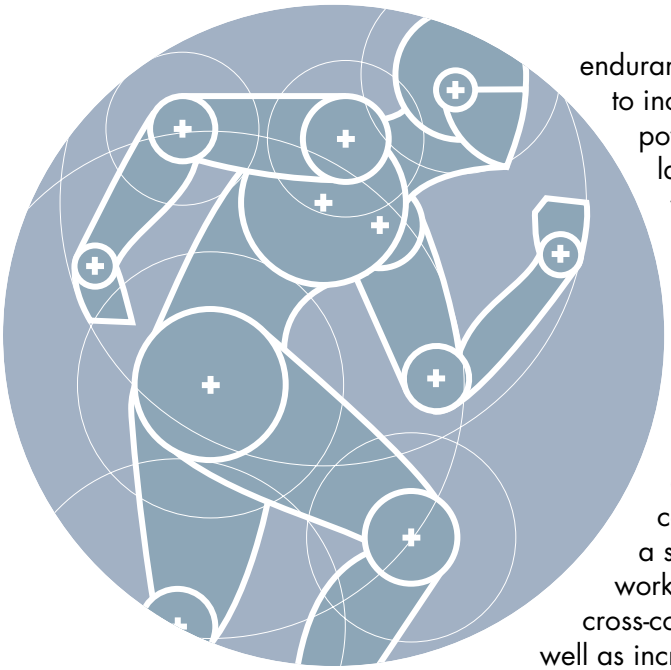
A RESEARCH OVERVIEW:

STRENGTH TRAINING AND THE ENDURANCE ATHLETE

by Patrick A. Ward, CSCS



Endurance based athletes (marathon runners, distance bikers, ultra-distance runners, Ironman athletes, etc.) are notorious for avoiding resistance training as part of their training program. The common excuse is that "their legs get enough training during their running/cycling". In reality, these athletes may be holding themselves back from hitting their full potential in their desired sport because they are avoiding resistance training!

Endurance athletes who perform strength training as part of their exercise program have the potential to increase their endurance capabilities due to increases in anaerobic power, increases lactate threshold as well as enhanced exercise economy. [1,2,3,5,8,9,16]. Hoff, et al., concluded that even maximal strength training increased work economy in the control group of a study focused on work capacity of female cross-country skiers [8], as well as increased endurance through greater work economy and rate of force development in male skiers [15]. Marcinik, et. al., found that while there was no change in VO2max, endurance performance was improved through increases in lactate threshold and leg strength in 18 untrained males, during a cycling test [5].

Another type of training that appears to show some benefit to the endurance athlete is explosive training [4,6,7,13,14]. The improvement in endurance from explosive training appears to be due to increased exercise economy, increased motor unit recruitment, and an increase in lactate threshold [4,6,7,13,14]. Paavolainen L, et. al, concluded that training consisting of both endurance and explosive exercise, enhanced running performance through improvements in neuromuscular characteristics, leading to greater maximal velocity [4]. Stone, et al, discovered that olympic style weightlifting alone can produce changes in some cardiovascular parameters; such as, increased VO2 max and decreased resting heart rate [7].

In order to take advantage of the potential benefits that strength training has to offer, athletes that compete in endurance based sports need to divide their training up to include a variety of energy systems and have a more well rounded approach. This type of training has been referred to as concurrent training or "simultaneous training"[9,11,12 ,14,16,17]. Concurrent training has been shown to be effective for increasing maximal strength, endurance and exercise economy [9,16]. As the competition nears, it might be advised that endurance athletes focus more of their attention on the actual event, while backing off of the strength training, but still maintaining strength levels by training one to two times a week [10].

REFERENCES

1) Bulbulian R, Wilcox AR, Darabos BL., Anaerobic contribution to distance running performance of trained cross-country athletes., Medicine and science in sports and exercise., vol. 18, no. 1, pg. 107-13, 1986.

2) Tabata I, Nishimura K, Kouzaki M, Hirai Y, Ogita F, Miyachi M, Yamamoto K., Effects of moderate-intensity endurance and high-intensity intermittent training on anaerobic capacity and VO2max., Medicine and science in sports and exercise., vol. 28, no. 10, pg 1327-30, 1996.

3) Hickson RC, Dvorak BA, Gorostiaga EM, Kurowski TT, Foster C., Potential for strength and endurance training to amplify endurance performance., Journal of Applied Physiology, vol. 65, no. 5, pg. 2285-90, 1988.

