

Aquatic Resistance Training

Research Enhanced Presentation

Compiled By: June M. Chewing, MA

Evolution of RT in the Aquatic Environment

1980's and Early 1990's

Thought process for Aquatic RT:

- Water creates resistance in all planes of motion and in all directions.
- Training in the water primarily builds muscular endurance.
- You can't really build strength effectively in the water.

Research Advanced RT Guidelines (later 1990's, early 2000)

The next set of guidelines became a little more specific and included biomechanic concepts.

For RT in the water, the following factors must be considered:

- The length of the limb.
- Equipment factors: surface (drag) area, level of buoyancy, amount of weight, or tension of the rubberized equipment.
- The velocity or speed of movement.
- Controlling range of motion is important in progressive overload.

Recommendations for Progressive Overload:

- More repetitions (increase speed) through full range of motion within the same period of time.
- More repetitions through full range of motion at the same rate of speed; this option will take a longer period of time.
- Systematically increase the frontal surface area, buoyancy, or resistance depending on the type of equipment being used.

Guidelines became less vague, but still didn't have much scientific evidence.

AEA Research Committee listed quantifying workload in the water as a priority research need.

Quantifying workload and progressive workload are important concepts for aquatic fitness as well as aquatic therapy.

Research Emerged!

In the past decade, two research groups emerged to study Aquatic RT:

A group in Finland, led by Tapani Pöyhönen

- Knee rehabilitation
- Knee flexion and extension
- EMG activity
- Drag forces, Drag coefficients
- Progressive resistance overload

A group in Spain, led by Juan Colado

- General and athletic populations
- Transverse shoulder abduction and adduction
- EMG activity
- Controlled cadence
- Progressive resistance overload
- Water currents
- Compared land and water RT exercises

Finland Recommendations

Recommendations emerged to help quantify and progress workload:

- Use a timing device to consciously control speed (durations and repetitions)
- Systematically vary the load of the equipment
- Use perceived Exertion

Spain Recommendations

In testing transverse shoulder adduction and abduction and using EMG:

- Found from EMG in trunk muscles that activation of the erector spinae lumborum was significantly higher in the aquatic medium compared to land
- Good form and technique as well as adequate strength in the stabilizing trunk musculature is recommended before performing aquatic resistance training exercises with high resistance/intensity.

Objective Recommendations/ Guidelines for program design with devices that increase drag force (DIDF): Summary Paper (Colado/Triplett 2009)

The same program design recommendations used for land resistance training should also be used for the aquatic environment to determine load, volume and progression.

1. You must have combined control of:
 - Cadence / movement pace
 - Size of the equipment (surface area)
 - Length of the extremity (lever arm)
 - Hydrodynamic position of the moving segment and device used
 - Perception of effort at predetermined number of reps using the OMNI Resistance Exercise Scale (OMNI-RES)
2. Monitor pace with beats per minute or a device like a metronome.
 - The resistance provided by the water is always the same.
 - Use the same form and technique through full ROM.
 - When you increase the pace, resistance increases quadratically (squared).
3. When necessary, increase DIDF to the amount necessary to keep a prescribed pace of movement and reach the desired number of reps and level of effort.
4. Increase the pace of movement with same size DIDF.

Recommended Steps to Determine Intensity of Aquatic Resistance Exercises: (Colado/Triplett 2009)

1. Determine desired rep range based on client goals and training history.
2. Determine desired level of exertion
 - Use the OMNI-RES Scale (This is a scale that was developed for resistance training which is similar to the Borg Scale.)
 - You can also use the OMNI scale to vary intensity
3. Choose the appropriate DIDF
 - Based on the client's reps and exertion level
 - This may involve a trial and error process just as for land RT
 - The cadence should be the maximal possible allowing the exerciser to complete targeted reps at the targeted OMNI-RES level
 - Cadences are commonly between 44 and 64 beats per minute

General Application

- Now know we can build significant strength with Aquatic RT.
- Now have the tools to build Aquatic RT programs for all levels of participants.
- Learn, practice and perfect guidelines and recommendations to consciously develop Aquatic RT programs with adequate resistance and progressive overload.