# Application of Therapeutic Modalities

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**Meaning, Need Importance of Physiotherapy.**

- **Physiotherapy:**

Physiotherapy consists of two words. One is 'Physio' which means 'physical agents' and 'therapy' means 'treating people'. So it is the treatment of disease, injury, or deformity by physical methods.

It is the science of treatment of disease by exercise, massage, heat, light, electricity or other physical agencies. Use of drugs in this form of therapy is avoided. When required, it can be administered from the neonatal to the geriatric stage.

Sports physiotherapy is a specialized branch of physical medicine mainly concerned with the prevention, treatment and rehabilitation of the athlete.

Physiotherapy is a medical practice in which a license health care provider professionally helps to reduce pain and restore mobility after an injury and surgery.

It is the treatment of disease, injury, or deformity by physical methods such as massage, Ice treatment, heat treatment, and exercise rather than by drugs or surgery.

Physiotherapy, also referred to as physical therapy, involves evaluating, diagnosing, and treating a range of diseases, disorders, and disabilities using physical means.

- **History of Physiotherapy:**

Physicians like Hippocrates & later Galenus are believed to have been the first practitioner of physiotherapy to treat people in 460 BC.

Modern Physiotherapy was established in Great Britain toward the end of 19th century.

Physiotherapy is a result of the Second World War. During the Second World War, when a large number of soldiers and civilians suffered injuries, the need for putting them back on health track became imperative. The number of injured persons was so large that acute shortage of medicines was felt. The situation gave rise to a new science of healing, now known as 'Physiotherapy'. Physiotherapy is the cheapest treatment without drugs.

- **Need of Physiotherapy:**

1. Balance and coordination
2. Neurological problems
3. Disturbed sleep
4. Reduce pain
5. Recover from the stroke
6. Avoid surgery
7. Improve mobility
8. Manage lung and heart disease
9. Manage women health and other condition.

**Importance of Physiotherapy:**

1. Physiotherapy gives relaxation of hypersonic muscle.
2. The tone and power of muscle is maintained by therapeutic exercises.
3. It improves muscle endurance.
4. Use a variety of techniques to maintain the property of muscles & joints.
5. The normal joint movement is maintained by therapeutic exercises.
6. It increases blood flow.
7. It manages the neuromuscular coordination.
8. Therapeutic exercises give the confidence level of patients.
9. It helps to reduce the patient's fear, anger and excitement.
10. Assess, manage & treat a broad range of medical conditions from sprained ankle to strokes.
11. Relieve physical pain & heal injuries.
12. Increase mobility, build strength, improve balance & enhance cardiopulmonary performance.
13. Use a variety of techniques to maintain the property of muscles & joints.
14. Make individual independent for his/ her activity of daily living.
15. Provides gait training & Posture correction.

## Guiding Principles of Therapeutic Modalities:

The Therapeutic Modalities in our specialized treatment programs use state of the art medical technology that has been used safely and effectively for many years among people of all ages. The treatments are comfortable and well accepted by patients. The Guiding principles of Therapeutic Modalities promote safety and effectiveness. The Guiding principles of Therapeutic Modalities are as follow -

1. It is essential that the therapist must have a good scientific knowledge of Therapeutic Modalities.
2. The therapist must have to know about Physiological, Chemical and Psychological effects of Therapeutic Modalities.
3. He should be able to observe carefully.
4. The patient should be placed in a comfortable position.
5. The temperature of the environment should be comfortable.
6. Breathing should be normal at the time of physical therapy.
7. Classify the various modalities according to the type of energy utilized by each.
8. The therapist must have to use the appropriate temperature of the each modalities of physical therapy.
9. The patient should be provided with a way to alert the doctor or the therapist if he/she thinks that any physical therapy causing discomfort.
10. Whenever possible, procedures of electrotherapies should be used on a wooden bench.
11. Massage should be given superficial to deep to superficial
12. Massage should be given to the periphery to centre to periphery.

## Different Types of Therapeutic Modalities (Cryotherapy, Superficial thermotherapy, Penetrating thermotherapy, Electrical Stimulation).

