**Unit 3.3 Therapeutic Modalities**

Therapeutic modalities are commonly used by physiotherapists to help the patients achieve therapy goals. It involves the administration of thermal, mechanical, electromagnetic, and light energies for a specific therapeutic effect. Different modalities are used to decrease pain, increase range of motion (ROM), improve tissue healing, or improve muscle activation. The choice of which modality to use may depend on a specific condition, patient's needs and goals. Some of the Therapeutic modalities used to treat sports injuries are as follows:

## ULTRASOUND

Ultrasound therapy has been used as an electrotherapy treatment modality by therapists over many years. It involves passing high frequency sound waves into soft tissues.

Ultrasound is normally applied by use of a small metal treatment head which emits the ultrasonic beam. This is moved continuously over the skin for approximately 3-5 mins. Treatments may be repeated 1-2 times daily in more acute injuries and less frequently in chronic cases.

Ultrasonic waves or sound waves of a high frequency that is not audible to the human ear are produced by means of mechanical vibration in the metal treatment head of the ultrasound machine. The treatment head is then moved over the surface of the skin in the region of the injury, transmitting the energy into the tissues. When sound waves come into contact with air, it causes a dissipation of the waves, and so a special ultrasound gel is placed on the skin to ensure maximal contact between the treatment head and the surface of the skin and to provide a medium through with the sound waves can travel. Ultrasound can also be applied underwater which is also a medium for ultrasound waves to travel through.

**Common Injuries Treated with Ultrasound**

Usually, orthopedic injuries are treated with ultrasound. These may include:

- Bursitis
- Tendonitis
- Muscle strains and tears
- Frozen shoulder
- Sprains and ligament injuries
- Joint tightness

**Benefits:**

1. Help to reduce pain and muscle spasm
2. Promote the healing process.
3. Reduce the healing time of certain soft tissue injuries.
4. Increase in tissue relaxation.
5. Promotes tissue heating.
6. Improves local blood flow around injured area.
7. reduces inflammation.
8. perfect for patients who are uncomfortable with injections.

**Other Advantages of ultrasound include:**

- Images are available instantaneously
- Can be used in real time

- Portable
- Requires little space
- No negative side effects
- Poses no known risk to human health
- Easy to operate
- Comfortable for patients
- Relatively inexpensive

**Contraindications of ultrasound:**

Do not use if the patient suffers from:

- Malignant or cancerous tissue
- Acute infections
- Risk of hemorrhage
- Severely ischemic tissue
- Recent history if venous thrombosis
- Exposed neural tissue
- Suspicion of a bone fracture
- If the patient is pregnant
- Do not use in the region of the gonads (sex organs), the active bone growth plates of children, or the eye.

## INTERFERENTIAL THERAPY UNIT

**Interferential therapy** is a type of TENS (Transcutaneous Electrical Nerve Stimulation) which has two alternating currents that are applied to the skin. It is an effective therapy option used by many physiotherapy clinics to relieve pain and accelerate the self-healing process, getting your body back to a healthy, pain free state. The high frequency signals of this penetrate

through the skin into deeper lying muscle tissues. Recently, numerous ‘portable’ interferential devices have become easily available. Despite their size, they are perfectly capable of delivering ‘proper’ interferential therapy.

Stimulation can be applied using pad electrodes and sponge covers (which when wet provide a reasonable conductive path), though electroconductive gel is an effective alternative. The sponges should be thoroughly wet to ensure even current distribution. Self- adhesive pad electrodes are also available (similar to the newer TENS electrodes) and make the IFT application easier in the view of many practitioners.

**Common uses**: Pre- and post-orthopaedic surgery, joint injury syndrome, cumulative trauma disorders, increasing circulation and pain control of various origins.

**The IFT is used for treating following pains**:

- Joint injuries
- Tennis elbow
- Back/ neck/ shoulder ailments or injuries
- Knee pain
- Sports injuries
- Fibromyalgia
- Post-surgical pain
- Carpel tunnel syndrome

- decrease in inflammation as well as swelling.

