Nerve pain in the arms or legs coming from the spine is referred to as radiculopathy. The symptoms are usually in just 1 of the extremities.
- Symptoms of radiculopathy include:
  - Pain that radiates
  - Loss of sensation
  - Decreased muscle strength
  - Loss of Reflexes
- A common form of radiculopathy is sciatica. This causes sharp and burning lower back pain, accompanied by pain through the buttocks and down one leg. Pain normally goes down up to the heel or big toe.

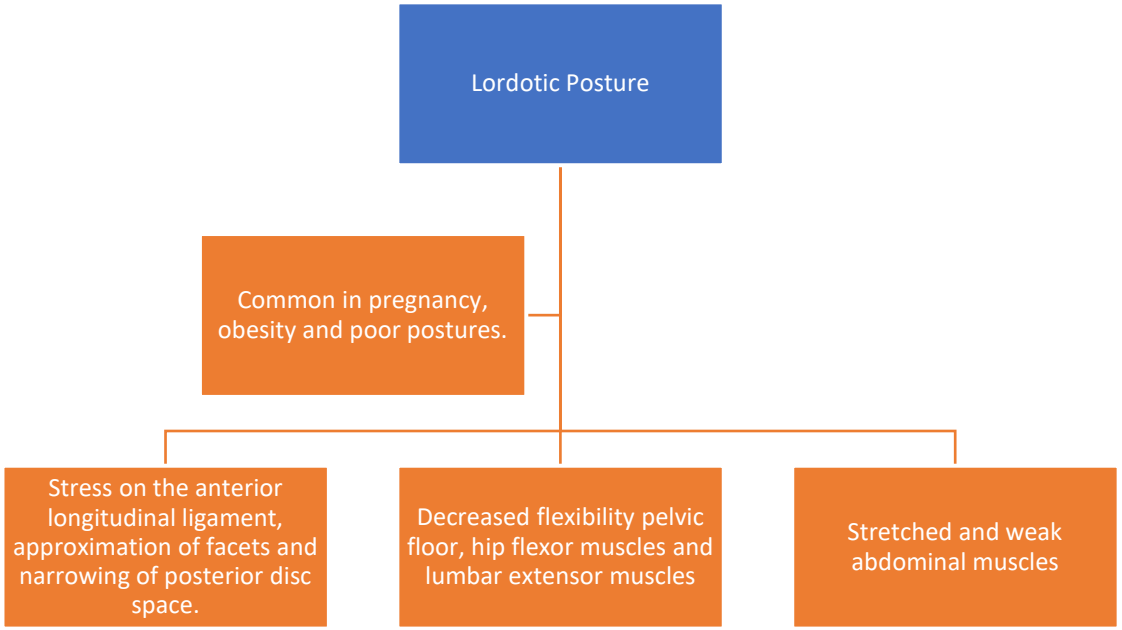


Postural Impairments and Hip Issues

Fault vs dysfunction

- A **postural fault** is a deviation from the normal alignment with no structural limitation. If a person maintains this posture pain may develop – e.g. slouching. The pain is removed with activity or movement. At this stage there are no imbalances in strength or flexibility.
- A **postural dysfunction** is brought about by structural/ adaptive shortening of soft tissues and muscle weakness due to poor habits or trauma. This creates more stress on the shortened structures resulting in pain or injury.

Lordotic Posture



Slouched (Sway Back)

Sway Back Posture

Attitudinal causes or structural fatigue.

Stress on the Iliofemoral ligaments in LS, and posterior longitudinal ligament in the TS.

ITB tightness on the side of raised hip, decreased flexibility on upper abdominal muscles and stretched and weak lower abdominal muscles and hip flexors.

Approximation of facets and narrowing of the intervertebral foramen.

Flat Back Posture

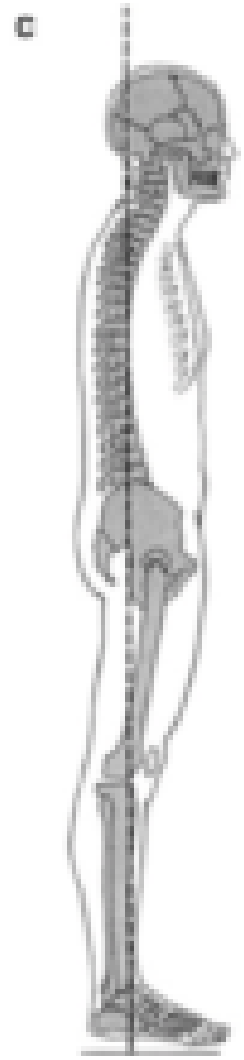
Flat Back Posture

Prolonged slouching or flexing in sitting or standing.