### Introduction:

Therapeutic means something that promotes **healing and injury repair**. Modality means the **method of applicatio**n of any therapeutic agent. The treatment of physical dysfunction or injury by the use of therapeutic exercise and the application of modalities, intended to restore or facilitate normal function or development that also called physiotherapy. Therapeutic modalities are used to **create optimum environment for injury repair** by limiting the inflammatory process and by breaking the pain spasm cycle. The main objective of this topic is going to focus about the application of Therapeutic Modalities and also an attempt to inform to the student of Physical education as well as those are involves in Sports field.

**Types of Modalities:**

**1. Cryotherapy 2. Thermotherapy 3. Electrotherapy 4. Massage**

## 1. CRYOTHERAPY:

An application of **cold modality** to the human body is known as cryotherapy. During the treatment heat is removed from the body and absorbed by the cold modality. Cold is relative state characterized by decreased molecular motion.

In this application of therapeutic modalities, the cold modalities range from **$32^0$F to $65^0$F ($0^0$c–$18.3^0$ c)**

- **Benefits of Cryotherapy:**
  1. Reduce oedema
  2. Decrease tissue damage
  3. Reduce pain
  4. Reduce muscle spasm
  5. Stimulate vasodilatation
  6. Musculoskeletal trauma
  7. haemorrhage control & analgesia
  8. Pain control
  9. Inflammation
  10. Reduce spasticity

- **Contraindication of cryotherapy:**
  1. Asthama
  2. Raynouds disease
  3. Open wounds
  4. C.V.N (cerebro vascular accident)
  5. Allergies to cold
  6. Skin rash or skin disease
  7. Rheumatoid Arthritis
  8. Sensory impairment
  9. Aversion to cold
  10. Cardiac Conditions
  11. Psychological:
  12. Peripheral Nerve Injuries
  13. Peripheral Vascular Disease
  14. Cold Sensitivity

- **Types of cryotherapy:**
  A. Ice Towels
  B. Ice-pack
  C. Ice massage
  D. Ice immersion
  E. Cryo-kinetics

**A. Ice Towels**:

A terry towel is put into a mixture of flaked ice & water & then wrung out; much of the clipped ice will be found to adhere to the cloth. This can be placed over a large area to give immediate surface cooling. The ice towel will need to be replaced by another **one after 2 – 3 min.** It is particularly useful method for the treatment of muscles & allows movement or exercise to be performed while cold therapy is being applied. Towels thoroughly soaked in water & ice mixture, Towel wrung out & applied to part; Procedure repeated every **few min (10-15 min.)**


Ice Towel

**B. Ice-Pack:**

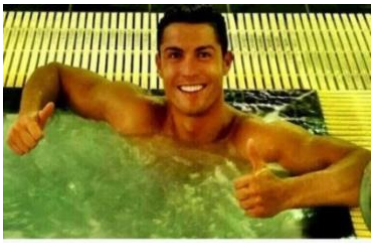
A bag or other container filled with **frozen material (such as crushed ice)** and applied to a body part to relieve pain or reduce swelling. Ice packs are found in 3 forms (i) **Ice Bag**- this are the most commonly used modality. They are easily available and safe to use. The requirements are only the plastic bag and Flaked and cubed ice. (ii) **Reusable cold gel** packs (iii) **Chemical cold packs**.


Ice-Pack

**C. Ice massage**:

An ice massage is the local application of ice to a portion of the body. During ice massage, blood flow to the body part is greatly decreased at first but then greatly increased. Exercise afterward may further heighten blood flow. Hold the ice block firmly with the mitt on one hand and apply the ice gently and **massage in a circular motion (10-15 cm diameters) for 5-10 minutes**.

**D. Ice immersion:**


Ice immersion

In sports therapy, an ice bath, or sometimes cold-water immersion or cold therapy, is a training regimen usually following a period of intense exercise in which a substantial part of a human body is **immersed in a bath of ice or ice-water for a limited duration.** A technique for administering therapeutic cold treatments to the distal extremities (e.g., the ankle or hand) with a **mixture of water and crushed, flaked, or cubed ice** with a temperature range of **50° to 60°F (10°–15°C**). The liquid medium allows for equal cooling of irregularly shaped body parts. **To reduce the amount of discomfort** initially experienced during this treatment, the fingers or toes can be covered with an insulating material.

