Inspiratory Muscle Training Testimonial by Dan Boothby

Dan Boothby is the Strength and Conditioning coach for the Men's and Women's Ice Hockey teams at Northeastern University and can be reached at d.boothby@neu.edu

This past year I was blessed with an opportunity to work alongside Dr. Larry Cahalin and Dr. Paul Canavan, both of the Northeastern University Physical Therapy Department on a study relating to increasing on-ice performance of the non-weight room variety. I usually try and jump on any opportunity I have to work with professionals of substantial greater cognitive function than myself in order to expand both my professional and knowledge base, however, this time, I found myself severely overmatched.

As a strength coach I have fallen into the trap of associating VO2 with endurance athletes, and like many other strength coaches, unsure of an appropriate balance between aerobic an anaerobic training. VO2 max is very important for Ice hockey despite the short work periods during a typical game. A shift on average is only about 40 seconds long, and a recent study found that the average heart rate in a NHL player during a normal shift is around 90% HRMax (Leone, 2006). **With this intensity an athlete is sure to build up lactic acid during a shift, and it is important for sustained performance to recover quickly. An increase in VO2 max will allow an individual to have a higher threshold or critical level.** Meaning they will be able to perform a moderate, sustained activity at a higher intensity without the continuous build up of lactic acid, or more specific to hockey they will be able to recover quicker from shorter, high intensity bouts.

We examined the effects of Inspiratory muscle training (IMT) on VO2 max. We had our experimental group perform 2 days/week of IMT following the Test of Incremental Respiratory Endurance (TIRE). **After 6 weeks of the IMT we were able to show a significant increase in VO2 max. More importantly the IMT helped to decrease pressure within the thoracic cavity, and ultimately improve venous return.** Healthy people have a normal negative pressure within the intrathoracic, intraplueral, and the intraalveolar areas, however the IMT was able to improve this negative pressure in order to facilitate a performance enhancement in these healthy athletes. The increased venous return caused a greater stretch to the left ventricle wall (Starlings Law) and resulted in an increase stroke volume and cardiac output.

The improvements to the inspiratory muscles also helped to increase the tidal volume within the lungs, and decrease the residual volume as well. The improved contractibility of the inspiratory muscles, changes in pressure and improved cardiac output is what makes up the increase in inspiratory capacity. **Muscles are able to perform more anaerobic and aerobic exercise, because of the improved ability to uptake O2 and remove CO2.** For hockey this is crucial between shifts. The improved vital capacity allows a hockey player to deliver more oxygenated blood to the working fat and replace the O2 debt faster. Athletes are able to sustain a higher work level throughout a game.

The hockey season is one of the longest in collegiate sports, and there are so many important areas that we need to cover during training with very little time. **The IMT was a commitment that yielded important benefits for our team and required a time investment of only 30 minutes 2 times/week.** The importance of recovery throughout as game is clear. Success is dependent on the ability to sustain work levels throughout three periods of hockey and maybe more importantly recovery from night to night.