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SPECIAL ISSUE

Strengths, Weaknesses, and Possibilities of the Buteyko Breathing Method

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The Buteyko Breathing Method is a unique breathing therapy that uses breath control and breath-holding exercises to treat a wide range of health conditions believed to be connected to hyperventilation and low carbon dioxide. A number of clinical trials indicate that it is a successful treatment for asthma; however, there is little support for the carbon dioxide theory that underpins the Buteyko Method. There are, however, many other possible reasons that the breathing techniques used by the Buteyko Method work. These reasons include change in symptom perception and improved sense of control, improved biomechanics of breathing, beneficial effects of low-volume breathing, altered nitric oxide levels, and resetting of respiratory rhythm generation by breath-holding techniques.

What Is the Buteyko Method?

The Buteyko Method, one of many health-promoting breathing techniques to originate from Russia, made its way to Australia, Europe, and the United States in the 1990s. The attention given by the media to stories of apparent cures of seriously ill individuals popularized this treatment for asthma and eventually a range of other conditions from anxiety to sleep apnea (Ameisan, 1997; Stalmatski, 1999; Stark & Stark, 2002). The method is named after its originator, Dr. Konstantin Pavlovich Buteyko, who claimed that his program of breathing retraining could cure a large number of the chronic ailments affecting modern society. His early work in the 1960s centered on the use of breathing retraining for diseases of the circulatory system and the respiratory system. Over time, doctors working in Buteyko's clinics in Moscow, Siberia, and the Ukraine also claimed success in treating diabetes, psychological disorders, immune and metabolic disorders, and reproductive disorders (Buteyko, 1990; www.buteyko.ru/eng/bolenz.shtml). According to the Buteyko Method teachings, low carbon dioxide or hypocapnia and its consequences aggravated many medical conditions and produced as many as 150 symptoms and conditions.

Buteyko's method rests very much on his carbon dioxide theory of disease, and the primary aim of the breathing techniques is to raise carbon dioxide levels. Buteyko claimed chronic hidden hyperventilation to be a widespread, important, and generally unrecognized destabilizer of physiological systems and psychological states.

It is known that low carbon dioxide affects many systems of the body either directly or through subsequent depletion of bicarbonate, pH disturbance, and reduced tissue oxygen levels (Folgering, 1999; Gardner, 1995; Hardonk & Beumer, 1979). However, Buteyko and his Russian colleagues elaborated on the conventionally accepted effects of hypocapnia and argued that depletion of carbon dioxide affected the core processes of energy production in the cell known as the Krebs cycle, vital chemical reactions requiring carbon compounds and other key homeostatic processes. In Buteyko's view, because carbon dioxide was so vital, the body created a series of defense mechanisms to retain carbon dioxide, including constriction of airways and blood vessels, and gave rise to conditions such as asthma and hypertension (Buteyko, 1990; Stark & Stark, 2002).

Research Studies on the Buteyko Method

Research into the Buteyko Method has mainly tested its clinical effectiveness in treatment of asthma and recently sleep apnea, with some research exploring therapeutic mechanisms. There have been at least five published clinical trials on the Buteyko Method for asthma (Bowler, Green, & Mitchell, 1998; Cooper et al., 2003; McHugh, Aicheson, Duncan, & Houghton, 2003; Opat, Cohen, & Bailey, 2000; Slader et al., 2006), and several trials have been reported as abstracts (Abramson et al., 2004; McGowan, 2003). The clinical trials indicate that people learning the Buteyko Method are able to substantially reduce medication with no deterioration in their lung function or asthma control, although no studies have demonstrated objective changes in lung function.

Stories of individuals who report remarkable and life-changing improvements in physical and psychological health using the Buteyko Method can be found in an abundance in books and on Internet sites (Ameisan, 1997; Kolb, 2007; Stalmatski, 1999). Scientist are trained to distrust anecdotal evidence of this type, but the consistent reports on various

continents over four decades invites speculation about what defines these positive responders to the Buteyko Method. Future research into the Buteyko Method might benefit from case series that explore which, if any, characteristics are shared by positive responders that might elucidate its mechanisms and potential usefulness.

Despite the growing body of literature, guarded endorsement by health and government authorities (Marks et al., 2005), and enthusiasm of individuals who have been helped, the Buteyko Method is still not widely accepted by the medical and scientific community. This may be partly because research has not supported the carbon dioxide theory that underpins this method (Al-Delaimy, Hay, Gain, Jones, & Crane, 2001; Bowler et al., 1998; Courtney & Cohen, 2008).

