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AQUATIC THERAPY BASICS- PRINCIPLES AND BENEFITS

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Overview

- Principles of water
- System impact
- Physiological impact
  - Precautions
  - Contraindications
- Identifying the appropriate patients
- Therapeutic benefits
- Basic equipment needs
- Case study example

Learner outcomes as a result of this course:

- Identify the principles of water and how these impact treatments.
- Identify the precautions and contraindications of the aquatic therapy environment.
- Identify appropriate patients for the water.
- Identify the therapeutic benefits of the use of water.

Principles of Water

Principles of Water

- Buoyancy
- Hydrostatic Pressure
- Viscosity
- Specific Heat
- Refraction

Buoyancy

Buoyancy

Force exerted on an object immersed in a fluid

Archimedes Principle-Buoyancy

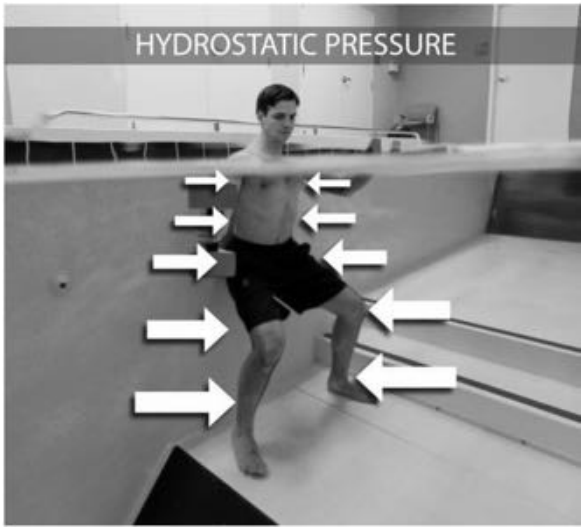
Less mass than water = float

More dense than water = sink

Hydrostatic Pressure

Hydrostatic Pressure

Depth Dependent



The Effect of Hydrostatic Pressure

3D Pressure

Think about scuba diving or snorkeling. The deeper you go, the more pressure you feel.

Viscosity

Viscosity

Describes the amount of resistance to gradual stress

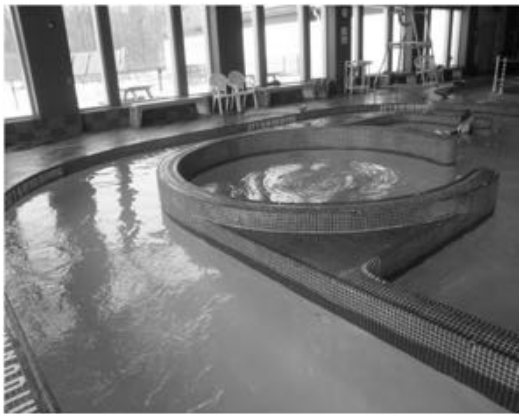
Water = Low Viscosity

Syrup = High Viscosity

Specific Heat

Specific Heat

Water has a very high specific heat capacity - meaning it takes a LOT of heat to raise its temperature a lot



4.184 Joules of heat to increase 1 gram of water by 1 degree Celsius vs.
0.385 Joule of heat to increase 1 gram of copper by 1 degree Celsius

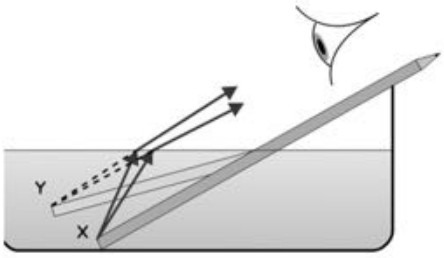
Water has high specific heat

Research says that the best temperature for aquatic therapy is 91-95 degrees F

Refraction

Refraction

Causes distortion to objects below water



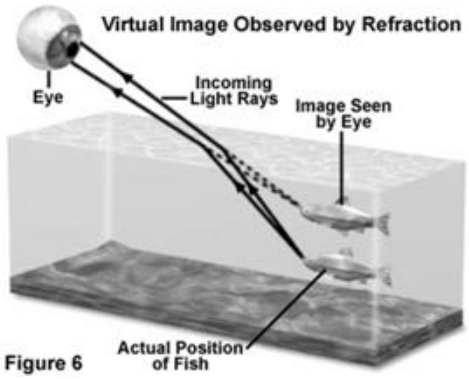


Figure 6

Underwater camera

Summary of Principles of Water

- Buoyancy - the force exerted on an object under water
- Hydrostatic Pressure - more pressure the deeper you go
- Viscosity - Water has a low resistance
- Specific Heat - Water has a high specific heat, meaning it takes a lot of heat to raise its temperature
- Refraction - Objects under water appear skewed as we look down into the water at them

