

“Communicating the Relevance of Research”

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This issue of *Physical Activity Today* focuses on studies related to the effects of water exercise on various adult populations.

**The Question:** What are the physiologic responses to water exercise in middle-aged and older adults?

### The Study

Aquatic exercise is becoming an increasingly popular form of aerobic exercise, especially for those who are physically limited, injured, and/or older. Although there is a substantial body of knowledge concerning the health benefits of water exercise, very little is known about the specific physiologic effects of aquatic exercise on middle-age and older adults. In addition, whether water exercise meets the American College of Sports Medicine (ACSM) guidelines for health benefits is not well established. In this study, the cardiovascular and metabolic responses to water aerobic exercise of 14 middle-aged and older adults were measured using a CosMed portable calorimetric measurement system. The CosMed portable system allows for breath by breath analysis and calculation of the  $VO_2$  (capacity to transport and utilize oxygen during exercise) and heart rate while the subject is performing the exercise in the water.

### The Results

The main finding was that water aerobics exercise elicited mean exercise intensities of approximately 43% of heart rate reserve (HRR) and 42% of  $VO_{2R}$ , within the 40% to 85% HRR or  $VO_{2R}$  range recommended by the ACSM. Also, the total net energy expenditure for the water exercise workout was 249 kcal. Together, these findings support water exercise as an ideal exercise modality. Moreover, the training intensity was 4.3 METs,

also within the range of 3.0 to 6.0 METs recommended in both the U.S. Surgeon General's report on physical activity and health (1996) and elsewhere for moderate-intensity physical activity.

### Relevance

Scientific research has found a dose-response relationship between exercise and multiple health outcomes, including cardiorespiratory fitness, coronary heart disease, dyslipidemia, obesity, type II diabetes, colon cancer, and all-cause mortality. In this study, the results suggest that a 50-minute water aerobics class at self-selected intensity was sufficient to meet the ACSM guidelines for training intensity and daily net energy expenditure. Although further research with larger sample sizes is warranted, water exercise appears to be an excellent exercise modality for middle-aged and older adults and particularly for individuals with movement limitations who are not well suited to land exercise. These findings are important for fitness instructors, physical therapists and others who design exercise programs for adults.

### Reference

Nikolai, A. L., Novotny, B. A., Bohnen, C. L., Schleis, K. M., & Dalleck, L. C. (2009). Cardiovascular and metabolic responses to water aerobics exercise in middle-aged and older adults. *Journal of Physical Activity and Health*, 6, 333-338.

**The Question:** Does deep water running elicit different muscular responses than treadmill running?

### The Study

This study was the first to examine how deep water running affects certain muscles when compared to treadmill running. Data were collected from seven college-age participants on both a treadmill and in deep water. Rate of perceived exertion scale was used to classify the running as fairly light, somewhat hard, or hard. Surface electromyography measurements were used to determine muscle activity of the rectus femoris (front thigh), biceps femoris (back thigh), tibialis anterior (outside of shin), and gastrocnemius (calf). The participants were oriented to the equipment used in the study before data collection began, and each data collection session was separated by at least two days but no more than seven days.

### The Results

Results showed that tibialis anterior and gastrocnemius muscle activity was significantly lower in deep water running than treadmill running at all three levels of exertion. Both the rectus femoris and biceps femoris showed no difference or slight decreases in muscle activity when comparing deep water to treadmill running. Findings also revealed similar muscle activity between higher intensity deep water running and a lower intensity on the treadmill.

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# PHYSICAL ACTIVITY

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## Relevance

Deep water running is often used for injury rehabilitation because it lessens impact and the chance of re-injury. In addition, because the larger upper leg muscles show similar usage as impact running, deep water running is an excellent cardiovascular running alternative or supplemental activity for individuals who seek to vary their running workouts.

## Reference

Masumoto, K., Delion, D., & Mercer, J. A., (2009). Insight into muscle activity during deep water running. *Medicine & Science in Sports & Exercise*, 41, 1958-1964.

## Contributor

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**The Question: What are the long-term effects of water exercise on the mobility of frail older adults?**

## The Study

Exercise is proven to have positive physical and mental benefits for people of all ages; however, in older adults, fear of falling is at times a barrier to participation in physical activity. Because water is a low-risk environment, the popularity of water exercise among older adults is growing. Earlier short-term studies have shown that water exercise improves the performance of activities of daily living (ADL), yet there is still no consensus on how to achieve long-term benefits. The purpose of this study was to compare the 2-year effects of once- and twice-weekly water exercise on ADL ability and lower muscle strength in 20 frail older patients housed in a nursing care facility.

## The Results

The key finding of this research was the significant improvement in functional mobility, transfer, bathing transfer, mobility, and stair climbing scores at the 2-year measurement compared to baseline. Group differences for bathing transfer and stair climbing suggested that at least twice-weekly water exercise was necessary to maintain the ADL ability and knee extensor strength of frail older adults during the 1-year water exercise period and for 1 year afterward.

## Relevance

No previous longitudinal study has investigated the benefits of water exercise for frail older adults. Earlier research had found that once- and twice-weekly water exercise over a 6-month period improved ADL ability and muscle strength of frail older adults. In this study, it took only 6 months of water exercise to improve ankle dorsiflexor muscle strength and 1 year to improve knee extensor strength. Given that lower muscle strength decreases with aging, the increase in strength achieved in this study may give hope to those who worry about falling during physical activities. Likewise, the improvement in knee extensor strength may have contributed to the positive changes in ADL that may also provide older adults with increased confidence in performing their physical activities.

## Reference

Sato, D., Kaneda, K., Wakabayashi, H., & Nomura, T. (2009). Comparison of 2-year effects of once and twice weekly water exercise on activities of daily living of community dwelling frail elderly. *Archives of Gerontology and Geriatrics*, 49, 123-128.



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