Implementing and Introducing Principles in Aquatic Therapy

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Background and Disclosure

- Pamela Tucker, PT DPT
  Doctor of Physical Therapy
- Children's Institute of Pittsburgh
- UPMC- Shadyside

The Children's Institute
Amazing Kids. Amazing Place.

UPMC
LIFE CHANGING MEDICINE

- Ultragenyx Advisory Committee member- current

OBJECTIVES

- Define aquatic physical therapy and describe the process to initiate this modality
- Identify precautions and contraindications to the use of aquatic therapy
- Explain the physical and physiological values of aquatic therapy versus land-based interventions

OBJECTIVES Cont.

- Discuss the therapeutic implications of buoyancy, relative density, hydrostatic pressure, and viscosity of water
- Describe and demonstrate exercises for low muscle tone and/or low energy
- Review suggestions to collaboratively guide your plan of care with your therapist
- Questions

What is Aquatic Physical Therapy?

What is it?

- Evidence-based and skilled practice of physical therapy in an aquatic environment by a physical therapist
- Includes, but is not limited to treatment, rehabilitation, health optimization, wellness, and fitness of a patient in an aquatic environment with or without equipment
    - NOT swim lessons

Benefits of Aquatic Therapy Across Diagnoses

- Osteoarthritis (Ma et al, 2022)
- Orthopedic injury (Buckthorpe et al 2019; Sadaak et al, 2024)
- Low back pain (Heidari et al, 2023)
- Fibromyalgia (Ma et al, 2024)
- Cancer (Wang et al, 2022; Mur-Gimeno et al, 2022; Reger et al, 2022)
- Multiple Sclerosis (Naeimi et al, 2024)
- Parkinson's disease (Cugusi et al, 2019; Hvingelby et al, 2022)
- Chronic conditions (Fail, 2022)
- Amputation (Cutler, 2017; Cotrobas-Dascalu, 2022)
- Older adults (Buitrago-Restrepo, 2024)
- Obese adolescents (Lopera et al, 2016; Irandoust et al, 2021)
- Children with developmental coordination disorder (Hillier et al, 2020)
- Children with neuromotor impairments (Getz et al, 2006; Hartlage et al, 2021; Maniu et al, 2013; Lai et al, 2015; Franzen et al, 2013)
- Children with autism (Aleksandrovic et al, 2016; Caputo et al, 2018)