System Impact

Immersion Effect System Impact

- Circulatory System
- Pulmonary System
- Musculoskeletal System
- Renal System

Circulatory System

Definitions

- Stroke Volume = amount of blood ejected per beat from left ventricle and measured in ml/beat
- Systolic Pressure: Pressure during contraction of the heart
- Diastolic pressure: pressure in between beats
- Vascular Resistance: calculation of blood pressure, blood flow and cardiac function
- Cardiac Output: volume of blood pumped out of a ventricle per minute
- Cardiac Index: amount of cardiac output per square meter of body surface area

Circulatory System

- Immersion: causes significant pressure in right atrial pressure, stroke volume and cardiac output
- Immersion: (whole body, head up)
  - Significant shift of blood into the intrathoracic circulation, followed by an increase in central venous pressure, heart volume and cardiac output

"Immersion" Study revealed

- Increase in stroke volume
- Increase in systolic blood pressure
- Minor increase in diastolic blood pressure
- Decrease in vascular resistance (Vasodilation)
- Increase in cardiac index

Pulmonary System

Pulmonary System

- Vital Capacity:
  - the greatest volume of air that can be expelled from the lungs after taking the deepest possible breath.
- Forced Vital Capacity:
  - is the amount of air which can be forcibly exhaled from the lungs after taking the deepest breath possible.

Pulmonary System

- Functional Residual Capacity:
  - is the volume of air present in the lungs at the end of passive expiration. At FRC, the opposing elastic recoil forces of the lungs and chest wall are in equilibrium and there is no exertion by the diaphragm or other respiratory muscles.
- Forced Expiratory Flow Rate:
  - is the flow (or speed) of air coming out of the lung during the middle portion of a forced expiration.

Pulmonary System – Immersion Effect

- Compression of chest wall by water
- Shifting of blood into the chest cavity
- Vital capacity decreased
- More work during inspiration

Pulmonary patients should start at waist level water and progress into deeper water as strength and respiratory tolerance improve

Pulmonary System – Immersion Effect

- Decrease in pulmonary vital capacity
- Decrease in functional residual capacity
- Decrease in maximum inspiratory muscle strength

Pulmonary System - SCI

- Significant improvements in Spinal Cord Injured patient with aquatic therapy
  - Increased forced vital capacity
  - Increased forced expiratory flow rate

Musculoskeletal System

Musculoskeletal System

Immersion Effect

- More 02 to muscles
- Less edema
- Decrease in pain
- Decrease in muscle spasms
- Promotes relaxation due to thermal energy transfer

Percentage of Body Weight Support

1	• Neck Line = 90% Buoyant
2	• Nipple Line = 75% Buoyant
3	• ASIS Line = 50% Buoyant

Impact on your patients:

Orthopedic Patients

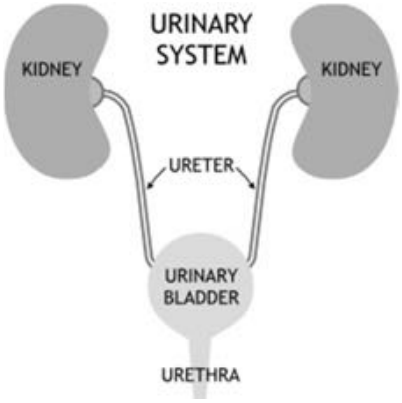
- ALWAYS get surgeon's OK
- Weight bearing

Neurological patients

- Neuro re-education
- Hyperstatic orthotension

Pain patients

Renal System



Renal System - Effect of Immersion

- Increase of blood flow to kidneys
- Causes changes in our hormones
- Increases urinary output
  - Reduces thirst mechanisms

Therapists! Drink your water while you are treating in an aquatic therapy environment!

In Summary

According to Amelia Elena Stan in The Journal of Romanian Sports Medicine Society:

- Medical Hydrology
- Immersion in warm water effects:
  - Transfer of heat
  - Pain relief
  - Promotes relaxation
  - Feeling of weightlessness
  - Supports body at the same time provides resistance

Summary Continued….

- Lymphatic compression
- Venous compression
- Increased central blood volume
- Increased cardiac volume
- Increased atrial pressure
- Increased stroke volume
- Increased cardiac output
- Increased work of breathing
- Increased oxygen delivery
- Improved dependent edema
- Increased muscle blood flow
- Offloading of body weight
- Decreased joint compression with movement
- Increased flow to kidneys
- Higher pain threshold
- Suppression of sympathetic nervous system activity
- Promotion of excretion of metabolic waste

Precautions and Contraindications

Definitions

Contraindication

- Prohibits the performance of an act or procedure

Precaution

- Methods intended to prevent or avoid adverse outcomes

Contraindications

Cardiac

- Cardiac failure, unstable angina or severely compromised cardiovascular system
- Unstable abnormal blood pressure

Pulmonary

- Severely limited vital capacity—check with the doctor to see if the patient can tolerate a 10% decrease in vital capacity
- Tracheotomy

Contraindications

Neuro -

- Cerebral hemorrhage within three weeks of bleed
- Uncontrolled epilepsy
- Temperature sensitive conditions
- Supra pubic catheter or any ostomy
- Absence of cough reflex or mouth closure deficits—need to closely monitor and keep face away from water
- Severe Cognitive Deficits
- Unpredictable bowel incontinence

Contraindications

Infections/Diseases/Etc.