**E. Cryokinetics:**


Cryokinetics

Cryokinetics is used for rehabilitation and reconditioning of an affected area and consists of **applying cold, followed by a full range of motion**. Cryokinetics is a rehabilitation technique involving ice application followed by progressive active exercises. Cold should be applied for a **maximum of twenty minutes** which should be sufficient to produce the numbed response which is required. The process can **be repeated for 5 minutes to re-numb the area** if necessary. **Swelling in reduced dramatically through the combination of cooling and exercise.**

## 2. THERMOTHERAPY:

Therapeutic heating modalities (Superficial and Deep) heating agents increase the skin temperature within the therapeutic range of **104°F to 170°F** to induce physiological effects for therapeutic benefits. The external application of heat is thermotherapy. Heat can be transferred into the body by conduction, convection, and radiation.

### ➢ Benefits of Thermotherapy:

1. Alleviates pain by reducing endorphins when applied.
2. Increases white blood cells, stimulating an immune system response.
3. Soothes, comforts, and sedates as long as inflammation is not present.
4. Reduces muscle spasms.
5. Increases blood volume, oxygenation, and nutrition.
6. Distends and softens superficial fascia.

### ➢ Contraindications of Thermotherapy:

1. Tumour or malignancy
2. Never apply heat directly to eyes or the genitals.
3. Recent injury
4. Recent contusion
5. Phlebitis
6. Diabetes
7. Hypertension
8. Mental retard patients.
9. Cardiac impairment
10. Recent burn or sunburn
11. Oedema

12. Directly over eyes or external genitalia
13. Cerebrovascular accident
14. Fever
15. Open wounds or skin infections
16. Sensory impairment
17. Pregnancy

- **Physiological Effects:**

1. Decrease muscle spasm
2. Decrease pain perception
3. Increased blood flow-vasodilation
4. Increase metabolic rate
5. Decreased joint stiffness
6. Increase range of motion
7. Increased general relaxation

- **Thermotherapy Applications:**

Heat therapy or thermotherapy applications include, but are not limited to, the following:

**A.** Whirlpool baths
**B.** Paraffin baths
**C.** Sauna baths
**D.** Steam baths
**E.** Hot packs
**F.** Spinal packs
**G.** SPA
**H.** Infrared
**I.** Hydrotherapy tubs
**J.** Shortwave diathermy (SWD)
**K.** Microwave diathermy (MWD)
**L.** Ultrasound Therapy (UST)
**M.** Laser

**A. Whirlpool Bath:**


Whirlpool Bath

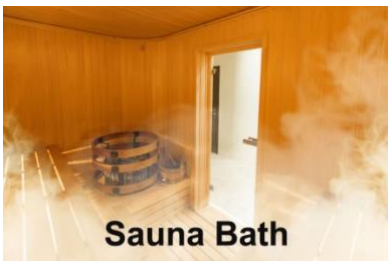
Whirlpool baths is tubs for soaking or contain jets of water. It is kept at **105 – 110º** Fahrenheit. Whirlpool baths in spa treatments are also known as hydro massage treatments since the jets push tepid water toward the sides of the tank and not on the affected areas. It is a Combination of massage and water immersion. It Provides conduction and convection, It is for **Swelling, muscle spasm and pain**. Maximum treatment time for acute injuries should not exceed **20 minutes**.

**B. Paraffin bath:**


Paraffin baths

Paraffin baths provide heat to contoured bony areas of the body (e.g., feet, hands, or wrists). They are used to treat **sub-acute or chronic rheumatoid arthritis associated with joint stiffness and decreased ROM, as well as other common chronic injuries**. A paraffin and mineral oil mixture (**6:1 or 7:1** ratio) is heated in a unit at **48º to 52º C (118º to 126º F).**

**C. Sauna Bath:**


Sauna Bath

A sauna bath is a **hot-air bath** with a temperature between **160 – 180o Fahrenheit in six to eight percent humidity**. The client can remain in the **sauna for twenty to thirty minutes once per week**. Instruct the client to refrain from eating one hour prior to treatment and to take a cool shower after treatment. A dry sauna induces sweating and is used for **insomnia, tension, and removal of toxins.**

**D. Steam Baths:**


Steam Baths

Steam baths or wet saunas are **hot vapour baths** given in specially designed chambers at **105 - 130o Fahrenheit and 100%**

**humidity**. If the head is exposed from the steam unit, it is referred to as a **Russian bath**. Steam baths may be given **once or twice a week** and the client remains in the bath **fifteen to twenty minutes**. The steam baths enhance the **removal of toxins** from the body.