Process for Starting Aquatic Physical Therapy

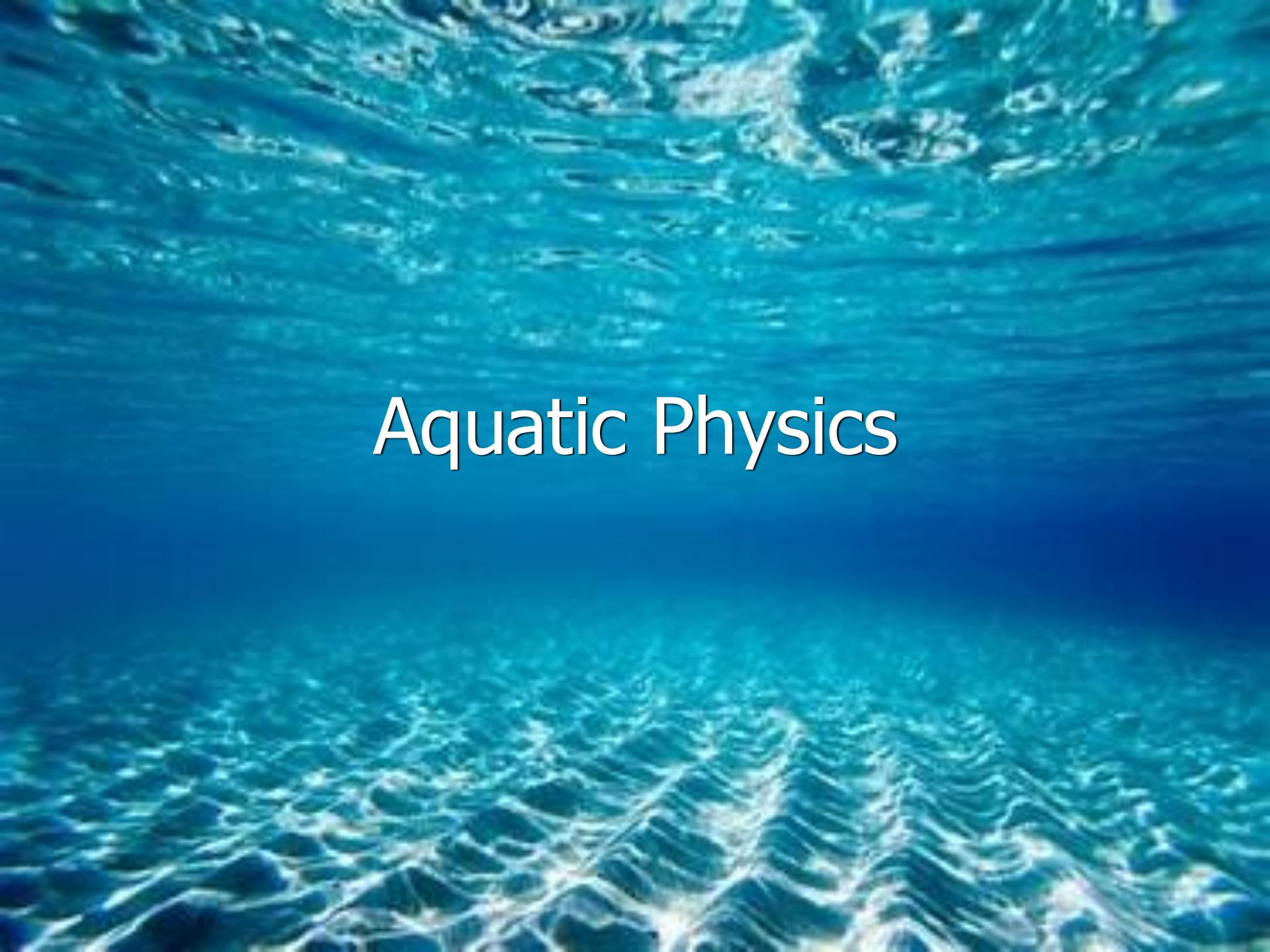
- Script for Physical Therapy Evaluation
- Evaluation and assessment by a Physical Therapist knowledgeable in aquatic interventions
- Clearance and consent (facility specific)
- Written plan of care returned to MD for aquatic therapy

Criteria for Consideration for Aquatic Therapy

- Identification of impairments which can be minimalized with aquatic physical therapy
- The patient has the potential to reach new functional goals or outcomes to improve quality of life or burden of care

Becoming an Aquatic Physical Therapist

- Education requirements
  - Water safety, risk management, an understanding of hydrodynamic principles and various techniques
- Certificate in Aquatic Physical Therapy Clinical Competency (CAPTCC)
  - Six module online course offered through the APTA covering:
    - Risk management
    - Understanding of hydrodynamic principles and various aquatic therapy techniques
    - Three-day pool clinic
    - Billing and coding


Aquatic Physics

Water

- Can be 500-800x more supportive than air AND up to 15x more resistant
  - Resistance is three-dimensional (FUNCTIONAL)
- To generate movement within a plane, we require stability in the others
- Water provides a more holistic/functional approach to exercise

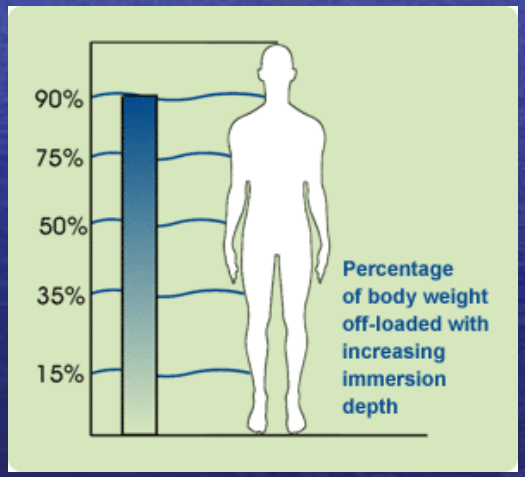
Temperature

- Most therapy pools are 92-94°F
  - Thermoneutral as skin temp is 92°F
  - Best for reducing muscle spasm, improving blood flow and preparing tissue for lengthening
  - This may be lowered to 89-91°F with active children
- 80-82°F usually better for vigorous exercise/conditioning (athletes)

Properties of Water

BUOYANCY

An upward force that opposes the force of gravity.