- Significant open wounds or skin infections
- Scabies or lice
- Deep x-ray therapy or renal disease where the patient cannot adjust to fluid loss
- Contagious water or air-borne infection/disease
- Fever
- Vomiting
- Severe hydrophobia
- Later stages of pregnancy unless approved by physician

Precautions

Cardiac

- Abnormal blood pressure – need to monitor response to immersion and exercise
- Angina or other cardiac considerations – monitor response to immersion and exercise, keep medication pool-side to be administered by client if needed

Pulmonary

- Limited vital capacity – caution with deep submersion

Precautions

Neuro -

- Multiple sclerosis – may not tolerate water over 88 degrees, requires written physician's approval
- Controlled seizures – seizure within 3 months, they must wear a flotation belt during session
- Bladder or bowel incontinence – empty bowel and bladder before session, adult swim briefs
- Vertigo/nausea – avoid rotational and swaying movements

More precautions

- Patients prone to skin breakdown are encouraged to wear pool shoes while in the pool.
- Prosthetic limbs (unless made for swimming) should not be worn in the pool
- Ear infections – wear properly fitted ear plugs or keep ears out of water
- Menstruation – should use internal protection only
- Hearing aids – remove to avoid contact with water
- Contact lens – remove before submerging face in water

More precautions

Infections/Diseases

- Small open wounds – can cover with Tegaderm or Opsite material.
- Uncontrolled diabetes – monitor response to exercise, keep medication and/or sugar source poolside to be administered by client if needed
- Chemical sensitivity (i.e. chlorine or bromine) educate on proper hygiene after pool session to minimize problem
- Behavior problems – have appropriate supervision to control behavioral outbursts
- Fear of water – need to progress slowly

The "Aquatic Patient"

How do we decide who can go in water?

- Clinical presentation supports water as treatment approach/modality
- Ethically the evaluating therapist can determine that water is an intervention that will make measureable functional changes
- Surgeon and/or MD support

The Aquatic Patient

- Arthritis
- Arthroscopic surgery recovery
- Balance disorders
- Bursitis
- Cerebral palsy
- Chronic pain
- Idiopathic joint pain
- Joint reconstruction surgery recovery
- Joint replacement surgery recovery

The Aquatic Patient

- Lower back pain
- Orthopedic injuries
- Parkinson's disease
- Multiple sclerosis
- Rheumatoid arthritis
- Scoliosis
- Spinal cord injury
- Sprains and strains
- Stroke
- Traumatic Brain Injury

The Aquatic Patient

- Young and old
- Athlete to wheelchair bound
- Acute and chronic

The Aquatic Patient

Indications

- Limited Range Of Motion
  - Impairments noted in
    - Trunk
    - Lower extremity
    - Upper extremity

The Aquatic Patient

Indications

- Decreased Strength
  - Impairments noted in
    - Trunk/Core
    - Lower extremity
    - Upper extremity

- How is strengthening better in the pool versus a traditional approach on land?

The Aquatic Patient

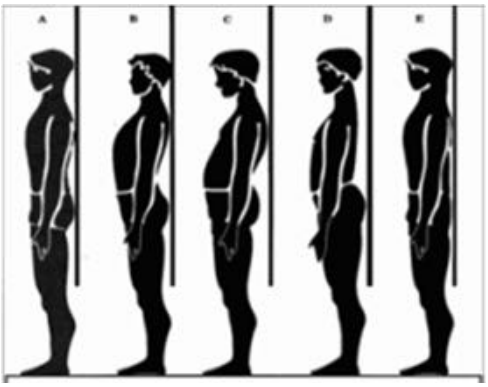
Indications

- Gait Abnormalities
  - Impairments noted in mobility
  - Low level
  - High level

The Aquatic Patient

Indications -

- Postural Abnormalities



The aquatic patient

Indications -

- Limited Activities Of Daily Living (ADL)
  - Bathing
  - Dressing
  - Functional mobility
  - Gross motor coordination