Evidence for and Against the Buteyko Carbon Dioxide Theory

Many Buteyko Method practitioners still strongly adhere to the CO_2 theory, but the scientific community is skeptical because research in the past decade has shown that even patients who in the past would have been diagnosed as symptomatic hyperventilators may not show low levels of CO_2 at the onset of their symptoms (Burton, 1993; Hornsveld & Garsson, 1997). The role of CO_2 is clearly not as straightforward as once thought. In the interests of not throwing the baby out with the bath water, the importance of CO_2 depletion should not be forgotten. There is clear evidence that low CO_2 plays a role in bronchoconstriction and many other types of physiological dysfunction (Bruton & Holgate, 2005; Laffey & Kavanagh, 2002). However, belief that hyopcapnia is the primary or only cause of breathing-related symptoms is out of step with the current thinking of respiratory physiologists, who for some time now have had doubts about the primary importance of CO_2 in symptom production (Hornsveld, Garsson, Fiedeldij Dop, Van Spiegel, & De Haes, 1996; Howell, 1997). It seems that in people with dysfunctional breathing, instability of breathing with fluctuating levels of CO_2 is more likely to be present than chronic hypocapnia (Han et al., 1996; Roth, 2005). Previously, a diagnosis of hyperventilation syndrome depended on finding chronic hypocapnia, but in recent years, it has become accepted that resting carbon dioxide levels can be normal in people with symptomatic hyperventilation (Folgering, 1999; Magarian, 1982).

Studies with the Buteyko Method have found that resting carbon dioxide levels do not change after Buteyko training despite reported improvement in symptoms (Bowler et al., 1998). A similar situation exists with capnometry biofeedback, in which symptom reduction is not commensurate with the person's initial levels of resting CO_2 (Roth, 2005). This does not remove hypocapnia from the suspect list, for example, in asthma, as it can be argued that fluctuating levels of CO_2 are more likely to cause constricted airways than chronically low levels (Kolbe, Kleeherger, Menkes, & Spannhake, 1987). In the case of chronic hypocapnia, the lungs seem to adapt to habitual levels, but the bronchi will constrict when levels of CO_2 drop suddenly (Kolbe et al, 1987). Many conditions treated by the Buteyko Method, such as hypertension and asthma, have a fluctuating course. Fluctuations in carbon dioxide levels may be associated with exacerbations of these conditions. Future studies could investigate whether Buteyko training actually stabilizes breathing and associated fluctuations in carbon dioxide.

It is a well-recognized phenomenon that people practicing the Buteyko Method develop an increased ability to comfortably hold their breath, a measure known as the Control Pause. Buteyko practitioners consistently report that a longer Control Pause is associated with decreased symptoms. Buteyko claimed that the Control Pause correlated with alveolar CO_2, and people learning the Buteyko Method are taught that longer Control Pauses reflect increased CO_2 levels. In a recent study, we investigated the correlation between alveolar CO_2 and the Control Pause, and we found that there was a very slight negative correlation between the Control Pause and end tidal CO_2, directly opposite to Buteyko's claims. We also found that the shorter Control Pause found in asthmatics had a significant correlation with a thoracic-dominant breathing pattern (Courtney & Cohen, 2008). This led us to propose further exploration of factors influencing the control of respiration, perception of dyspnea, and the biomechanics of breathing, as additional explanations for the improvement in health, breathing, and dyspnea reported by people learning the Buteyko Method.

Breathing Techniques of the Buteyko Method

The breathing techniques of the Buteyko Method are unusual in that people are asked to breathe less rather than more and not breathing or holding the breath is considered as important as breathing. The main breathing technique of the Buteyko Method is reduced-volume breathing. This is done by sitting with an erect posture and relaxing the muscles of respiration until one feels a slight lack of air. This sensation of slight breathlessness is then maintained by a combination of relaxation of breathing muscles, erect posture, and slight tension of the abdomen.

In a formal practice session, reduced-volume breathing is done in combination with breath-holding techniques, the two most important being a short breath hold, called the Control Pause, and a longer breath hold, called the Maximum Pause.

During the Control Pause, the breath is held after a gentle exhalation until the first desire to breathe or until a little jerk or involuntary motion of the diaphragm is felt. The other main breath-holding technique, the Maximum Pause, also involves holding the breath after a gentle exhalation, but it is held longer, generally as long as one can, which in most people is about double the Control Pause or to the point of moderate discomfort. People with hypertension, heart disease, epilepsy, or other serious illness are prohibited from doing the Maximum Pause.

A typical Buteyko formal practice routine takes around 40 minutes. It begins and ends with the Control Pause. The Control Pause, although not considered therapeutic, is an essential part of the Buteyko Method, as it indicates the level of health, the state of breathing, and the degree of hyperventilation and hypocapnia. In a good formal practice session, the Control Pause is longer at the end than at the beginning. This is believed to indicate that the breathing practice session has achieved the aim of resetting the brain's breathing center so it is less sensitive to CO_2.

Once the techniques are mastered, students are encouraged to use them in an informal manner in daily life as a way of controlling symptoms and gradually resetting unconscious breathing patterns. Gradually, the Maximum Pause and the Control Pause at the start of the session get longer. People doing the Buteyko Method aim for a perfect Control Pause of 60 seconds, and some can do Maximum Pauses of more than 2 minutes.

