

# Water Immersion

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Although the temperature and humidity level of air affect comfort level and physiological exercise parameters, the water itself has a more direct impact on aquatic exercise participants. One primary variable invades all aquatic fitness research and directly or indirectly affects virtually all outcomes. That variable is immersion of the human organism in water. In aquatic exercise, research indicates that immersion in water has direct impact on human physiological, psychological, and emotional outcomes.

(This information is extracted and very generally compiled from the Aquatic Exercise Association's aquatic fitness research database. This database is managed by the AEA Research Committee, and is available through the Aquatic Exercise Association.)

Researchers have been fascinated by the effects of water immersion on human physiology and psychology for many years. Immersion studies date back as early as 1938 and continue through the present. Human immersion falls into two general categories: face-in immersion as in swimming or horizontal exercise, and face-out immersion as in vertical water exercise. In this manual, vertical aquatic exercise or face-out immersion is of primary concern.

Many primary physiological responses to water immersion are accepted in research. These include:

- Alterations in circulation, the circulatory system, blood volume, and the heart.
- Both a resting and exercise heart rate reduction with immersion.
- Alterations in thermal regulation, changes in body core temperature, with heat dissipation primarily through conduction and convection.
- Impact on renal/kidney output due to diuresis and an increase in blood fluid.
- Endocrine system responses.
- Hydrostatic pressure impacts on surface and internal body organs.
- Reduction in hydrostatic weight with reduced impact stress on joints.
- Decompression of the spine in deep water.
- Reduced edema and swelling in the extremities, especially the legs and ankles.
- Benefits to pregnant anatomy and physiology.
- Effects on oxygen transport and oxygen consumption.
- Musculoskeletal adjustments to movement in a more viscous environment including an increase in muscular effort, type of muscular contraction, and rate of perceived exertion.
- Biomechanical adjustments/ changes in human movement patterns when submerged.
- Changes in pulmonary function, pulmonary blood distribution, and added load to the respiratory muscles.
- Facilitation of recovery from exercise performed in the water and from exercise performed on land.
- Positive psychological, emotional, and social aspects of aquatic exercise.

The effects of water immersion on the human organism are profound and affect oxygen consumption, impact load, heart rate, breathing, thermal regulation, and musculoskeletal load during aquatic exercise. The water is a very complicated environment offering numerous benefits as an exercise medium. To make life in the water even more complicated, the physiological responses to water immersion are affected by additional criteria including:

- Water temperature
- Water depth

- Body composition
- Intensity of exercise (rest, submaximal exercise, or maximal exercise)
- “Dunking” or temporary submersion of the head and face
- Individual participant factors (age, gender, disease, etc)

For example, water temperature has an effect on thermal regulation, oxygen consumption, circulation, and pulmonary function. These effects may be different for a younger exercise participant as opposed to an older adult. Water depth affects hydrostatic weight, impact load, hydrostatic pressure, renal function, and biomechanical adjustments to movement in the aquatic environment.

As research continues to illuminate our understanding of the aquatic environment, we continue to understand optimal conditions and safety for aquatic exercise. It is also clear that not every program is created equal in its needs for an ideal aquatic environment. Some programs, such as a yoga program in the water, may require higher water temperatures for optimal physiological effects, physical and psychological comfort, and safety as opposed to a program requiring intense cardiorespiratory exercise.

As an aquatic fitness professional, you want to learn as much about the aquatic environment and its affects on aquatic exercise as possible. This environment is very different from exercise performed on land. By studying the aquatic environment, how the body moves in the water, the physiological and psychological effects of water immersion, as well as the research based industry recommendations/ guidelines for aquatic exercise, you will positively affect the quality of your client’s exercise experience. Proper knowledge of the aquatic environment is essential to your effectiveness and professionalism.