**E. Hot Packs:**

Hot packs provide superficial heat, transferring energy to the individual's skin by way of **conduction**. The pack consists of a canvas or nylon case filled with a **hydrophilic silicate** or other **hydrophilic substance, or with sand**. The packs are stored in a hot water unit at a temperature ranging from **70° to 75° C (158° to 170° F)**

Hot Pack

**F. Spinal Pack:**

A spinal pack is used to soothe and relax clients during the massage session. It is a long, narrow fomentation pack applied directly on the spine, and insulated with a towel. The spinal pack may be left on for approximately **ten minutes**.

Spinal Pack

**G. SPA:**

**A town** where water comes out of the ground and people come to drink it or lie in it because they think it will improve their health. A commercial establishment with exercise rooms, sauna baths, etc. a large whirlpool bath, with ledges for seating several people. A mineral spring considered to have health-giving properties.

**H. Infrared Lamp**

Infrared (IR) radiation is a type of **electromagnetic radiation** (a wave with electricity). The wave is longer than light which humans can see and shorter than microwaves. The word infrared means below red. It comes from the Latin word infra (meaning below) and the English word red. (Infrared light has a frequency below the frequency of red light.) Red light has the longest wavelength that human eyes can see. Infrared waves cannot be seen by the eye. The infrared wave is between 800 nm and 1 mm. People sense infrared as heat. Single near infrared heat lamps are a simple and inexpensive, yet incredibly effective **treatment for pain, muscle strains, rashes, acne, infections and more.**

Infrared

**I. Laser**

Laser therapies are medical treatments that use focused light. Unlike most light sources, light from a laser (which stands for light amplification by stimulated emission of radiation) is tuned to specific wavelengths. This allows it to be focused into powerful beams. Laser light is so intense that it can be used to shape diamonds or cut steel. **Relieve symptoms of cancer, remove kidney stones, repair a detached retina, improve vision and treat hair loss**

Laser Therapy

**resulting from alopecia or aging.** Lasers are more precise than traditional surgical instruments, and cuts can be made shorter and shallower. This causes less damage to tissue.

**J. Ultrasound:**

Superficial heating agents were discussed in the previous section. These agents produce temperature elevations in skin and underlying subcutaneous tissues to a depth of 1 to 2 cm. Ultrasound uses high-frequency acoustic (sound) waves, rather than electromagnetic energy, to elicit thermal and nonthermal effects in deep tissue to depths of 3 cm or more. The actual mechanism of ultrasound, produced via the reverse piezoelectric effect, converts electrical current to mechanical energy as it passes through a piezoelectric crystal (e.g., quartz, barium titanate, and lead zirconate titanate) housed in the transducer head. **Thermal effects increase collagen tissue extensibility, blood flow, sensory and motor neuron velocity, and enzymatic activity, and decrease muscle spasm, joint stiffness, inflammation, and pain.**

Ultrasound Therapy

## 3. ELECTRICAL STIMULATION / ELECTROTHERAPY:

Electrical stimulation is a type of physical therapy modality used to accomplish various tasks in physical therapy. If you have an injury or illness that causes pain or limited functional mobility, your PT may use electrical stimulation, or Esteem, as one part of your rehabilitation program. Electrical stimulation has most commonly been used for the modulation of pain through stimulation of cutaneous sensory nerves and the following analgesic mechanisms.

Electrotherapy

- **Benefits of Electrical stimulation:**
  1. The main benefit of electrical muscle stimulation therapy is pain relief.
  2. The electrical currents allow the muscles to release tension and stress relieving muscle soreness, tightness and body aches.
  3. It prevents and reverses muscle atrophy
  4. It offers fast muscle recovery for various injuries
  5. It improves the range of motion
  6. It offers stress relief
  7. It generates energy for muscle activities

- **Contraindications of Electrical stimulation:**
  1. Haemorrhagic conditions
  2. Pregnancy
  3. Eyes, anterior neck, carotid sinus, head, reproductive organs
  4. Impaired cognition or communication
  5. Regenerating nerves
  6. Cardiac failure (local)
  7. Damaged or at-risk skin (local)
  8. Infection or tuberculosis (local)
  9. Malignancy (local)
  10. Recently radiated tissue (local)
  11. Electronic device (local)

12. Impaired sensation (local)

- **Types of electrical stimulation:**

Your physical therapist will use different types of electrical stimulation to accomplish different tasks. These may include:

**A. TENS**: ***Transcutaneus electrical neuromuscular stimulation*** (TENS) is a physical therapy modality used to manage acute and chronic pain in physical therapy. The intensity of the electricity will be **adjusted to block the painful signals traveling from your body to your brain**.