4) Paavolainen L, Hakkinen K, Hamalainen I, Nummela A, Rusko H., Explosive-strength training improves 5-km running time by improving running economy and muscle power., Journal of Applied Physiology, vol. 85, no. 5, pg. 1527-33, 1999.

5) Marcinik EJ, Potts J, Schlabach G, Will S, Dawson P, Hurley BF., Effects of strength training on lactate threshold and endurance performance., Medicine and science in sports and exercise., vol. 23, no. 6, pg. 739-43, 1991.

6) Bastiaans JJ, van Diemen AB, Veneberg T, Jeukendrup AE., The effects of replacing a portion of endurance training by explosive strength training on performance in trained cyclists., European Journal of Applied Physiology, vol. 86, no. 1, pg 79-84, 2001.

7) Stone MH, Wilson GD, Blessing D, Rozenek R., Cardiovascular responses to short-term olympic style weight-training in young men., Canadian Journal of Applied Sports Sciences, vol. 8, no. 3, pg. 134-9, 1983.

8) Hoff J, Helgerud J, Wisloff U., Maximal strength training improves work economy in trained female cross-country skiers., Medicine and science in sports and exercise., vol. 31, no. 6, pg. 870-7, 1999.

9) Millet GP, Jaouen B, Borrani F, Candau R., Effects of concurrent endurance and strength training on running economy and .VO(2) kinetics., Medicine and science in sports and exercise., vol. 34, no. 8, pg 1351-9, 2002.

10) Bell GJ, Syrotuik DG, Attwood K, Quinney HA., Maintenance of strength gains while performing endurance training in oarswomen., Canadian Journal of Applied Physiology, vol. 18, no. 1, pg. 104-15, 1993.

11) Zatsiorsky PhD, Vladimir M., Science and Practice of Strength Training, Human Kinetics, pg. 126-127, 1995.

12) Siff PhD, Mel C., Supertraining, 6th edition, Supertraining Institute, pg. 290, 2003.

13) Paton CD, Hopkins WG., Combining explosive and high-resistance training improves performance in competitive cyclists., Journal of Strength and Conditioning Research, vol. 19, no. 4, pg. 826-30, 2005.

14) Creer AR, Ricard MD, Conlee RK, Hoyt GL, Parcell AC., Neural, metabolic, and performance adaptations to four weeks of high intensity sprint-interval training in trained cyclists., International Journal of Sports Medicine, vol. 25, no. 2, pg. 92-8, 2004.

15) Hoff J, Gran A, Helgerud J., Maximal strength training improves aerobic endurance performance., Scandinavian Journal of Medicine and Science in Sports, vol. 12, no. 5, pg. 288-295, 2002.

16) McCarthy JP, Pozniak MA, Agre JC., Neuromuscular adaptations to concurrent strength and endurance training., Medicine and science in sports and exercise., vol. 34, no. 3, pg. 511-9, 2002.

17) McCarthy JP, Agre JC, Graf BK, Pozniak MA, Vailas AC., Compatibility of adaptive responses with combining strength and endurance training., Medicine and science in sports and exercise., vol. 27, no. 3, pg. 429-36, 1995.

Patrick A. Ward, II - Co-Founder
NSCA-CSCS, NASM-CPT, USAW Club Coach

Patrick Ward is a certified strength and conditioning specialist through the National Strength and Conditioning Association (NSCA), a certified personal trainer through National Academy of Sports Medicine (NASM), a USA Weightlifting-Certified Club Coach, and a competitive Olympic weightlifter. He grew up in Lyndhurst, just outside of Cleveland, OH, where he played High School Baseball for Notre Dame Cathedral Latin. He is currently pursuing a Masters degree in Exercise Science and Health Promotion.

Patrick's professional experience working with a diverse clientele ranges from training for general health, rehabilitation, to athletes who want to take their abilities to the next level. Prior to founding Optimum Sports Performance, Patrick was a top-level personal trainer in New York City, where he also taught and held seminars for other trainers, covering topics such as program design, periodization and fitness assessments. He served as a strength and conditioning consultant for various athletes of all ages and status.

THE OSP PHILOSOPHY

Every athlete who trains with us ***is*** Optimum Sports Performance.

The moment an athlete commits to becoming a better, stronger athlete with us, he or she becomes part of our family. Every athlete who completes one of our programs, whether training with us for a summer, or for years, represents what we believe in and why we do what we do.

We expect our athletes to give us everything they've got, and in return, we demand the same from ourselves.