The whole line of treatment also includes some exercises along with IFT therapy. The exercises include:

- Stretching injured muscles
- Moving stiff joints
- Strengthening muscle groups to support joints

**Benefits**

- Pain relief
- Muscle stimulation
- Increased local blood flow
- Reduction of oedema
- its pain-free, drug-free, and non-invasive way of healing.
- IFC can reach greater depths and offers electrotherapy to a larger number of tissues
- has a role in stimulating healing and restoration of tissues

**Contraindications**

- It should not be used to treat symptomatic local pain unless the cause of the pain has been clearly diagnosed.
- IFT should not be used in areas of the body where cancerous lesions exist.
- The treatment should not be applied in areas of the skin that are swollen, infected, or inflamed (e.g. varicose veins)
- Patients suspected of having serious infectious diseases or diseases that require heat or fevers to be suppressed should not be treated with IFT.
- IFT current should not be applied to the anterior neck (carotid sinus) or through the head.
- Women who are pregnant should avoid IFT treatment, as safe use has not been established for pregnancy.

- Patients with cardiac demand pacemakers should not be treated using powered muscle stimulators.
- should not be used on patients who have cardiac demand pacemakers.
- Patients who have an allergic response to the electrodes, gel or tape
- Application over the anterior aspect of the neck or carotid sinus
- Deep vein thrombosis
- Pregnant uterus
- Danger of hemorrhage

## Transcutaneous Electrical Nerve Stimulation (TENS) Therapy

Transcutaneous electrical nerve stimulation (TENS) is a therapy that uses low voltage electrical current to provide pain relief. A TENS unit consists of a battery-powered device that delivers electrical impulses through electrodes placed on the surface of the skin. The electrodes are placed at or near nerves where the pain is located or at trigger points.

The battery-powered TENS device is about the size of a small cell phone. The device comes with several sets of electrode wires and end pads. The electrodes connect to the device at one end and are attached to about 2 inch by 2 inch pads at the other end. Each pad has an adhesive backing and is positioned on your skin in specific areas along nerve pathways in the area to be treated. (Instead of direct contact with the skin, an acupuncturist may connect the TENS unit to acupuncture needles.)

The device delivers pulses of electrical energy. Pulses can be adjusted for intensity, frequency, duration, and type (burst or continuous). A doctor, physical therapist, or acupuncturist determines and adjusts the machine's settings.

There are two theories about how transcutaneous electrical nerve stimulation (TENS) works. One theory is that the electric current stimulates nerve cells that block the transmission of pain signals, modifying your perception of pain. The other theory is that nerve stimulation raises the

level of endorphins, which are the body's natural pain-killing chemical. The endorphins then block the perception of pain.

**USES**

TENS therapy has been used or is being studied to relieve both chronic (long lasting) and acute (short-term) pain. Some of the most common conditions for which TENS has been used include:

- Osteoarthritis (disease of the joints).
- Fibromyalgia (aching and pain in muscles, tendons, and joints all over the body, especially along the spine.
- Tendinitis (an inflammation or irritation of a tendon).
- Bursitis (inflammation of the fluid-filled sacs that cushion joints).
- Labor pain.
- Low back pain.
- Chronic pelvic pain.
- Diabetic neuropathy (damage to the nerves that connect the brain and spinal cord to the rest of the body).
- Peripheral artery disease ("hardening of the arteries" that circulate blood to the body).