**B. Iontophoresis**: Iontophoresis is a **type of electrical stimulation** that is used to help administer medication to you in physical therapy. The **electrical current** pushes various medications in through your skin and into your body. It is uses **to decrease inflammation or muscle spasm.**

**C. Neuromuscular electrical stimulation (NMES):** NMES uses an electrical current to cause a single muscle or a group of muscles to contract. By placing electrodes on the skin in various locations the physical therapist can recruit the appropriate muscle fibers. Contracting the muscle via electrical stimulation helps improve the way your affected muscle contracts.

## Massage: Principles and Classification of massage of massage, Physiological, Chemical and Psychological effects of massage.

### 4. MASSAGE:


Massage

Massage is one of the oldest forms of treatment for human ills. It has been derived from the Hebrew word 'sascheasal' that means "to knead", and it is also think that the word massage originates from the French word 'Masser' that means "to rubs". Many mechanical massaging devices have been developed, but none can function as well as skilled human hand in manipulating the soft tissue of the body.

- **Definition of massage:-**

- **William Murrell, Edinburg and London (1853-1912):** "The scientific mode of treating, certain forms of disease by systematic manipulations".
- **Albert Hoffa, Germany (1859-1907):** "Mechanical procedure that can cure illness"
- **John S. Coulter (1932):** "Massage includes a great number of manipulations of the tissue or the organs of the body for therapeutic purpose".

- **Contraindication of massage:**

1. Haemorrhage or tumour
2. Never put direct pressure on the spine.
3. A person affected by virus.
4. Do not massage the areas that are infected or have a rash.
5. Not massage in and around open sores.
6. Do not massage fracture.

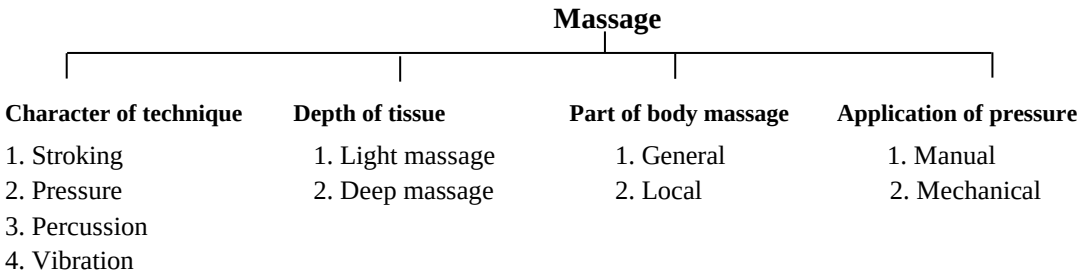
7. A person in pain due to infection.
8. A person with unstable cardiac condition.
9. A person having a feeling of vomiting.
10. Do not massage the person with high fever of uncontrolled high blood pressure.
11. An acute stage of injury.
12. Do not use the deep massage technique for a person having osteoporosis.
13. Generally massage is contraindication for pregnant and breast feeding women, but there may be alternative massage technique.
14. Bio-freeze and prossage products are not to be used around the face, eye, or any open wounds or sores, and should not be used in the genital areas.

