Chapter 8.2

Buteyko breathing method

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WHAT IS THE BUTEYKO METHOD?

The Buteyko Method is primarily a system of breathing training that teaches patients to control their tendencies to overbreathe or hyperventilate. It is based on the theories of the late Ukrainian physician Dr Konstantin Buteyko who believed that carbon dioxide deficiency was a major cause of many chronic diseases. He claimed that his programme of breathing retraining, which aims to raise carbon dioxide, could purportedly benefit up to 150 diseases.

The Buteyko Method made its way to Australasia, Europe and the United States in the 1990s. In these countries the Buteyko Method became best known as a treatment for asthma and was also considered to be helpful for individuals with chronic obstructive pulmonary disease, chronic mouth breathing, sleep apnoea and stress-related disorders.

Research studies on the effectiveness of the Buteyko Method

There have been at least six published clinical trials on the Buteyko Method for asthma (Burgess et al 2011). These studies show that people learning the Buteyko Method are able to substantially reduce their medication with no deterioration in their lung function, and in fact improve their asthma control. These positive research findings have led to a degree of endorsement by health and government authorities in Australia and by the British Thoracic Society who in 2008 endorsed the recommendation of this method for asthma patients. Other research into the Buteyko Method includes one formal case study on sleep apnoea (Birch 2004) and some limited research exploring therapeutic mechanisms (Courtney & Cohen 2008, Al-Delaimy et al. 2001).

Techniques of the Buteyko Method

The Buteyko breathing method encourages breath control as part of daily life, particularly at the onset of asthma or other breathing-related symptoms. However, particularly in the early stages of training, patients are taught a structured daily routine of breathing exercises and

Table 8.2.1 Typical Buteyko Method practice session

Procedure	Description
Step 1 – Beginning Control Pause (CP)	The patient gently inhales and then exhales through the nose and then holds their breath until the point that they feel either 1. The first clear and distinct desire to breathe <u>or</u> 2. An involuntary movement or jerk coming from the diaphragm
Step 2 – Three to five minutes of relaxed reduced-volume breathing or slow breathing	The patient gradually reduces their breathing until they feel a light lack of air. They sustain this while staying relaxed.
Step 3 – Maximum Pause (MP). The MP may be substituted with a CP if MP is contraindicated due to presence of kidney disease, epilepsy, hypertension or other severe chronic illness	The Maximum Pause begins with a gentle inhalation and exhalation. Then the breath is held as long as possible but not to the point of severe discomfort.
Step 2 and Step 3 are then repeated up to 5 times	
Final Control Pause	Same as Step 1

breath-holding techniques, lasting 20 to 40 minutes. A typical routine is shown in Table 8.2.1.

Reduced-volume breathing

The main breath control technique of the Buteyko Method is reduced-volume breathing, where the individual tries to decrease minute volume and raise alveolar CO_2 by reducing tidal volume, i.e. the size of the inhalation and exhalation phase of each breath.

It is particularly important that patients relax during reduced-volume breathing to counteract their body's natural tendency to increase respiratory rate as a response to decreased tidal volume. It has been found that some patients, particularly those who suffer from anxiety, can overcompensate when they try to reduce tidal volume by increasing respiratory rate to the point that minute volume increases rather than decreases (Mueller et al 2005). In these types of patients other breathing control and relaxation strategies may be necessary to raise CO_2.

Reduced-volume breathing has other benefits apart from raising CO_2. If performed correctly it is likely to be an effective means to reduce hyperinflation of the lungs. Dynamic hyperinflation is a condition where end-expiratory lung volume is increased due to air-trapping and incomplete exhalation. It is common in asthma, chronic obstructive pulmonary disease and, while not well researched, it probably also exists in all other conditions associated with chronic elevation of respiratory drive such as chronic anxiety. Dynamic hyperinflation is a key factor in explaining the extent of dyspnoea, diaphragm dysfunction and disruption of neuromechanical aspects of breathing control in patients with dysfunctional breathing (O'Donnell et al 2007). The extent to which breathing therapies reduce hyperinflation is probably an important measure of their success in reducing dyspnoea and improving breathing function and breathing control.

Reduced lung volumes also lead to increased pressure inside the lungs, particularly at the end of exhalation when this pressure becomes greater (positive) compared to the atmospheric pressure. Generation of positive pressures inside the lungs may have beneficial effects for patients with chronic respiratory disease by equalizing distribution of ventilation and improving matching of ventilation to perfusion.

Breath slowing

In recent years there has been a tendency for some Western practitioners of the Buteyko Method to teach breath slowing as an alternative means for reducing minute volume and this is sometimes done in conjunction with capnometry biofeedback, where a patient observes the effects of their breathing on their end-tidal CO_2 levels and adjusts their breathing rate to raise the levels (see Chapter 7.7). This is a recent development of the Buteyko Method which may have different physiological and biomechanical effects to reduced-volume breathing. It is not the technique used in most of the research trials on the Buteyko Method and was not the technique used by Dr Buteyko, who advised his students to focus on breathing volume and not breathing rate.