The Aquatic Patient

Indications -

- Pain

The Aquatic Patient

Indications -

- Edema

The Aquatic Patient

Indications -

- Good Tolerance to Exercise on Land

The Aquatic Patient

Indications -

- Balance Dysfunction

The Aquatic Patient

Indications -

- Hyper or Hypo-tonicity
- Impaired Flexibility

The Aquatic Patient

Indications -

- Dependence on Assistive Devices

Therapeutic Benefits

Therapeutic Benefits

- Promotes muscular relaxation
  - Decreases muscle spasm

Therapeutic Benefits

- Reduces pain sensitivity • Reduces edema
  - Increases peripheral circulation

Therapeutic Benefits

- Increases ease of joint movement

Therapeutic Benefits

- Increases muscle strength and endurance

Therapeutic Benefits

- Reduces gravitational forces

More Benefits

- Improves body awareness and balance

More Benefits

- Improves core/trunk stability

Neuro re-education

Neuro re-education

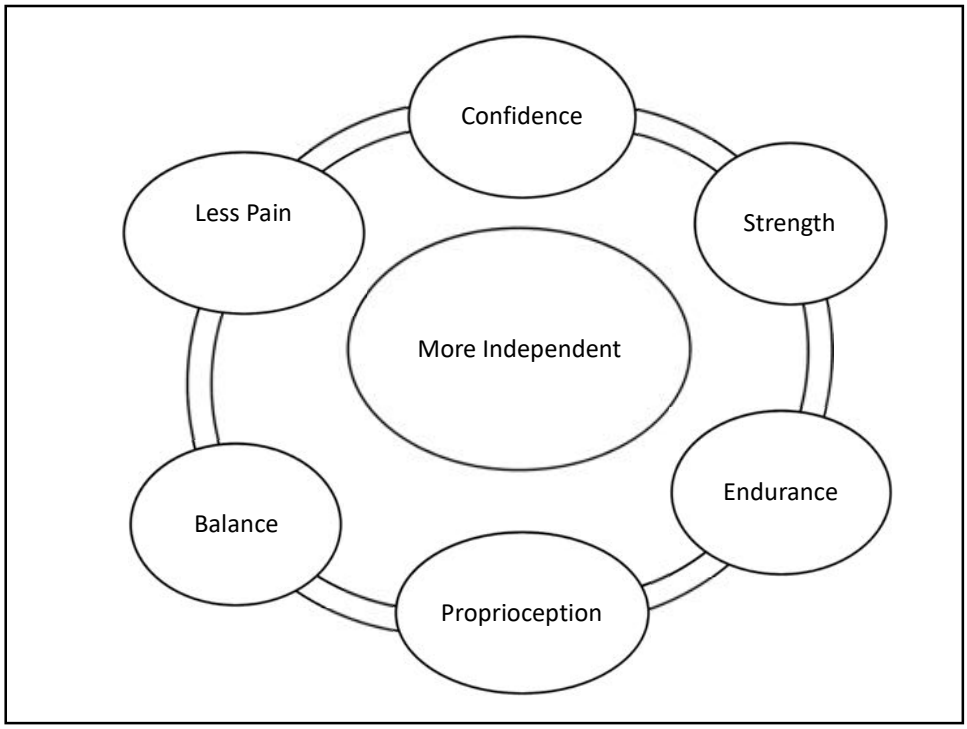
Mobility

More Benefits

- Improves respiratory muscle strength

More Benefits

- Improves patient morale and confidence



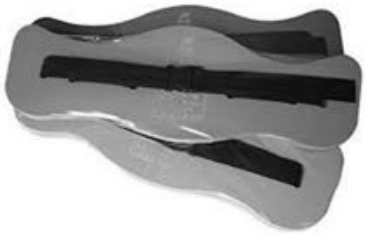
Basic Equipment

Equipment

- Safety: Blood pressure cuff, pulse oximetry

Equipment

- Floatation belts
- Neck support ring



Equipment

- Floatation Aides
  - Aqua joggers
  - Pull buoy

Strengthening Equipment

- Hydro-tones

Lower Extremity

- Ankle weights (designed for water)
- Fins

Equipment

- Foam dumbbell
- Long dumbbell

Equipment

- Foam Rings

Equipment

- Kickboards

Equipment

- Foam noodles

Equipment

- Gloves (webbed)

Equipment

- Bands (waterproof)

More Fun Stuff

- Wrist weights

Equipment

Equipment

Case Study

Case Study

Ben

- Suffered a CVA resulting in right hemiparesis on his right side
- Upon evaluation, Ben was totally dependent for ADL and mobility
- Ben progressed to outpatient services where he began Aquatic Therapy
- Ben's goal - to return to work (he was a mechanic)

What's next?

Aquatic Therapy - Beyond the Basics - Putting Aquatic Therapy into Practice -

- Design a plan of care
- Treatment ideas
- Progression of exercises
- Documentation strategies

Thank you!

QUESTIONS?

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- Equipment Resources
  - Aqua Gear
  - Pro Therapy Supplies
  - Sprint Aquatics
  - SwimOutlet.com