Aquatic Therapy for Injury Prevention, Rehabilitation, and Sport Performance

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Objectives

Identify principles of aquatic therapy including indications, contraindications, and special considerations for diverse patient populations

Demonstrate specific aquatic therapy exercises for improving range of motion, strength, gait training, balance, power, and injury prevention.

Create an aquatic therapy program for a specified case study while meeting individual patient needs

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Therapeutic Effects

- Relaxation
- Reduction of pain and muscle spasm
- Increased ROM
- Increased strength, power, and endurance
- Cardiovascular Conditioning

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Indications

- Pain
- Gait training
- Strength
- Coordination/ movement patterns
- Controlled weight-bearing
- Muscular endurance
- Reduced peak impact forces by 33-54% (Doctor, et al., 2024)
- Flexibility (ROM)
- Posture
- Controlled skill simulation
- Speed, Power, & Agility (Doctor, et al., 2024)
- CV endurance
- Relaxation
- Recreation and enjoyment

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Indications - Specific Conditions

- Low back pain (Peng, 2022) and Facet joint syndrome (Bellomo, 2020)
- Neck pain (Corvillo, 2020)
- Ankle sprains (Sadaak, 2024)
- Shoulder mobility and muscle performance (Thein & Brody, 2000)
- Fibromyalgia - clinical symptoms (stiffness, pain, fatigue, stiffness, anxiety, depression), physical function (balance, walking, & stair-climbing), and quality of life (Ma, 2022)
- Improved Static & Dynamic Balance in older adults (Sharia, 2022)
- Reduced pain and improved function, strength and QOL in patients with hip or knee osteoarthritis (Hinman, 2007; Ma, 2022)
- Post-op ACL-R. (Buckthorpe, 2019)
- Post stroke rehab (Veldema, 2020)

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Contraindications

Fever

Open Wound (2 weeks post-op)

Contagious Rashes

Infectious diseases

Severe CV disease

Allergies to pool chemicals

Incontinence

Hypertension or hypotension

Cognitive impairments

Functional impairments

Aquaphobia

Hx of seizures

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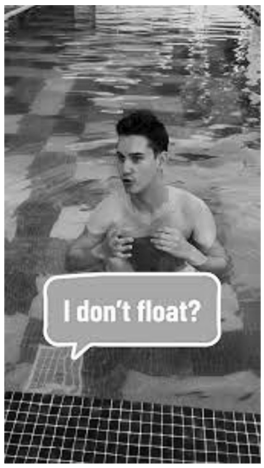
Basic Principles Buoyancy



Archimedes Principle

- The upward force or flotation of an object is equal to the weight of the water it displaces
- Dependent upon both volume and density of the object
- Examples

  Volume – inhaling and exhaling changes the volume of the lungs

  Density – Muscles are more dense than adipose tissue and, therefore, don't float well

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Specific Gravity

The ratio of the mass of a substance compared to the mass of water

- Specific gravity of water = 1.0
- If SG > 1, then the object will sink
- If SG < 1, then the object will float

The human body ranges from .93 to 1.10

- Fat = 0.8
- Bone = 1.5
- Lean Muscle = 2.0

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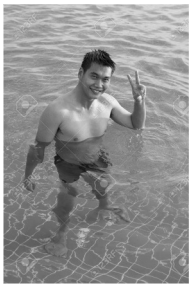
Weight-Bearing



	Males	Females	Average
C7	8%	8%	8%
Xiphoid Process	35%	28%	30%
ASIS	54%	47%	50%

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Hydrostatic Pressure

Pascal's Law

- Fluid pressure is exerted equally on all surfaces.
- Pressure increases as depth and density of the liquid increases (greater pressure in salt water)
- Pressure may be used to control or reduce swelling/lymphedema

Pressure = 1mmHg/1.36cm of depth (Wilcock, 2006)

- 120cm of depth (3.9ft) = 90mmHg of pressure (slightly higher than normal diastolic blood pressure)

Patient should be vertical in the water, submerged up to their clavicle (Aquatic Physiotherapy Group, 2017)

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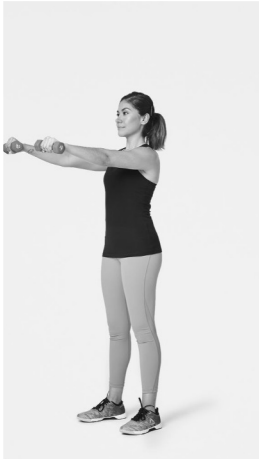
Moment of Force / Moment of Buoyancy



The longer the lever arm, the greater the effect of assistance and resistance provided by the water

Example – Straight arm flexion vs. bent arm flexion

- Extended elbow will make shoulder flexion more challenging

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Resistance

Movement provides a smooth resistance along the entire surface of the limb

- No uneven pressure or strong torque due to a long lever arm

Viscosity – friction between molecules that provide resistance

Turbulence – caused by irregular movements

- Increases resistance (turning on jets, if available, or having others in the pool will increase difficulty)

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Movement

Newton's First Law

- There is a tendency of a body to resist a change in its state of motion
- Example – Changing direction in the water is more difficult because one must overcome the resistance of the water

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Movement

Newton's Second Law

- Acceleration of an object is directly proportional to the force applied
- Example – Increase in speed of a motion will result in greater force being applied, and more resistance is felt
  - To make an exercise more challenging, increase the speed of the movement
  - If the patient states that an exercise is too difficult, reduce the speed of the movement

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Movement

Newton's Third Law
- For every action, there is an equal and opposite reaction
- Example – pushing arms backwards will result in the body moving forward

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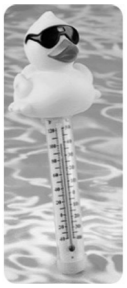
Water Temperature