**CONTRAINDICATIONS**

Do not use TENS therapy at these specific body locations if you have any of the following conditions:

- An **implantable device** (cardioverter/defibrillator, neurostimulators, bone growth stimulator, indwelling blood pressure monitors). Do not use TENS therapy over or close to the areas where an electronic device is implanted. TENS could cause these devices to malfunction.
- **pregnancy**. Do not apply TENS therapy to the abdomen; pelvic area; lower back; or to acupuncture points at the knee, hand or ankle. (However, TENS can be used for labor pain.)
- **Cancer**. Do not apply electrodes to areas of the body where there is known or suspected cancer. Do not use TENS if you have undiagnosed pain and a history of cancer in the last 5 years.
- **Epilepsy**. Do not apply electrodes to the head, neck or shoulders. The impulses could cause seizures.
- **Deep vein thrombosis or thrombophlebitis**: Do not use TENS therapy as it may increase blood circulation, which may increase the risk of dislodging a blood clot.
- A **bleeding (hemorrhagic) disorder or recent or actively bleeding tissue**. TENS therapy could increase bleeding at the tissue site or increase the risk of bleeding in persons with bleeding disorders.
- **Heart disease**. Do not apply TENS therapy to the chest if you have heart disease, heart failure or arrhythmias.

In addition, TENS should not be applied:

- To infected tissues, wounds due to osteomyelitis or if you have tuberculosis. TENS therapy may result in the spread of infections.
- To areas of tissue that have been recently treated with radiation.

- To damaged skin (Except for open wounds where the intent is to use electrical stimulation to heal tissue. In these cases, therapy should be guided by a skilled therapist.)
- Near or over eyes or mouth, front or side of neck, or on the head.
- Near reproductive organs or genitals.
- To areas of the body that lack or have reduced sensation.
- In persons who have trouble communicating or who have mental impairment and cannot provide feedback to ensure the safe use of TENS.

If you have any current or past health issues, or any concerns or questions, always check with your healthcare provider before using TENS.

**Benefits**

TENS is a non-invasive method of pain relief. It can be used alone or in addition to prescriptions or over-the-counter pain-relieving medications. The amount of medication may be able to be reduced in some patients who use TENS therapy. Do not stop taking or make any adjustments in your dose of medications without discussing it with your doctor first.

Another benefit of the TENS unit is that it is small and portable and therefore can be used at home or away, anytime pain relief is needed.

**Risks and Side Effects**

TENS therapy has few reported side effects. In rare cases, patients have reported burns at the sites where the electrodes are placed. Some patients may be allergic to the adhesive used to affix the pad to the skin or the materials in the pad itself (the skin may appear red, irritated, or a rash may break out). Some people may be sensitive to or feel uncomfortable with the prickling/tingling sensation generated by the TENS unit.

# INFRARED LAMP

Infrared therapy is a safe, drug-free, and effective way to reduce pain and inflammation throughout the body with the use of light. Though the method is relatively simple, it has become the center of many studies for its effectiveness in the treatment of a wide array of health conditions. Infrared therapy utilizes numerous light wavelengths between 780 nm to 1000 µm, which are directed at injured or inflamed sites in the body.

**Uses and Applications**

- Infrared lamp therapy has been used in a wide range of applications for many years. It is one of several innovative therapies used to help patients suffering from pain and/or injury.
- Infrared light can penetrate deep into the skin layers, reaching the tissues of the body.
- The good thing about infrared light is that it does not damage the skin like ultraviolet light. In fact, infrared light improves the circulation of blood, and promote cell regeneration. Infrared light is the heat people feel when exposed to the sun and the body has the natural ability to radiate it as well.
- For years, infrared therapy has been used for its soothing effects in wound treatment. Some studies have revealed that infrared can help improve circulation in various parts

of the body like the skin and tissues. Also, it can help regulate sleep, protect against oxidative stress, reduce inflammation, and ease the pain.