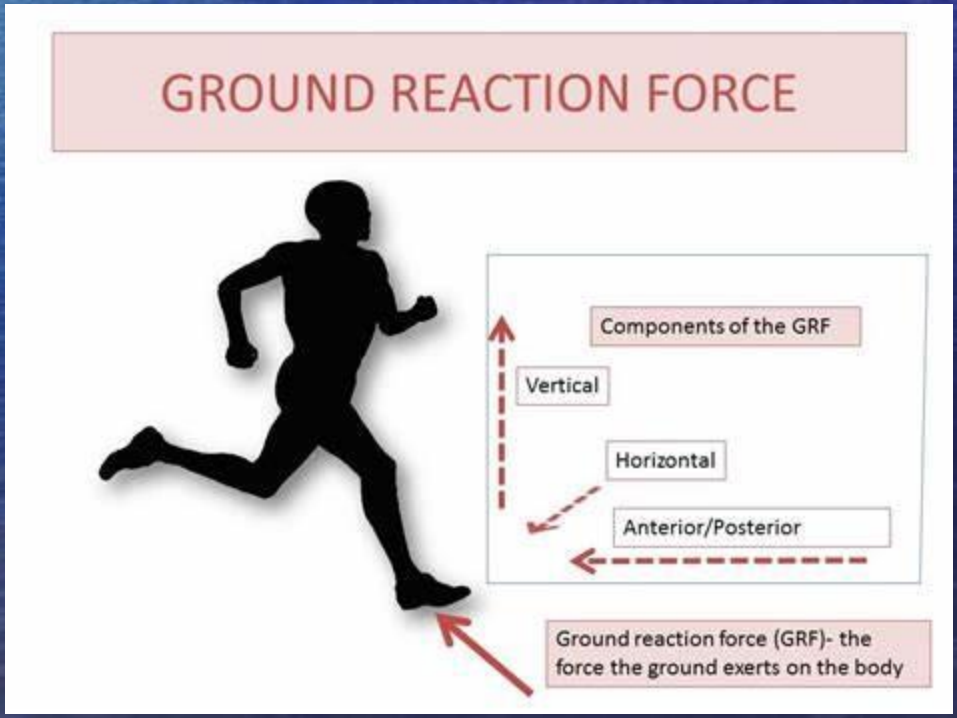


Body Weight Unloading

- ASIS 50% body weight
- Nipple Line 33% body weight
- C7 10% body weight

These percentages are based on *static* position, not *dynamic*.

When moving, ground reaction forces need to be taken into consideration.



Three Components of Buoyancy

1. **Buoyancy Assisted**: Water is assisting the motion (walking performing SLR, assisting hamstring lengthening)
2. **Buoyancy Supported**: Water is supporting the motion (arms on kick board and performing horizontal adduction/abduction)
3. **Buoyancy Resisted**: Water is resisting motion (shoulder at 90 degrees of flexion moving rapidly into extension)

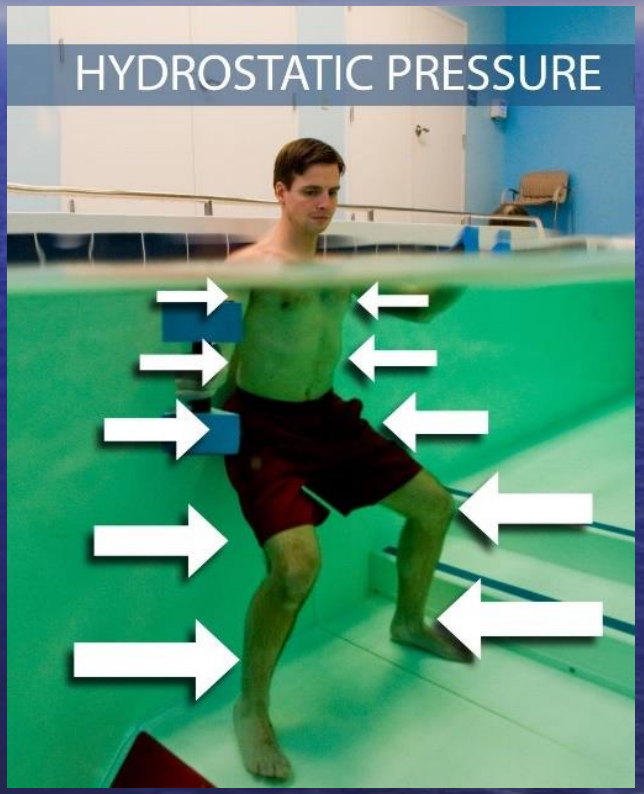
STRAIGHT LEG RAISE WALK
Buoyancy Assisted