Decrease in lumbosacral angle, lordosis, hip extension and posterior pelvic tilt.

Reduced shock absorbing effect in LS, stress on posterior longitudinal ligament and increase posterior disc space.

Decreased flexibility in trunk flexors, and hip extensors. Stretched and weak lumbar extensors.

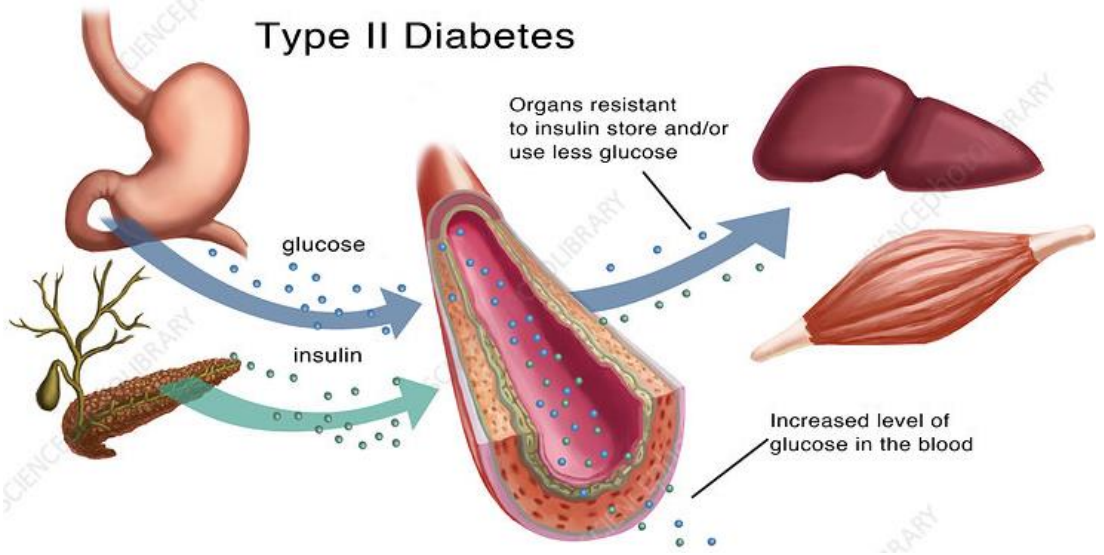


Cardiovascular System

- Cardiovascular disease has been identified as the most common cause of death worldwide. Office workers face more psychosocial demands as opposed to blue collar workers who are more physically active in their jobs. Long working sedentary hours leading to lack of exercise have been related to a higher chance of developing heart disease. Office hours longer than 48 hours a week are positively associated with obesity, hypertension, and high blood cholesterol.

Endocrine System

- Sitting down for long periods can result in changes in the body's metabolism, including insulin resistance, which can lead to **Type 2 diabetes**. Reducing time spent sitting or lying down may have a significant role in preventing the condition developing. Obesity is a risk factor to develop type 2 diabetes, fat absorbs less glucose from the blood stream as it has less insulin receptors than muscle.



Therapies/ Therapeutics

The Multidisciplinary Team

Outline

- Enable attendees to identify hazards and possible conditions arising from poor workstation ergonomics.
- This lecture will identify various professionals who can assist conditions and when and to whom a referral can be done.

Ergonomics Consultant

- Specialists adapting jobs to workers rather than vice versa. They aim to increase performance whilst ensuring safety. The assist companies to make jobs less prone to injury whilst still ensuring maximum efficiency.

