Effects of high-intensity training on exercise performance in well-trained swimmers
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In the last decade, many studies have reported that high-intensity or sprint interval training can improve not only anaerobic (glycolytic) metabolism but also aerobic (oxidative) metabolism and that such metabolic adaptations improve exercise performance. Recently, we developed a very high-intensity, low-volume, sprint interval training (SIT) protocol. It consists of five 5 s bouts at an intensity which cause exhaustion in ~10 s (~300% VO\textsubscript{2}max) with a 10 s rest between each bout, and then we determined metabolic profile of the protocol. As the result, it is revealed that VO\textsubscript{2} during 5\textsuperscript{th} 5 s bout of the SIT protocol reached ~96% VO\textsubscript{2}max and that the net accumulated O\textsubscript{2} deficit corresponded more than 50% of maximal accumulated O\textsubscript{2} deficit (MAOD).

After that, we examined the effects of the SIT on metabolic, mechanical characteristics and swimming performance in well-trained swimmers. After 4 weeks of training, VO\textsubscript{2}max, MAOD, and maximal propulsive power (MPP) increased significantly. In addition, the swimming record on 50m freestyle event was significantly improved (P<0.01) and it was brought by the increased stroke rate, but not stroke length. On the other hand, drug-swimming velocity relationship did not change. These results revealed that the SIT improves MPP associated with an increase in metabolic capacity, and consequently sprint swimming performance, without any decrease in drag.

Key words: sprint interval training, high-intensity exercise performance, maximal propulsive power

EMG measurements of human movement when immersed in water
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Purpose and Contents: Recent research was conducted for electromyogram (EMG) measurement and analysis for human movement, specifically during immersed in-water environments. This was followed by application of outcomes to aquatic exercise and rehabilitation training programs to enhance human health care aimed at regaining the target movement. Water has a high density at approximately 800 times than that of air, as well as having 25 times greater thermal conductivity and both create physical characteristics such as buoyancy, viscosity, pressure, and temperature effects. While moving in water, buoyancy and viscosity strongly affect the human body, especially on skeletal muscles and motion itself. Therefore, this presentation will focus on three points of interest. Firstly; how to measure EMG during human movement in an aquatic environment including introducing water proofing method recently applied by the author. Secondly; introducing results of EMG for lower and trunk muscles during human walking and running in water environments from this author’s and other research investigations. Finally recent developments of water proofed devices will be introduced to discuss conveniences and difficulties for using in underwater environments.

Key words: Water immersion, Surface EMG, Motion analysis, Water proofing