

Advances in *Endurance*

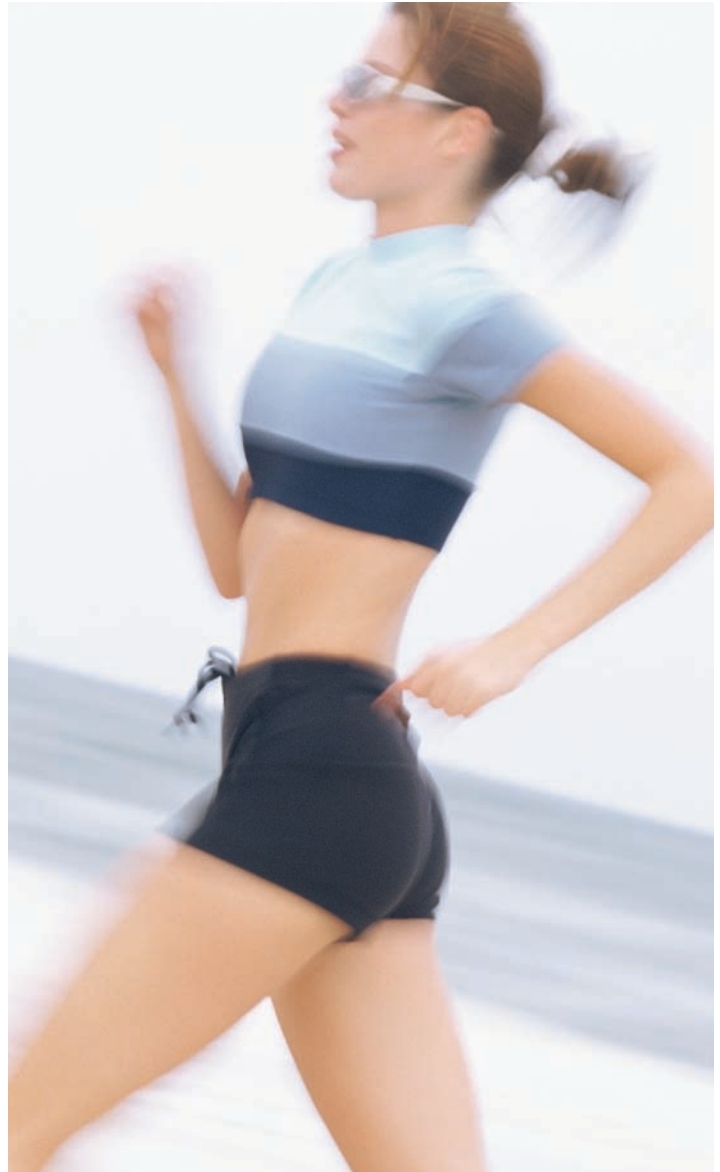
By Dr. Chris Aland

Endurance athletes train at levels that require them to push their outer limits. These athletes are consistently looking for new ways to improve both their stamina and performance. The threshold for improvement, however, is not simply a matter of adding more hours, increasing the intensity of workouts, or the use of supplements. The athlete must be willing to find different ways to continue to make his or her workout more efficient while also sustaining a level of improvement.

Options to make conditioning more efficient include training at altitude, strength training, and the utilization of modern technology. Unfortunately for most of us living on the east coast, altitude training is not an easy option. Atmosphere tents are expensive, and travel is not practical. Strength training, particularly upper body workouts can help with speed, but add little for endurance. Smarter training through the use of technology is therefore the option that makes the most sense.

Training at optimal efficiency requires training that focuses on the role that the heart plays in your conditioning regimen. Heart rate monitors have long been commercially available, but the use of them has been poorly understood. The problem lies in accurately determining the appropriate level at which heart rate training should be performed. Formulas and calculations give only an approximation of the ideal heart rate required for one to be at his or her optimal training zone.

Metabolic testing, is a methodology that provides a more specific "ideal heart rate training zone." It utilizes a computer analysis of expired gasses from the athlete to determine the efficiency of exercise. By knowing this efficiency level, and the heart rate that accompanies it, an accurate determination of exercise heart rate levels can be done. Typically meta-



bolic testing is done at a university exercise center with complex equipment and is not generally available to the general population. However, miniaturization of computer equipment has made metabolic testing available on smaller, portable units.

Fitness can also be measured by the volume of oxygen you consume while exercising at your maximum capacity. Oxygen utilization is usually measured in an equation called VO₂ max. VO₂ max is the maximum amount of oxygen in milliliters, one can use in one minute per kilogram of body weight. Those who are more fit have higher VO₂ max values and can exercise more intensely than those who are not as well conditioned. Numerous studies show that you can increase your VO₂ max by working out at an intensity that raises your heart rate to between 65 and 85% of its maximum for at least 20 minutes three to five times a week.

Prior to exercise, metabolic and VO2 max testing will allow for the designation of VO2 max, as well as resting metabolic rate. In this way, both exercise as well as diet can be co-ordinated so as to produce the optimal effect. Additionally, based on the results from the metabolic and the VO2 max testing, appropriate training zones can be determined and exercise protocols can be created with respect to these numbers. Consistently training in these pre-determined zones allows work-outs to be customized. Once the accurate heart rate training zones are established, the use of a heart rate monitor device is crucial. (Heart rate monitors are relatively inexpensive and are available at most sporting good stores, or on-line.) It is at this point that the individual can truly train at the optimal level of intensity with the maximum amount of efficiency.

In summary, smarter exercise, not more exercise is the solution to maximum utilization of time and energy. Consulting with a professional that specializing in metabolic and VO2 max testing may be the gateway to better performance.



Christopher M. Aland M.D. is an orthopedic surgeon who has been in practice in bucks county for the past 15 years. he is the team doctor for the council rock, pennsbury, and morrisville school districts, and has been the consulting physician for many local and national athletic events.