When to refer:

- Setting up new work stations and designing office space
- Assist in risk assessments
- Making alterations in work stations to ensure safety
- Preventative measures
- Training employees working from home to ensure safe work environment
- Make employees aware of poor working habits and recommends adjustments
- Identifies the types of tools needed based on user's existing & future technology requirements and ergonomic needs

General Practitioner

- General practitioners (GPs) treat all common medical conditions and refer patients to hospitals and other medical services for urgent or specialist treatment. They focus on the health of the whole person combining physical, psychological and social aspects of care (NHS, 2022).
- When to refer:
  - Common illnesses
  - Anxiety
  - Headaches mainly migraines
  - Annual/required health checks

Physiotherapist

- Physiotherapy is an area of health responsible for promoting, developing, maintaining, and restoring people's maximum movement and functional ability throughout their lives. It also improves the movement of each person in areas promotion, prevention, and rehabilitation (World Confederation for Physical Therapy,2020).
- When a person's function or mobility is affected by pain, injury, or long periods of inactivity the physiotherapist is the health professional qualified to complete a full medical check-up of the patient. The physiotherapist has an in-depth anatomical and physiological knowledge of the body and movement.
- When to refer:
  - Any of the above mentioned musculoskeletal conditions
  - Back, neck pain, tension headaches
  - Movement disorders

Orthopaedic Consultant

- Orthopaedic surgeons are devoted to the diagnosis and surgical treatment of disorders of the bones, joints, ligaments, tendons and muscles.
- Some orthopaedists are generalists, while others specialize in certain areas of the body, such as:
  - Hip and knee
  - Foot and ankle
  - Shoulder and elbow
  - Hand
  - Spine
- When to refer:
  - Injury at the work place e.g. falls resulting in fractures
  - Usually referred to by other specialists when conservative treatment fails

Neurologist

- A neurologist is a physician who specializes in the diagnosis and treatment of disorders of the brain and nervous system.
- When to refer:
  - When conservative treatment fails by other professionals
  - Unexplained weakness or tremors in arms and legs
  - Severe headaches

Exercise Specialist

- Exercise Specialists create exercise plans for clients to help improve their health, to counteract the long periods of sedentarism. They are fitness instructors who also help clients perform fitness techniques to keep fit and achieve their health goals. They assess their lifestyle and physical activity patterns to come up with the best exercise plans. They work with healthcare professionals to design a program round their client needs.
- When to refer:
  - Ideally all workers exceeding 6hrs of sedentary work
  - Inactive workers
  - Workers who are eager for a healthier lifestyle change
  - Post-injury strengthening e.g. back pains

Osteopath

- An osteopath is trained in a form of manual therapy that focuses on overall body health and wellbeing by treating imbalances and weaknesses of the musculoskeletal system. Osteopathic treatment is directed to muscles, joints and connective tissue which reduces pain, improves postural balance, and aims to enhance the healing capacity of the body by promoting optimal blood flow, healthy nervous system tone, and lymphatic drainage.
- When to refer:
  - Postural asymmetry
  - Back and neck pains
  - Poor postural control
  - Chronic spinal pain

Chiropractor

- Chiropractors diagnose, treat, and prevent mechanical disorders of the musculoskeletal system. They use spinal manipulation as their main form of therapy. This involves using the hands to move a joint beyond its usual range of motion. Manual pressure is applied to the spine using different techniques, and some movements may give an audible crack or pop.
- When to refer:
    - Back or neck pains with no radicular or suspected disc pathology

Nutritionist

- Nutritionists evaluate the dietary needs of a client by assessing their health and exercise levels, sleep, and food habits etc. They clarify Clarifying information to clients and explaining the effects of nutrients on overall health condition and offer positive alterations in nutrition to address their dietary and lifestyle needs.
- When to refer:
  - Unhealthy eating habits
  - Obesity and increasing physical inactivity

Massage Therapist

- Massage therapists perform their duties by manipulating soft tissues of the body through touch. By this process, therapists relieve stress, increase general wellness, improve circulation of blood, and increase relaxation.
- When to refer:
  - Anxiety
  - Muscle tension /pain
  - Promote relaxation

Yoga / Meditation

- Yoga can help in maintaining fitness or flexibility, it can also help in achieving control over your mind and relaxing it. Yoga and meditation enable focus on positive and discard negative thoughts and emotions from the mind which are the root cause of stress and anxiety.

- When to refer:

  - Joint stiffness

  - Anxiety

  - Increased work stress

Questions?

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