- Promoting wound healing and tissue repair
- Stimulating healing of ulcers and slow-healing wounds
- Improving hair growth
- Controlling psoriasis
- Relieving pain
- Improving skin appearance
- Reducing the side effects of cancer treatments such as oral mucositis
- Aside from these, infrared therapy helps reduce sun damage, improve joint health, reduce scars, prevent chronic and recurring cold sores, and relieve inflammation.
- Infrared therapy is widely used in sports medicine to treat injuries incurred by athletes, including a broad range of chronic and acute musculoskeletal injuries.
- Infrared therapy is a safe and effective way to reduce pain and treat a wide array of conditions. It seems to be a safe, effective, and drug-free way for long-lasting pain relief. It also helps to heal injured body parts.

With the treatment of injuries come multiple benefits such as pain relief, reduction of inflammation, and the restoration of the function of the affected body part. Other conditions that can be treated by infrared therapy include joint pain, joint inflammation, muscle pain, spine injuries, nerve pain, and sports injuries.

**Contraindications**

Each day, humans are immersed in infrared radiation from the sun in the form of heat. In fact, infrared saunas are in-demand today, but experts warn of possible health risks. Thermal or heat injuries can happen, depending on the wavelength of the infrared light. Thermal injury can occur even without pain. Also, pregnant women, people with heart diseases, and those who are sick should never undergo infrared therapy.

Moreover, experts warn against using infrared therapy to treat chronic diseases while neglecting the use of medications and recommended treatment procedures. Though infrared therapy promises many health benefits, its study is far from complete. At present, therefore, it should be considered an adjunct to medical treatment, and other regimens should be continued as prescribed.

## WAX BATH THERAPY

Wax bath therapy is intended to moisturize, soften the skin, improve blood circulation and reduce pain of joints. The wax bath uses paraffin wax that is soft and melts at a lower temperature than normal, therefore it does not cause any burns or blisters. It is quite beneficial for patients with Rheumatoid Arthritis, Scleroderma, Raynaud's or any rheumatic pains. Paraffin wax is also known to help muscle relaxation and muscle movement.

If you have an open ulcer/wound DO NOT put your hands directly into the paraffin wax. However, you can put on latex/non latex gloves to protect the wound before putting them into the paraffin wax bath. You can wax your hands or feet as often as you please and the more often you do it the more beneficial you would find it. It is suggested to use the wax 3 times a week.

Paraffin wax bath therapy is safe, although you should take care with home kits not to heat the wax too much. You shouldn’t use wax bath therapy if you have cuts, open sores or inflammatory skin conditions.


**Wax bath equipment**

You will need a paraffin wax bath, a pair of mittens and about 1 kg (2lb) of paraffin wax. If you look after the paraffin wax, you may reuse it and it may last almost 2 years or more. You will need a paraffin wax bath that has a thermostat, so that you can be able to control the heat and avoid overheating. We strongly recommend you test a small area on the inside of your wrist prior to full immersion of your hands or feet.

**Procedure**

1. Melt the wax in the paraffin wax bath. Do not immerse your hands or feet into the wax at this time.

2. Once melted and at the right temperature according to the thermostat, allow the wax to cool a little.

3. Wash your hands or feet thoroughly before using the wax.

4. Test a small area on the inside of your wrist to make sure the temperature is suitable for you before you fully immerse your hands or feet.

5. Dip your hands or feet into the wax and then completely remove them. Allow the wax to begin solidifying. Rapidly re-dip for another few seconds and remove again. Separate the fingers or toes before dipping to allow the wax to coat all around them.

6. Repeat the process until you have built up to four or five layers. Then rapidly wrap the hand with one of the following:

a. Plastic liner

b. Foil

c. Greaseproof paper

d. Roasting bag. When they are in place put your hand or foot inside the mitten or you can use an old towel and wrap it around your hand or foot.

7. Leave the mitten or the towel for approximately 20-30 minutes.

8. Peel off the wax and make it into a ball, exercising the fingers by gripping and un-gripping the wax before returning it to the pan for future use.

9. Moisturize your hands/feet using emollients or moisturisers.

10.Continue to exercise the joints for at least ten minutes after the procedure.

