Hello all,

Welcome to the May 2010 ***COHERENCE Newsletter***. This month we explore the topics of sports performance and breathing efficiency. I'm pleased to introduce Dr. Bob Ward, author, sports scientist, and conditioning coach for the Dallas Cowboys from 1976-1989. Today Bob remains a very active competitor in Masters Track and Field and Masters Weightlifting, holding numerous American and World records in both arenas. You can find out more about Bob at *Sports Science Network - The Art And Science of Human Performance,* and our new venture, *Breathe To Win!*

Climber On Mt Everest

¶ In 2006, well known Italian researcher Luicano Bernardi and his team published the results of a seminal study examining v*entilatory efficiency* with a group of 11 elite Italian climbers both at sea level and during acclimatization at 5200 meters leading up to their assault on Mt. Everest and later K2. The research team was particularly interested in understanding the body's respiratory response to hypoxia (inadequate oxygenization of the blood) under extreme work load and its relationship to *ventilatory reserve*, where ventilatory reserve is the difference between the actual rate of respiration and the absolute maximum rate. When the reserve is exhausted, the breather is breathing at their absolute maximum rate and has no capacity for further increase in work load (without oxygen assist). [Hypoxic Ventilatory Response In Successful Extreme Altitude Climbers, Eur Respir J 2006; 77: 165-171]

At sea level, the breathing rate for 5/11 climbers averaged 10 breaths per minute; the breathing rate for 6/11 averaged 12 breaths per minute. After 15 days of acclimatization, differences in breathing rate were magnified, the 5/11 averaging ~11 breaths per minute and the 6/11 averaging ~19 breaths per minute. The same 5 of 11 went on to summit both peaks without oxygen assist. Of the group of 6, 2 went on to summit with oxygen assist, the remainder not summiting at all. We do not know what their breathing rates were during the climb itself, however, the conclusion suggests that at higher altitudes and work load, differences in breathing rate were even further magnified, pointing to significant deltas in ventilatory efficiency and reserve between the two groups.

Dr. Bob Ward, Author, Athlete, Competitor, And Conditioning Coach, Dallas Cowboys, 1976-1989

Bob Holding Master's Track & Field Awards

Winning World Records in Hammer Throw, Best Weight Throw, Weight Pentathlon, and Clean and Jerk in age group 70-74, Bob, now 76, "walks the talk" when it comes to personal fitness and peak performance.

Bernardi et al point out that at some elevated breathing rate, the incremental energy expended by respiration, which is itself "work", is greater than the incremental energy generated, hence a negative impact on the overall capacity to perform work and a decline in performance. The authors go on to suggest that breathing efficiency and ventilatory reserve are related and that a common crucial factor could be the rate of breathing which was consistently lower (as measured) in the successful summiters.

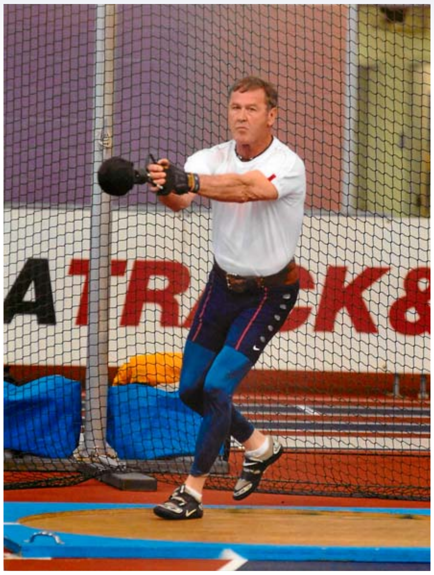
They offer that breathing slowly and deeply may improve breathing effectiveness and efficiency not only at altitude but also at sea level – a belief that this author shares. If so, then does breathing more slowly, deeply, (and rhythmically) have the potential to improve performance relating to every endeavor where there is a requirement for sustained increase in work output and commensurate respiratory demand?

