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AQUATIC THERAPY BASICS-
PRINCIPLES AND BENEFITS

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Overview

• Principles of water
• System impact
• Physiological impact
  o Precautions
  o 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

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

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
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

- **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 O2 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

- 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 measurable 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

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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

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?
Resources

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Resources


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Resources


Resources

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