SUPINE SNOW ANGELS
Buoyancy Supported

KICKBOARD PUSH DOWNS
Buoyancy Resisted

Hydrostatic Pressure

- Pressure of the molecules of a fluid upon an immersed body
- Increases with depth
  - Approximately 2mmHg per inch
- This assists in the reduction of swelling, but also impacts the CV and respiratory systems




ICE
BILLABONG

Dad Uses Scuba Therapy To Restore Paralyzed Son's Motor Functions – Now He's Doing It For Others As Well
https://www.upliftingtoday.com/2019/09/dad-uses-scuba-therapy-to-restore-paralyzed-sons-motor-functions-now-hes-doing-it-for-others-as-well/

Hydrostatic Pressure

- Immersion yields increases stroke volume and cardiac output which will cause the heart rate to decrease approximately 11-15bpm.
- Increased resistance for respiratory musculature.
  - Requires increased strength and energy to breathe.

Viscosity

- The friction between the molecules of a liquid which cause the molecules to adhere
- Resists movement depending on speed and surface area
- Delayed balance reactions are trained more functionally
- When immediately exiting water, you carry that same water with you


Considerations for
Aquatic Therapy

PRECAUTIONS/CONTRAINDICATIONS TO AQUATIC THERAPY

PRECAUTIONS

- Confusion/Disorientation
- Certain Medications
- Respiratory Problems (Lung capacity 1.5L or less)
- Hypertension
- Fear of water
- Chemical allergies (chlorine)
- History CVA or epilepsy
- Labyrinthitis
- Diabetes
- Cardiovascular or cardiopulmonary conditions

PRECAUTIONS/CONTRAINDICATIONS TO AQUATIC THERAPY

CONTRAINDICATIONS

- Cardiac failure
- Urinary infection
- Incontinence
- Open wound
- Infectious diseases (Influenza)
- Uncontrolled seizures
- Skin conditions
- Menstruation without interior protection
- Recent surgery (unless cleared by surgeon)

Aquatic Equipment

Assistive Equipment:

- Barbells/Dumbbells
- Cuffs
- Belts
- Kickboards
- Noodles

Aquatic Equipment

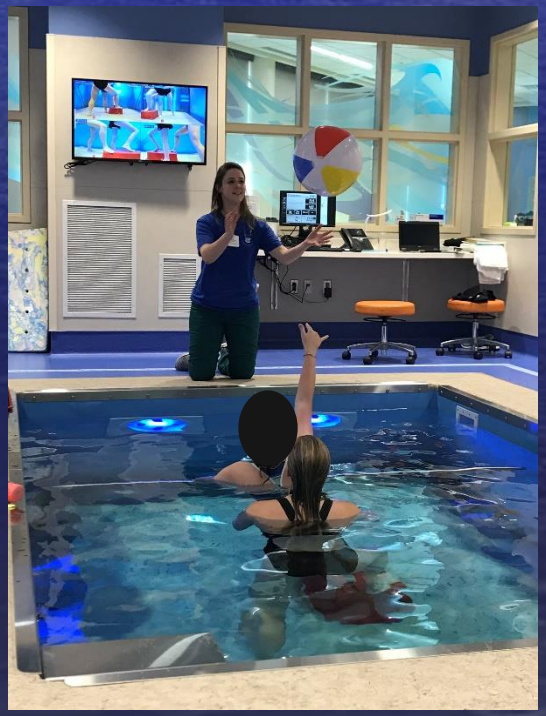
Resistive Equipment: Based on principles of drag, viscosity, and surface area.