The rationale for this question is this: Just as when we are at rest or semi-activity, when we are engaged in sustained activity there *must* be a specific breathing frequency (and depth) where breathing is most efficient. We can think of this as a matter of *dynamic resonance*, the frequency of optimal effectiveness and efficiency given the level of activity and work load. *Above or below this frequency and depth* cardio-vascular-pulmonary efficiency declines. There are several reasons why this must be so..

1) Breathing functions as a "thoracic pump" (pumping both air and blood). The thoracic pump works most efficiently when it fills/empties to an optimal extent. I have previously estimated the optimal extent at rest to be 40-60% of total volume. As we breathe more rapidly, the contribution of the thoracic pump to overall circulation diminishes placing greater and greater burden on the heart and vascular system. Breathing through the mouth as opposed to the nose as one tends to do at higher levels of physical demand also diminishes this pumping efficiency.

2) As Bernardi points out, breathing itself represents "work", the burden of breathing adding to the burden of the sport, exercise, or work endeavor. Evenutally, the cost of increased breathing effort detracts from performance vs. adding to it.

3) As breathing becomes more rapid, the autonomic nervous system shifts toward increased sympathetic (activating) emphasis and away from parasympathetic (deactivitating) emphasis.With this increase, there is a gradual tensing of all



Weight Throwing Competition
(2009, age 75)

As an "integrative" sports professional, I've continued to reach for new performance horizons, incorporating Eastern, Western, ancient, and cutting edge methods to maximize health, well-being, and its result, maximized performance on the field of competition.

Having been involved in athletic training and coaching for peak performance for 50+ years, its extremely clear that "breathing" plays an absolutely critical role in sports performance. Yet, because the body is so adaptive, unless we train under extreme conditions, its hard for us to understand the vital part that it plays. To the exerciser, breathing *seems* to take care of itself.

But is there a better way? A large body of evidence from the East and a mounting body of evidence from the West, including the work of Stephen Elliott, suggests that there is.
Dr. Bob Ward- Sports Scientist

muscles in the body, increasing energetic burden and the requirement for increased gas exchange.This is a well known phenomenon in scuba diving where if one does not breathe slowly and deeply and relax, air that might last 60 minutes is consumed in 20 minutes.

This suggests that no matter what the activity, an approach to achieving optimal performance is to slow the breathing rate, increase the breathing depth, and increase rhythmicity to a point of maximal performance and comfort. (Isn't this how one accesses the "runner's high"?)

If true, then breathing has the potential to enhance or detract from sport/work performance regardless of altitude. If breathing is optimal it facilitates circulation, gas exchange, and energy production while minimizing its own contribution to energetic burden, and that of tense muscles that might otherwise be relatively relaxed. By contrast, if it is *far* from optimal it compromises circulation, gas exchange, and energy production, while maximizing its own contribution to total energetic burden. It is a matter of optimality given the circumstance.

A situation that is even more demanding of breath control than very high altitudes is cold water hypothermia where we have 60 seconds to bring the breathing under control, lest we perish. This is supported by the work of Dr. Gordon Giesbrecht, a thermophysiologist at the University of Manitoba. Dr. Giesbrecht is a pioneer in the physiology of cold water immersion and survial.

He makes clear that with the right knowledge, surprisingly, humans are able to survive fridged water for up to an hour or two if we do *everything* right. However, once immersed in freezing water we have *1 minute* to bring our breathing under control. Why only 60 seconds? Because once immersed, due to the shock of the cold water on the skin, we immediately we begin to hyperventilate. We've all experienced this to a degree when we jump into a cold pool or even step into a cold shower. The cold water literally "takes our breath away". Under extreme temperature circumstances, if we don't "get our breath back" within 60 seconds we become unconscious and drown.

In very extreme cases, breathing can be the difference between life and death. In less extreme cases it can be the difference between success and failure, as demonstrated by the 11 elite climbers. [Of course death as a consequence of cardiopulmonary complications at very high altitude is also a very real risk.] We know that in the normal walk of life, breathing can mean the difference between health, vitality, and wellness vs. disease. *What is not well understood is that relative to sport, it can also mean the difference between winning and losing.*

Thank you all for your interest and consideration. Thank you Bob!

Stephen Elliott - COHERENCE