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AEROBIC TRAINING IS NOT ENOUGH

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Much swimming training is aimed at "aerobic training". It is not unusual to hear coaches extolling the virtues of aerobic adaptation and training the aerobic system maximally. Actually, that is a very limited vision of swimming adaptation and does not result in near maximal performances of which a swimmer is capable.

What distinguishes the aerobic system from the "anaerobic system" is that aerobiosis uses oxygen to consume fats and glycogen to provide energy. The byproducts of that consumption are water and carbon dioxide. Anaerobiosis increases the acidity of the blood and interstitial fluids and eventually interferes with performance.

Tests are available for measuring maximal aerobic capacity (VO_{2max}). The majority of swimming coaches believe that if the VO_{2max} value is increased until it cannot be increased further, then maximal capacity is achieved and training has been "successful". While that may be true it is not the best state for competitive swimmers.

The more important factor of physiological function for swimming is oxidation to produce energy. A maximal oxygen capacity is only part of a swimmer's potential oxidative capacity. The maximal oxidative capacity is of greater importance than maximal aerobic capacity because it involves the aerobic system PLUS Type IIa fibers. Those fibers in an untrained state are anaerobic in function but with sufficient exposure to high-intensity training stimuli are adapted to become oxidative. Training the Type II fibers to be IIa adapted increases the ability of a swimmer to use oxygen before anaerobiosis is needed. To adapt the Type II fibers, training stimuli have to be voluminous and require energy beyond that which can be supplied by the aerobic system alone. The swimming velocity that is accommodated by maximal oxidative capacity is faster than that which can be sustained with maximal aerobic capacity.

Aerobic training (Type I fibers) is not enough when one is looking for maximum performances. What is required is oxidative training, which is the provision of training stimuli that require full aerobic system capacity and more. With sufficient volume of repetitions at greater-than-aerobic-training levels, the oxidative capacity of a swimmer is increased by the development of Type IIa fibers.

Since swimming races are maximal performances, one has to ask why would training stimuli be less than what is required in races? What is the value of a large proportion of practice exercises being undertraining?

Ultra-short race-pace training (USRPT) is the format for producing significant volumes of race-specific (high-intensity) training intensities that will maximally stimulate both the aerobic system and the conversion of originally anaerobic fibers to oxidative Type IIa fibers. Coaches claim

other formats yield the same result but usually they do not because glycogen stores are depleted resulting in no learning of pace-specific techniques, diminished functioning of the aerobic system, and the sensation of cumulative fatigue. Glycogen depletion does not recover quickly (i.e., a matter of a few hours). Training sessions that reduce glycogen could take at least 48 hours for full replenishment to occur. One significant training session every 48 hours, while less than significant sessions might occur in the between time and stall glycogen recovery, is not valuable training. Since USRPT does not deplete glycogen but does present valuable training stimuli, it is possible to perform USRPT twice daily and for stroke/events specialists possibly only once daily.

It is not hard to realize that USRPT is the method for providing greater volumes of race-specific, and therefore valuable, training stimuli which result in faster and higher levels of oxidative adaptation in swimmers. It is a maximum stimulus that replicates the maximum requirements of a race. Aerobic training does not serve that function and does not develop an optimal physical status for competing.

No research is available that shows how much high-intensity training is needed to develop maximal oxidative capacity for each race-pace. Rest assured it will be much greater than a small amount of race-pace swimming (e.g., broken swims) on occasions. Maximal oxidative capacity will be achieved if USRPT is the only format used for training. Since the energy provision and technique are specific to every race distance and stroke, USRPT is the only training format that is relevant to racing that is, it makes training sense. Other forms of non-specific training are irrelevant and mostly produce accumulated fatigue that diminishes further the small amount of benefit (if that) that might result.

USRPT requires adherence to certain criteria (Rushall, 2011). If those criteria are not met, USRPT is not presented to swimmers. Some race-pace work in swimming training is ineffective, not synonymous with or as effective as USRPT, and fails to propel swimmers to improved performances in races. USRPT trains the aerobic system maximally and other avenues for oxidative energy production. Aerobic training is not enough.

Reference

Rushall, B. S. (2011b). Swimming energy training in the 21st century: The justification for radical changes. *Swimming Science Journal, Swimming Science Bulletin #39*. On line <http://coachsci.sdsu.edu/swim/bullets/energy39.pdf>.