



## Extra Benefit of Water-based Exercises

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We CALA trained instructors know there are five magical properties of water. One of those is turbulence. It provides a number of positives on the outside of our bodies and helps with internal strength. Turbulence is, however, not welcome inside the body. Turbulence inside the walls of our blood vessels is bad and goes by the fancy name of endothelial dysfunction. Endothelial dysfunction is a systemic pathological state of the endothelium (the inner lining of our blood vessels) and can be broadly defined as an imbalance between vasodilating and vasoconstricting substances.

Endothelial dysfunction is found in people with cardiovascular disease, and those with vascular risk factors. It is commonly associated with decreased nitric oxide (NO) bioavailability, which is due to impaired NO production by the endothelium and/or increased inactivation of NO by reactive oxygen species. Endothelial function, however, can be improved significantly by exercise, especially water-based exercise, and improved diet.

The use of water-based exercises in rehabilitation programs designed for cardiac patients was relevant in inducing an increase in basal circulating nitrates, both in stable chronic heart failure (CHF) and coronary artery disease (CAD) patients with preserved left ventricular function. The results of the study we are reviewing in this report indicated that **water-based rehabilitation exercises increased a person's basal level of plasma nitrate, a main NO metabolite, better than in those people who performed their whole training on land.** This result was, for the authors, "a true reinforcement of the beneficial training effect by water immersion".

The study found that exercise training in general produces an increase in exercise capacity and at the same time an improvement in NO bioavailability, both in healthy participants and in people with CHF or CAD. In the groups performing water-based exercises, the plasma concentration of nitrates was significantly increased ( $P = 0.035$  for chronic heart failure and  $P = 0.042$  for coronary artery disease), whereas the change in the groups performing gymnastic exercise on land was not statistically significant.

The authors of the study concluded that in every group – gym and water -, the cardio respiratory capacity of patients was significantly increased after rehabilitation. The water-based exercises seemed "to effectively increase the basal level of plasma nitrates." Such changes may be related to an "enhancement of endothelial function and may be of importance for the health of the patients".

It is known that rehabilitation programs involving immersed exercises are more frequently used with severe cardiac patients. The main reason for such practice comes from the buoyancy provided by water which makes any kind of water exercise attractive for individuals seeking ways to improve fitness without the risk of musculoskeletal injuries and the fear of falling. There now appears to be another reason to use water based rehab and that is enhanced endothelial function that it encourages.

Here is a direct quote from the study. "Attention has been paid to short-term adaptations occurring during water immersion. In this condition, the ambient hydrostatic pressure reduces the vascular



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capacitance, leading to the translocation of peripheral blood into the thoracic vasculature (hydrostatic pressure forces blood into the chest). Cardiac preload and central venous pressure are increased because of the relative hypervolemia (improved stroke volume). In both healthy participants and cardiac patients, cardiac output and pulse pressure (PP) are greater during water immersion than on land, both at rest and during exercise. A lowered vascular tone and a lower total peripheral resistance are also achieved, which on the whole sketch a state of peripheral low vascular tone concomitant with replete vessels. Therefore, regular exercising in water may trigger long-term effects on the cardiovascular system, but this has not been verified yet to the best of our knowledge." More studies needed.

So they investigated whether a rehabilitation program including water-based exercises has additional effects on the cardiovascular system in heart disease patients compared with a traditional land-based training. The authors evaluated the cardiovascular status of patients with heart failure (CHF) or coronary artery disease (CAD) involved in either a rehabilitation program entirely performed on land or in a program including immersed exercises.

In the study, the duration of the rehabilitation program (3 weeks) was sufficient to allow improvement of cardiorespiratory capacity. Furthermore, we were able to observe differences between the land-based and the water-based rehabilitation program. The authors go on to say that it is plausible that a longer rehabilitation duration would have majored the differences between the two programs. A follow-up of the patients would have been of interest, as well. Therefore, further studies are required to better assess the long-term effects of training including exercise in water.

The study title and authors are:

**Training-induced increase in nitric oxide metabolites in chronic heart failure and coronary artery disease: an extra benefit of water-based exercises?**

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