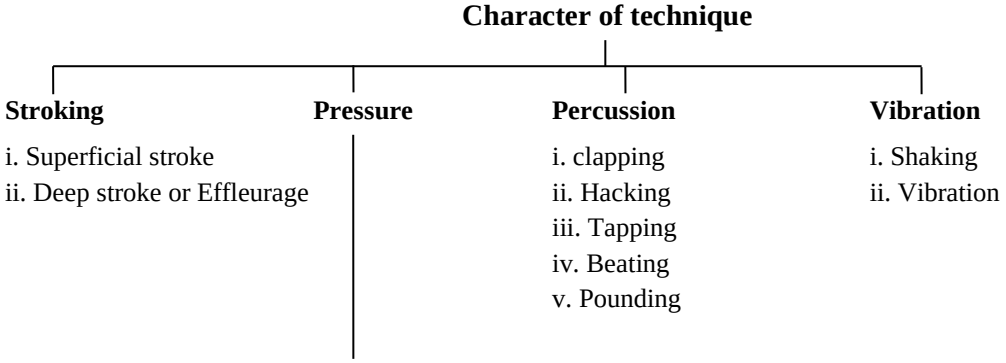
- **Principles of massage:**

The principles of massage are guidelines that promote safely and effectiveness. The principles of massage are as follow-

1. Massage should be given general to specific then general.
2. Massage should be given superficial to deep to superficial
3. Massage should be given to the periphery to centre to periphery.
4. Massage should be given to distal to proximal.
5. The duration of massage treatment will depend upon (a) the area to be treated, (b) the rate of movement (c) the age and the size of the individual, (d) changes in symptoms.
6. The massage should not be limited to the disease or injured area only.
7. Massage should be rhythmic, slow and gentle.
8. Breathing should be deep and slow at the time of massage.
9. A definite uniform rate should be established for the time of massage.
10. The frequency of the application will depend upon pathological condition that is to be treated.
11. The type of massage movement will depend upon the pathology of the tissue.
12. It is essential that the therapist must have a good scientific knowledge of massage and its physiological effects and should be able to observe carefully.

- **CLASSIFICATION OF MASSAGE:**



vi. Cupping

| **Kneading** | **Petrissage** | **Friction** |
|---|---|---|
| i. Stationary | i. Picking up | i. Circular |
| ii. Circular | ii. Wringing | ii. Transverse |
| iii. Ironing | iii. Rolling | |
| iv. Squeezing | | |

- **Physiological effects of massage:**

1. Stimulating Cell metabolism
2. Increasing venous flow and lymphatic drainage
3. Increase circulation and nutrition
4. Stretches superficial scar tissue
5. Relaxes muscle tissue and relieves muscle stiffness.
6. Reduces muscle fatigue and Improves muscle tones
7. Reduce physical stress of joint and increases muscle flexibility.
8. Improves the posture by reducing different bone deformities.
9. It reduces ischemia.
10. Stimulate immune system and nervous systems.
11. Decrease chronic pain and Calms nervous system.
12. Increase production of sweat from the Sweat gland.
13. Improve the skin colour and elasticity.
14. Eliminates waste materials.

- **Chemical effect of Massage:**

1. Endorphins are only one of neurotransmitters released when you perform Massage. Endorphins are a type of neurotransmitter, or chemical messenger. They help relieve pain and stress.
2. Massage also stimulates the release of dopamine, norepinephrine, and serotonin. These brain chemicals play an important part in regulating your mood.
3. Massage can positively impact serotonin levels in your brain. Raising your levels of serotonin boosts your mood and overall sense of well-being. It can also help improve your appetite and sleep cycles.

4. Massage also helps balance your body's level of stress hormones, such as adrenaline. Adrenaline plays a crucial role in your fight-or-flight response, but too much of it can damage your health.
5. A slower, longer, deeper, and more rhythmic massage can, on the other hand, reduce Epinephrine levels, creating a feeling of relaxation, and facilitating deep sleep.
6. Pressure technique of massage creates endorphins, which are compounds known to reduce pain and produce a sense of euphoria. After 15 minutes of massage, endorphins come into play and their "feel good" effects may last up to 48 hours.
7. By encouraging sleep, massage can increase the availability of growth hormones, which promote cell division and are involved in tissue repair, regeneration, and healing.
8. Massage therapy has also been shown to reduce levels of Cortisol - the stress related neurohormone produced by the adrenal glands. Cortisol is a hormone that is important throughout the body to maintain blood pressure, blood sugar, metabolism, and respond to infections and stress.

- **Psychological effects of massage:**

1. Calming effect on the mind.
2. Cooling the mind, and mental and emotional excitation
3. Preparation for mental work, concentration and meditation
4. Relieves stress and anxiety
5. Directs awareness inward, brings peace of mind and one pointed focus
6. Helps when suffering from Depression, Lethargy, dullness and sleepiness

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