Alternative Theories for the Buteyko Effect

Breathing techniques can give asthmatics a sense of control, thus reducing their anxiety about their symptoms. The Buteyko Method's comprehensive and plausible CO_2-deficiency model of asthma helps reattribution of symptoms to a controllable cause with clear instructions about how to fix the problem (i.e., breathe less and hold your breath). The Buteyko Method teaches students to voluntarily pursue a slight lack of air sensation during breathing practice, and this may result in a positive change in the person's response to breathlessness when it arises spontaneously during exercise or an asthma attack. Some asthmatics are in danger because of underperception of asthma symptoms. It is not known whether the Buteyko Method would make these individuals more sensitive to asthma symptoms because of improved body awareness or less sensitive because of a blunting of sensitivity to dyspnea. These effects, sometime called nonspecific effects, may be an important part of how the Buteyko Method works. However, there are several possible neurological, biochemical, and biomechanical pathways that may also explain the Buteyko effect.

One possible biochemical mechanism of Buteyko may be through its influence on nitric oxide (NO). NO is involved in a large number of physiological responses including bronchodilation, vasodilatation, tissue permeability, immune response, oxygen transport, neurotransmission, insulin response, memory, mood, and learning. Buteyko practitioners' insistence on nasal breathing at all times is likely to affect NO levels, as a large percentage of the body's NO levels are made in the paranasal sinuses (Lundberg & Weitzbergb, 1999). Also, the long breath holds interspersed with reduced-volume breathing used by the Buteyko Method produce a mild fluctuating hypoxia, another mechanism know to influence NO and its functions (Malyshev et al., 2001).

Interestingly, breathing at both the low lung volumes taught by Buteyko and the higher lung volumes commonly used by Yoga practitioners and those teaching resonant-frequency breathing can have a bronchodilating effect (Douglas, Drummond, & Sudlow, 1981; Lehrer et al., 2004; Shen, Gunst, & Tepper, 1997; Slader et al., 2006). The mechanisms behind the symptom-attenuating effects for asthmatics of breathing repeatedly above or below tidal volumes have not been well researched. There is some evidence that the pattern of breathing affects the composition of surfactant (Doyle et al., 1994). Surfactant is known to be a smooth muscle relaxant, with beneficial effects on lung immunity, allergy, and inflammation (Koeztler et al., 2006). These physiological effects of changing breath volume could be additive to the observed nonspecific effect that merely controlling the pattern of breathing has in making people with asthma more comfortable with their symptoms (Slader et al., 2006).

People practicing the Buteyko Method are taught to reduce their volume of breathing by using a combination of increased abdominal muscle tone and relaxation of all the other muscles of breathing, particularly the shoulders and chest. Low-volume breathing often reduces the effort of breathing, leads to relaxation of respiratory muscles, and improves the function of the diaphragm. It can reduce the amount of hyperinflation or trapping of air in the lungs, which is very common in asthmatics, people with chronic obstructive pulmonary disease, and others with unexplained breathlessness (Muller, Bryan, & Zamel, 1981; O'Donnell, 2006; Wolf, 1994).

It may seem paradoxical that breathing less could make a person less breathless, as this is generally not the case; however, if the lungs are hyperinflated, increasing the volume of breathing with deep abdominal breathing will make a person more breathless (Cahalin, Braga, Matsuo, & Hernandez, 2002). Hyperinflation of the lungs makes the diaphragm shorten and flatten so that it loses its ability to lift

and widen the lower rib cage; understandably, this contributes to feelings of not being able to take a deep breath (Finucane, Panizza, & Singh, 2005). Reduction of hyperinflation by any means makes the muscles of breathing function more efficiently and significantly decreases the symptom of breathlessness (Casaburi & Porszasz, 2006).

Breath holding is a technique shared by yoga and Buteyko. Few studies have been done on the therapeutic effects of breath holding, and further research could be fruitful. During a long breath hold such as the Maximum Pause, one can see oxygen saturation dropping and then often reaching maximum saturation of 100% when the first breath is taken. The face flushes, tight diaphragms relax, and people feel their breathing become free. One effect of long breath holds is that they enable the body to reverse carbon dioxide gas exchange so that the body reabsorbs carbon dioxide (Hong, Rahn, Kang, Song, & Kang, 1963). Repeated use of extended breath holds increases the body's production of endogenous antioxidants and raises the anaerobic threshold, thus increasing capacity to exercise at higher levels of exertion, an effect similar to altitude or hypoxic training (Joulia et al., 2003). Stopping breathing and then restarting when respiratory impulses intensify may help to reset abnormal breathing rhythms in a similar way to stopping the heart to reset cardiac arrhythmias. The cerebral vasodilation that results from a drop in O_2 or rise in CO_2 after breath holding may also help to reset the breathing pattern by changing the input to the central and peripheral chemoreceptors.

At present, we cannot explain why the Buteyko Method works and therefore what its real therapeutic potential is. A better understanding of the mechanisms would allow better targeting of this breathing therapy to individuals who might benefit the most and show its true therapeutic potential.

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