**Side effects**

Paraffin wax is tested in a lab to make sure it's safe and hygienic to use on the body. It's completely natural and has a low melting point, which means it can be easily applied to the skin at a temperature low enough not to cause burns or blisters.

However, if you have very sensitive skin, paraffin wax may cause heat rash. Heat rash results in small red bumps on the skin that can be itchy and uncomfortable.

You should not use paraffin wax if you have:

- poor blood circulation
- numbness in your hands or feet
- diabetes
- any rashes or open sores

If you have a chemical sensitivity, you may develop minor swelling or breakouts from the wax treatment. That's because paraffin comes from petroleum products.

If you're doing a paraffin wax treatment at home, take care not to heat the wax too much, as it may catch fire. It should be no more than 125°F (51.7°C) when you start your treatment.

**Benefits :** Paraffin has cosmetic and therapeutic benefits.

- **Cosmetic benefits**

Cosmetically, paraffin wax is often applied to the hands and feet. The wax is a natural emollient, helping make skin supple and soft. When applied to the skin, it adds moisture and continues to boost the moisture levels of the skin after the treatment is complete.

It can also help open pores and remove dead skin cells. That may help make the skin look fresher and feel smoother.

- **Therapeutic benefits**

Paraffin wax may be used to help relieve pain in the hands of people with:

- osteoarthritis
- rheumatoid arthritis
- fibromyalgia
- other joint mobility issues

It acts like a form of heat therapy and can help increase blood flow, relax muscles, and decrease joint stiffness. Paraffin wax can also minimize muscle spasms and inflammation as well as treat sprains.

**Contraindications**

Paraffin use is contraindicated for the following conditions: Should not be used in the presence of open cuts or wounds, inflammatory skin conditions, neoplasm (growths), peripheral vascular disease where circulation is impaired, acute inflammation, or when sensation of the extremity is reduced or absent (such as in some cases of diabetes). If there is any question about peripheral vascular disease or decreased sensation of the extremities, consult a physician or physical therapist before using. Should not be used on areas subject to hemorrhaging or in cases involving abnormal sensitivity to heat. Discontinue use if dermatitis due to paraffin sensitivity occurs. Discontinue use if wax feels too hot or cool, which could indicate health problems with the user. Do not allow children or those with severe physical disabilities to use the device.

## SHORT WAVE DIATHERMY (SWD)

**Short Wave Diathermy (SWD)** is a treatment that uses electromagnetic energy to produce deep heating in joints and soft tissues. This form of heat can be applied to deeper structures than other forms of heat treatment. Thus SWD can effectively relieve joint pain, improve soft tissue healing and decrease the symptoms.

Shortwave diathermy uses high-frequency electromagnetic energy to generate heat. It may be applied in pulsed or continuous energy waves. It has been used to treat pain from kidney stones, and pelvic inflammatory disease. Its deep tissue heating process increases blood flow, metabolic rate, oxygenation, and concentration of white blood cells and antibodies, while decreasing inflammation and edema. Alongside it provides relaxation and relief from muscle spasm, and increases pliability of collagenous tissues. It is commonly used for conditions that cause pain and muscle spasms such as:

- sprains
- strains
- bursitis
- tenosynovitis

Short-wave diathermy also includes **non-thermal benefits** as well including:

- Acceleration of cell growth
- Enabling damaged cells to return to normal function
- Increase wound healing

**CONTRAINDICATIONS of SWD:**

- Areas of poor or deficient thermal skin sensation.
- Metal in the tissues
- Circulatory compromise or deficit, thrombosis and associated conditions
- Advanced cardiovascular conditions
- Pacemakers
- Pregnancy
- Recent or current hemorrhage
- Avoid irradiation of the lower trunk, abdomen or pelvis during menstruation

- Malignancy.
- Active tuberculosis.
- Deep X Ray therapy or other ionizing radiations (in the last 6 months) in the region to be treated.
- Patients who are unable to cooperate.