Therapy Pool
- 92-98ºF (33-37ºC)
- Warm, comfortable
- Used for ROM, light strengthening, gait training
- Use warmer temps for children, elderly, and spinal cord patients (poikilothermic)

Cardiovascular Exercises
- 80-85ºF (27-30ºC)
- Cool, prevents heat illness
- Used for swimming, running, strenuous workouts

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Upper Extremity Exercises

Elbow
- Flexion and extension
- Supination and pronation with a paddle or dumbbell
- Push and pull

Shoulder
- horizontal abduction and horizontal adduction
- Flexion and extension (to 90 degrees)
- Abduction and adduction
- Internal and External rotation (at neutral)
- Arm circles and figure 8's
- Codman's pendulum

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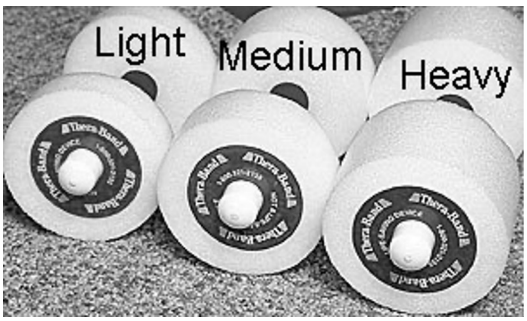

Aquatic Dumbbells

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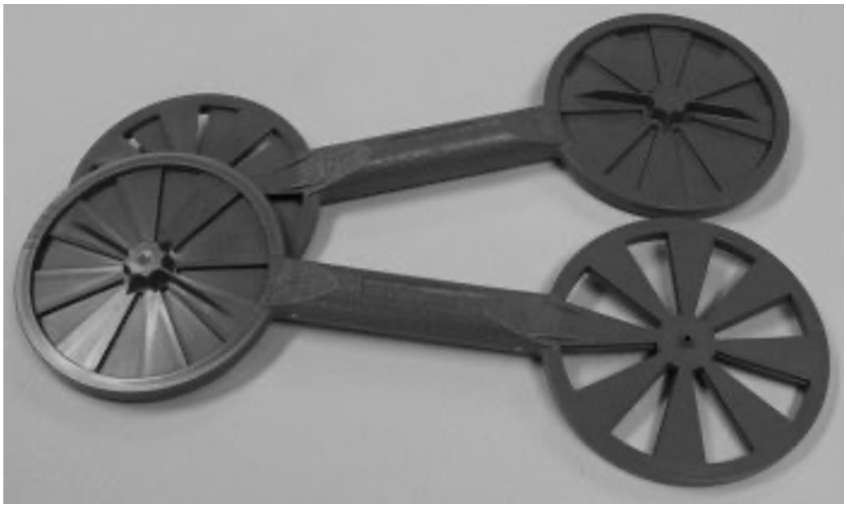
Aquaflex Paddles



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Lower Extremity Exercises

Straight leg raises (in all directions)

Hamstring curls

Jumps

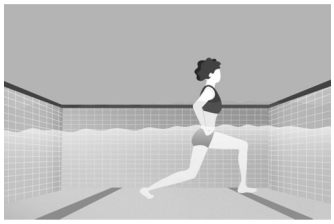
– Jump and tuck

Shuffles

Swimming with a kickboard

Scissor kicks

Gait Training



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Gait Training

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Aquafins – for ankles or wrists

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Instructional Swim Bar

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Cardiovascular Exercises

- Swimming laps with various strokes
- Jogging/sprinting with belts
- Arm laps only (squeeze float between legs)
- Flutterkick with kickboard
- Sitting flutterkick

- Plyometric exercises
  - Explosive without hard landings
- Sport-specific exercises

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Running in the Pool

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Pool Walking & Running

Walking (forward, backward, carioca)

Running

- Run for time instead of distance (get workout from coach and convert it)
- Have athlete visualize running a race
- Maintain good running form – stay vertical!!!
- Pump arms using running form

Land	Water
50 m	7 sec
100 m	15 sec
200 m	30 sec
400 m	60 sec

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Aquatic Therapy Products

Theraband Aquafins

Hydrotone

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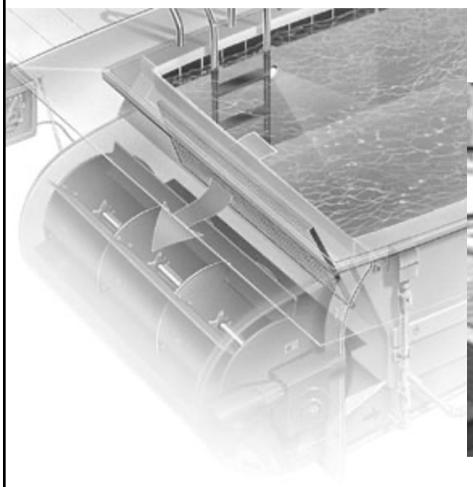
SwimEx



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Hydroworx

Videos on YouTube & Hydroworx website

- http://www.hydroworx.com/products/hydroworx-2000/
- Has floors that meet you near the surface & lower down to any height up to 6 feet

Preferred, but very expensive ($1 million US)

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Sport Specific Exercises

- Basketball – jump shot, defensive slides
- Baseball – Swing a bat, pitcher's leg kick
- Golf – golf swing
- Volleyball – blocks
- Rugby - backpedaling and cutting
- Soccer/Football - side - to - side kicks
- Track & Field – high knees in place, bounding drills, pool sprints

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Case Studies

- Choose a case that you would likely see in your current or desired clinical practice setting
- Develop an aquatic therapy rehabilitation session for today that would last 20-30 minutes.

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Questions?

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