

# Hydrotherapy Theory

## 1. Relative Density (RD)

The RD of an object is the ratio of the weight of the object to the weight of an equal body of water. The density of various substances is defined by a pure number value called **Specific Gravity (SG)**.

**Implication:** The RD and SG will determine how well an object (dog or cat) will float.

If the ratio of an object's SG to that of H<sub>2</sub>O is greater than 1 = object will sink

If the ratio of an object's SG to that of H<sub>2</sub>O is less than 1 = object will float

- Specific Gravity of H<sub>2</sub>O = 1
- Lean person SG = 1.10
- Obese person SG = 0.93
- Human body with air in lungs = 0.974 and 1.1 without air
- Fat lowers SG
- Dense bones increases SG

**Relevance:** Lean animal that is not moving will sink faster than an obese animal.

## 2. Buoyancy and Gravity

There are 2 forces affecting a body immersed in water

a) Gravity

b) Buoyancy - upward thrust of water acting on body that creates and apparent decrease in body weight while submerged.

An immersed body with RD less than water will be assisted to the surface by buoyant forces.

**Implication:**

- Buoyancy aids in the rehabilitation of weak muscles and painful joints.
- Joints can be unloaded as a result of the buoyant properties of water.
- Buoyancy counteracts weight, allowing ambulation when weight bearing is contraindicated.
- Water level can be adjusted to decrease weightlessness
- Can use floatation devices to increase resistance

## Hydrostatic Pressure (HP)

- Pressure is exerted by water on a immersed body
- The pressure is equal on all surfaces at rest at a given depth

- Greater depth = greater pressure
- Hydrostatic Pressure I = constant

**Implication:**

- **HP** can be beneficial for swollen joints and oedematous tissue
  - **HP** opposes the tendency of blood and oedema to pool in lower parts of the body (deeper depth = higher pressure)
  - **HP** can aid in circulatory problems
  - Patients with respiratory problems or heart conditions can be affected
- It is proposed that hydrostatic pressure provides phasic stimuli to the skins sensory receptors causing a decrease in nociceptor hypersensitivity.

**Implication**

The decrease in pain perception will allow the animal/human to perform a variety of movements with less pain.

3. **Viscosity**

Frictional resistance caused by cohesive forces between molecules of a liquid

- H<sub>2</sub>O provides resistance that may strengthen K9 muscles and improve cardiovascular fitness
- Possible increase in sensory awareness
- Assist in stabilising an unstable joint/s
- Buoyancy and Viscosity prevents falling by increasing the time span for animal to react... more willing to move in water (especially spinal patients)
- Anti-swim jets/turbulence

4. **Resistance**

To increase resistance

- Increase velocity (encourage dog to swim faster)
- Increase surface area (Add floatation/ boot)
- Increase lever arm

5. **Surface Tension**

Resistance to movement is slightly greater on the surface

**Implication:**

Therapeutically if the patient is weak movements may be performed more easily just beneath the water surface. Miniature breeds will be more affected by surface tension.