

## Performance Strategies for MMA Athletes

# VO2 Testing

## A Fighter's Blueprint for Success

VO2 (volume of oxygen) testing for MMA and grappling athletes will determine the maximum amount of oxygen consumed by the body at near maximal or exhaustive exercise levels.



Brian Richardson places the head strap for VO2 testing



The pneumotach is placed on the face by Brian Richardson



Brian Richardson keeps a close watch as the athlete generates oxygen debt

**A**s the muffled echoing of the bell goes off, the exhausted MMA athlete seeks to recognize any signs of life in himself in the corner before the final round. He sits silently as he tries to slow his breathing. His arms are like heavy bags of concrete, his lungs burn like fire and his heart pounds in his ears like a pneumatic jackhammer. As the 60 second rest closes, he prepares for the final five minutes. Thoughts race through his head like a runaway train: "Can I possibly continue? Do I have the mental strength to push forward and perse-

vere? What could I have done differently to prevent this?" When this common yet dreadful sports situation occurs, there are several key points an athlete needs to understand.

The human body needs oxygen (O<sub>2</sub>) to function optimally as well as efficiently.

Without O<sub>2</sub>, other metabolic pathways (anaerobic) are used to create and maintain energy levels. Without O<sub>2</sub>, carbon dioxide (CO<sub>2</sub>) prevails as a by-product of muscular work as well as hogging these anaerobic pathways. This sudden increase in CO<sub>2</sub> causes a rise

in lactic acid (a burning sensation). When this "burning" begins to accumulate throughout the blood and muscles and exceeds the body's ability to remove it (anaerobic threshold), performance will come to an end.

As Wilmore and Costill wrote in "Physiology of Sport and Exercise," in order for any athlete to address these 5 key points, they must first obtain the necessary baseline data to improve on. VO<sub>2</sub> (volume of oxygen) testing may be defined as discovering the maximum amount of oxygen consumed by the body at near max-



A fighter struggles to recover between rounds

imal or exhaustive exercise. This highly sought-after testing protocol is the absolute best indicator of cardio-respiratory endurance as well as a suitable insurance policy for mixed martial artists and their training.

### Breathing

When exercise intensity increases so too does respiratory ventilation (breathing). As the sudden rise in CO<sub>2</sub> begins to creep to non-desirable levels throughout the body, respiratory muscles such as the diaphragm and inter-

costals begin to work feverishly in an attempt to rid the body of this toxic waste. This elevation in CO<sub>2</sub> ultimately results in lactic acid accumulation or the "burning" sensation which invades the working muscles.

### The Heart

The human heart is a four-chambered muscular computer whose primary job is to precisely receive deoxygenated blood from body tissues as well as deliver oxygenated blood from the lungs to the entire human movement sys-

tem. As a result of high intensity exercise, the body's ability to receive O<sub>2</sub> is limited by the heart's ability to pump it, otherwise known as stroke volume (amount of blood pumped with each contraction). Therefore, a more forceful contraction will facilitate higher blood/oxygen volumes resulting in a higher VO<sub>2</sub>. According to experts Bennett and Kehoe in their 2008 published work, the two most valuable pieces of data an athlete can receive from participating in a VO<sub>2</sub> test are 1) the particular point during performance at which the onset of CO<sub>2</sub> and blood lactate accumulation exceeds the body's ability to remove it (the anaerobic threshold) and 2) whether the body is using carbohydrate or fat as the predominant fuel source at that particular time (substrate utilization). Through proper training we can teach the body to use higher percentages of fat at higher intensities. This will allow the body to preserve stored sugar which may be a preferable source of fuel as intensities rise. It is these components that are absolutely necessary when designing a performance program which seeks to increase the athlete's aerobic capacity allowing them to perform at higher intensities without "running out of gas."

### The Test

A VO<sub>2</sub> test may be administered on a stationary bike or a treadmill. Prior to the test the athlete is given a heart rate monitor which is placed snugly just below the chest. A head strap is then adjusted and placed over their head (Fig. 1). The technician then places the face mask and pneumotach over the athlete's nose and mouth (Fig. 2). After the analyzer is calibrated, the athlete begins with a walk followed by progressively running faster on the treadmill until either mechanics become compromised or the athlete "taps out" (Fig. 3). Upon conclusion of the test, the performance specialist covers the data collection and how it can be used to optimize training and performance.

### Conclusion

As a performance specialist it is my duty to implement evidence-based and scientifically valid testing protocols which assess the current functional as well as physiological capacity of the athlete. It is this documented data that allows the fitness professional to establish the athlete's strengths as well as weaknesses facilitating a blueprint for future success. **G**

*San Diego-based Brian Richardson is a member of the National Strength and Conditioning Association and a National Academy of Sport Medicine performance enhancement specialist. He founded Dynamic Fitness High Performance Kinesiology to help athletes obtain maximum results and is available for worldwide consultation at [www.dfpformance.net](http://www.dfpformance.net).*