- Paddles
- Weights
- Hydro-tone/Aqualogix
- Fins

Aquatic Equipment

Functional Equipment: Bridge the gap between water and land.

- Tethers
- Steps
- Rings
- Balls
- Workout Stations



Considerations for Patients with Metabolic Conditions

Does Intensity Matter?

Water allows exercise with less stress on joints, muscles, bones due to aquatic properties

Low impact ≠ low intensity

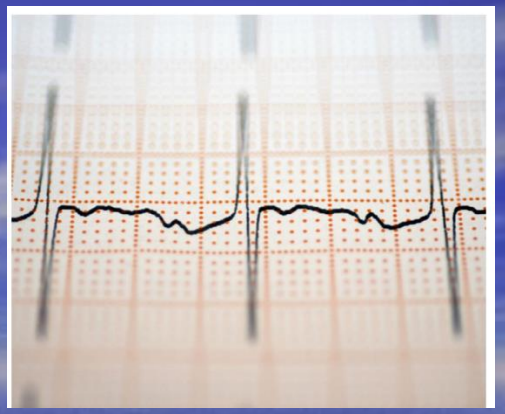
Intensity cont.

Land intensity is *mostly* quantifiable: speed/grade (mph/%), watts, kcals, METs, theraband color, BW, lbs/kg, resistance listed on plate/hydraulic equipment

Water is *nuanced*: buoyancy/resistance combined with equipment, altering resistance in water, body composition, water depth, temperature.

DeBlois et al. Hard Water, 2025

Intensity cont.



- HR reduced approx. 10-15 bpm
  - water depth dependent
- Identify any HR lowering medications and notify your therapist
- Utilize HR range and target zones as a guide

DeBlois et al. Hard Water, 2025

Measuring Intensity- RPE

Borg Rating of Perceived Exertion (RPE) Scale & Talk Test Comparison		
Borg	**Talk Test**	**Level of Exertion**
6	Not Difficult Exercise	No exertion or extremely light exertion. Easy to speak or sing without straining for breath.
7		
8		Very light exertion. Still easy to speak clearly for a sentence or two without needing to pause for breath.
9		
10	Moderate Exercise	Light exertion. Can still speak easily, but may need slightly more breath. Singing may be difficult.
11		
12		Moderate to somewhat hard exertion. Begins to get difficult to speak more than a few words without pausing for breath.
13		
14		
15	Vigorous Exercise	Hard exertion. Heavy breathing, difficult to speak without pausing for breath every few words.
16		
17		Very hard exertion. Speaking and catching your breath while exercising are both very challenging.
18		
19	Extremely Vigorous Exercise	Extreme exertion. Speaking not likely to be possible in this zone.
20		Maximal exertion. Catching your breath while continuing this level of exertion will be very very difficult.
The information in this table is based on estimated values, and is intended to provide guidelines for self-assessment, not to replace medical advice.		

DeBlois et al. Hard Water, 2025

Key exercise prescription and dosage recommendations for aquatic therapy

A person-centred approach is recommended.

Design and tailor aquatic programs to individual needs, goals, preferences, medication and the stage of disease.

How often? (Frequency)

Rehabilitation/ hospital setting:

2-5 times per week as part of an overall therapy program.

Community-based setting:

At least **twice per week** as part of an overall exercise and physical activity program.

OR

At least **once per week** together with a targeted home exercise program.

How hard? (Intensity)

In the warm-up and cool down phase include low intensity activities.

In the active phase aim for **moderate to high intensity** aquatic exercises including: progressing aquatic exercises by gradually increasing the quality, time, speed, resistance and number of repetitions and sets.

How much? (Duration)

30–60-minutes are recommended.

At least **12-weeks** of aquatic therapy is recommended for optimal outcomes.

Continuous participation in community aquatic therapy is recommended if possible.

Corrini et al, Mult Scler Relat Disord. 2022
Carroll et al, Journal of Parkinson's Disease. 2022

Talking to Your Therapist

- Fuel before, during, and after
- Consider interval training with modifications
- Combine aquatic and land-based PT to maximize results
- Plan ahead for energy costs
- Ask about assistive device use in the pool (e.g., rails, AFOs, floats, etc.)
- Ask about flexibility progression

QUESTIONS?

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