The principles of soft tissue dysfunction

LO1: Soft tissue dysfunction

Assessment criteria

1. Differentiate between soft tissue injury and dysfunction.
2. Explain the types of soft tissue injury.
3. Describe common causes of soft tissue injury.
4. Differentiate between the severity of injuries.
5. Describe common causes of soft tissue dysfunction.
6. Describe signs and symptoms of soft tissue dysfunction.

Dysfunction

- Soft tissue that is not able to function optimally.
- Tissue impairment, e.g. areas of tension, discomfort, scar tissue, aches, postural ischemia.
- Imbalances, e.g. muscle weakness, shortening or lengthening.
- Structural changes NOT caused by disease (non-pathological).
- No inflammation or injury.
- In the longer term, dysfunction may lead to injury.

Soft tissue dysfunction

- Challenging to identify origins of issue.
- Without clear identification, problem will continue.
- Long term risk of injury, due to:
  - Muscular imbalances lead to weakness or compensatory movements in other structures.
  - Compensatory movement patterns become dominant and disturb the natural efficiency of movement.

Cycle of soft tissue dysfunction

Muscle shortening or lengthening

Muscle weakness or tightness

Joint movement dysfunction

Neuromuscular /movement inefficiency

Injury

Adhesions

- Fibrous bands that form between tissues.
- Contribute to a lack of glide between tissues and reduced functional capacity.
- Can develop following periods of immobilisation and in adaptation to abnormal posture.

Injury

- Damage to any biological tissue (not bone)
- Pain is experienced.
- Inflammation of tissue.
- Movement/mobility affected.
- Caused by a trauma or force.

Types of soft tissue injury

- Strains – muscle and tendon.
- Sprains – ligament.
- Overuse – tendinopathy, bursitis.
- Skin – cuts, abrasions, blisters. Friction burns
- Contusions and haematoma - inter and intramuscular

Related conditions

- Muscle cramp.
- Delayed onset muscle soreness (DOMS).

Activity

Recall:

- What is the difference between a soft tissue dysfunction and a soft tissue injury?

Strains - muscles and tendons

Severity of injury graded as:

- **Grade 1** - **mild**, occurs when < 5% of muscle fibres are damaged. Minor pain, swelling , minimal loss of function
- **Grade 2 – moderate**, more extensive damage to fibres, pain and weakness more pronounced.
- **Grade 3 – severe**, total rupture/tear, damage to > 95% of fibres, more significant swelling, loss of function.

Sprains - ligaments

Severity of injury graded as:

- **Grade 1** - minimal damage, minor swelling, pain
- **Grade 2** - partial rupture/tear, joint laxity, some instability, moderate to severe pain
- **Grade 3** - total rupture, severe pain and swelling, permanent loss of stability

Overuse injuries

- **Tendinopathy –** generic term for painful conditions that affect tendons, including:
  - Tendonitis – inflammation and swelling.
  - Tendinosis – degeneration of the tendon's collagen in response to overuse
- **Bursitis** - swelling of a bursa (small, fluid-filled sacs that provide cushioning between bones and tendons) due to overuse or direct trauma.

Muscle cramp

- Spasm and tightness in a muscle.
- Comes on suddenly.
- Can be excruciatingly painful.
- Visible lump appears.
- *Can be alleviated by stretching and massage.*

- Possible causes (none definitive):
    - Tight/short muscles.
    - Low sodium levels.
    - Dehydration.
    - Glycogen depletion

Injuries to the skin

- **Graze** – caused by friction, usually superficial.
- **Cut** – caused by something sharp penetrating through the skin.
- **Burn** – caused by fire, chemicals, electricity. Different degrees of burns, can be severe.

Delayed onset muscle soreness

- Discomfort, soreness and stiffness.
- No sharp or acute pain.
- No visible inflammation.
- Onset of symptoms delayed, not immediate:
  - Present 1-2 days after training.
  - Can last 3 days.
- History - usually caused by unfamiliar eccentric loading or exercise, high intensity or unfamiliar exercise.
- Proposed mechanisms (none definitive):
  - Damage to myofibrils.
  - Inflammation and oedema
  - Muscle spasms

Contusions

- Caused by an external blow or impact to the muscle.
- Leading to disruption of the muscle fibres and their vascular supply .
- Bruising observed.
- The bleeding and swelling associated with a contusion is usually referred to as a **haematoma**.
    - Intramuscular haematomas - blood into the body of the muscle affected by the impact.
    - Intermuscular haematomas - blood between the muscles and fascia.

Activity

- What is the difference between a strain and a sprain?
- What is the difference between different grades of strains and sprains?
- What may cause an injury?

Causes of injury

Injuries can be:

- A specific trauma or direct impact/blow to an area (intrinsic or extrinsic) – **Primary injury.**

- Other injuries that occur in response to, or as a consequence of the original injury, e.g. from compensatory movements or postural changes – **Secondary injury.**

- Not caused by any direct trauma. Can occur in response to other conditions that increase potential risk of injury, e.g. knock knees, bow legs - **Non-consequential injuries.**

Intrinsic

Relate to innate/internal anatomical and physiological factors:

- Muscle weakness.
- Muscle tightness.
- Muscle length / flexibility / inflexibility.
- Joint laxity / stiffness.
- Excessive Q-angle.
- Muscle imbalances.

These are all contributory factors for overuse injuries.

Extrinsic

Relates to factors that are external and outside of an individual's control:

- **Collisions** – direct contact with another competitor or object during a game or tournament, e.g. basketball, rugby, ice hockey.
- **Accidents** – dropping a weight on the toes, trapping finger in weight stack.
- **Clothing and footwear** – chafing, ineffective protective equipment (gum shield/helmets).
- **Environment** – uneven floor surface (running on grass), hard floor surface and impact forces (e.g. running on concrete pavement); temperature.

Activity

Why is it useful for a sports massage therapist to know the cause of an injury?

Benefits of knowing cause of injury

- To advise on risk management and injury prevention.
- To prevent further injuries or reoccurrence.
- To enable treatment and consideration of all factors that impact on functioning and range of movement (e.g. pain, tightness etc.).
- To identify any need for referral (e.g. physiotherapist)
- To restore functioning.

Learning check

- Differentiate between soft tissue injury and dysfunction.
- Explain the types of soft tissue injury.
- Describe common causes of soft tissue injury.
- Differentiate between the severity of injuries.
- Describe common causes of soft tissue dysfunction.
- Describe signs and symptoms of soft tissue dysfunction.

The principles of soft tissue dysfunction

LO2: Soft tissue repair

Assessment criteria

1. Describe the process of soft tissue repair.
2. Describe factors that may influence soft tissue repair.
3. Explain the importance of the inflammatory process.

Process of soft tissue repair

- The timescale for healing of tissue will vary.
- Healing time will be affected by:
  - The severity of the injury.
  - The treatment provided to care for the injury.

Healing phases or stages

- The acute, or inflammatory phase (48 hours).
- The sub-acute, or repair phase (14-21 days).
- The chronic, or remodelling phase (21 days +).

Source: Norris, C (2013) *Exercise Therapy*. London. Bloomsbury Publishing.

Acute phase

- Tissues are damaged.
- No healing happening at this stage.
- Tissues are reacting to the damage (muscle, connective tissue, lymphatic and blood capillaries, sensory and motor nerves)
- Bleeding, swelling, inflammation, heat, redness.
- Aim to reduce any further damage.
- Stop activity!

Tissue response to Injury

- Local tissues react to the damage.
- Vasoconstriction - to reduce blood flow and minimise blood loss.
- Reduced blood flow and oxygen to other cells causes secondary cell death.
- Platelets activated - to create a blood clot (*thrombin*) to catch debris and bacteria.
- Histamine release by dying cells - to dilate the undamaged blood and lymphatic vessels and increase permeability of cell membrane.
- Muscle spasm to restrict movement of the local tissues.
- Lymphocytes directed to injured area to clear waste.

Activity

Why is the inflammatory process important?

Sub acute phase

When healing tissues begin to form and there is no further bleeding or swelling.

- Tissue regrowth around the area
    - Collagen fibres are laid down to form scar tissue
- New lymphatic and blood vessels form.
- Blood vessels – to deliver oxygen and nutrients to aid healing.
- Lymphatic vessels - drainage system, to reduce oedema.

Scar tissue

Collagen fibres are orientated along lines of stress

Haphazard, disorganised formation of fibres can lead to suboptimal repair.

Tissues must align with original tissue for optimal functioning.

Tissues have to be stressed slightly to enable this – progressive movement and exercise at the correct level.

Chronic phase

- Scar tissue contracts and strengthens at injury site.
- Progressive movement and exercise essential to provide stress to tissue and enable functional healing.
- Graded rehabilitation of around 3-4 months.
- Tissue can be virtually healed and pain free, but is susceptible to further injury, if stress excessive (e.g. sport)

Activity

What factors may influence the soft tissue healing and repair process?

Factors influencing healing

- The severity of the injury and amount of tissue damage.
- Cessation of activity, e.g. immediate stop or kept playing/training?
- Rest and recovery time allowed.
- Treatment provide to assist healing.
- Diet and nutrition.
- Medication.
- Staged recovery movement programme.
- Age of client.
- Health status.
- Psychology and mind set.

Activity

What are the three phases of the soft tissue healing and repair process?

Learning check

- Describe the process of soft tissue repair
- Describe factors that may influence soft tissue repair
- Explain the importance of the inflammatory process