Despite the fact that slow breathing is a new addition to the Buteyko Method protocol it has been shown to have beneficial effects. In some patients breath slowing may be a better way to decrease minute volume and raise CO_2 than reduced-volume breathing. Research has shown that slow breathing decreases chemoreceptor sensitivity and enables the patient to tolerate higher levels of CO_2 (Bernardi et al 2001). Slow breathing has also been shown to be very beneficial for treating asthma (Lehrer et al 2004). It might prove to be a useful addition to the Buteyko Method but should probably not replace reduced-volume breathing. A challenge for practitioners is understanding which patients respond better to breath slowing and which respond better to reduced-volume breathing, and how to balance the use of these two techniques for the best results on patients' degree of relaxation, CO_2 levels and extent of hyperinflation.

Breath-holding techniques

The Buteyko Method also uses post-expiratory breath holding as a means to assess and train an individual's breathing. The two types of breath holding are:

1. The Control Pause (CP) and
2. The Maximum Pause (MP).

The Control Pause is used at the beginning and at the end of a session to assess breathing. The Maximum Pause is used to train breath-holding capacity and as a treatment tool to control symptoms.

The Control Pause is an essential part of the Buteyko Method, and many practitioners of this method believe that it indicates both the level of health and the degree of hypocapnia. Recent research suggests that the Control Pause does not give a precise indication of a patient's CO_2 levels but it is nevertheless a good indication of dyspnoea threshold and ventilatory drive (Courtney & Cohen 2008). A longer Control Pause at the end of a practice session is a sign that ventilatory drive from chemical and non-chemical drivers of respiration has decreased and that the tolerance for dyspnoea has increased. This is a very desirable outcome for the individual with hyperventilation, hyperpnoea, hyperinflation and breathlessness. People who regularly practise the Buteyko Method generally find that the Control Pause gets longer and can continue to lengthen after weeks, months and even years of practice.

The Maximum Pause, where the breath is held to more or less maximum tolerance, is used to train breath-holding ability. It is also used to relieve symptoms such as blocked nose and acute bronchospasm. During the Maximum Pause, carbon dioxide levels momentarily increase, enabling the body to reverse carbon dioxide gas exchange so that the body reabsorbs carbon dioxide.

Research with athletes has shown that including breath holding to maximum capacity in their training routines resulted in increased production of endogenous antioxidants and higher anaerobic threshold (Joulia et al 2003). Maximal breath-holds also cause splenic contractions with subsequent increased haematocrit and haemoglobin levels and possible immune stimulation effects (Schagatay et al 2005). It therefore seems likely that these types of haematological, immune, metabolic and anti-inflammatory effects also apply in people undertaking regular Buteyko Method training.

At the termination of the Maximum Pause, most people will take at least a few deep breaths before gaining control of breathing volumes again. The increased bronchodilation following a sudden deep breath, called pulmonary hysteresis, is a well-documented physiological phenomenon. Pulmonary hysteresis may in part explain the bronchodilation that many asthmatics observe after performing a Maximum Pause.

A major aim of the Buteyko Method is to see the gradual lengthening of the CP and MP. People using the Buteyko Method are encouraged to aim for a perfect Control Pause of 60 seconds, and some have been known to perform Maximum Pauses of more than 2 minutes.

Establishing nasal breathing

The Buteyko Method places a lot of emphasis on the importance of establishing and maintaining nasal breathing at all times including during exercise, during sleep and even when the nose becomes blocked as a result of having a cold or allergic reaction. It appears that this is an important part of asthma treatment as it has been shown that replacing mouth breathing with nasal breathing, even without other breathing exercises, improves lung function and reduces asthma exacerbations (Hallani et al 2008).

Patients learning the Buteyko Method are taught to clear obstructed nasal passages by using a variety of breath holding strategies, either as a series of Control Pauses or by doing a Maximum Pause while sitting or walking. To effectively clear the nose with breath-holding techniques it is essential that one learns to take the first breath through the nose, keeping the mouth closed until a quiet breathing pattern can be resumed. A common observation of individuals with chronically blocked noses is that the more they breathe through the nose, the clearer and more comfortable it becomes.

Dr Buteyko's carbon dioxide theory

The foundation of the Buteyko Method is Dr Buteyko's carbon dioxide theory which expands on the well-known and generally accepted negative effects of hypocapnia. The key elements of Buteyko's theory are outlined in Box 8.2.1. Some aspects of this theory are controversial and not supported by currently available research. The main areas of controversy relate to:

1. high prevalence of chronic hypocapnia
2. relationship between acute and chronic hypocapnia and symptoms

Box 8.2.1 Some key elements of Buteyko's carbon dioxide theory

1. Up to 150 symptoms and diseases are due to the presence of hypocapnia.
2. Chronic hidden hyperventilation is widespread and almost universal, affecting up to 90% of the world's population.
3. Hypocapnia is an important and generally unrecognized destabilizer of physiological systems and psychological states.
4. Depletion of carbon dioxide affects the core processes of energy production in the mitochondria and vital chemical reactions requiring carbon-containing compounds.
5. Pathophysiological processes in chronic illnesses such as asthma, rhinitis, hypertension, heart disease and sleep apnoea are defence mechanisms against chronic hyperventilation.
6. Normalization of carbon dioxide levels explains symptom reduction and improved health in patients who learn and apply the Buteyko Method.

3. role of diseases such as asthma as defence mechanisms to prevent loss of CO_2
4. emphasis on CO_2 as the single most important mechanism underlying the Buteyko Method.

Importance of CO_2 in human health

Carbon dioxide is important in human health and hypocapnia can contribute to a number of pathophysiological processes in several organ systems (Laffey & Kavanagh 2002). It is involved in a number of key physiological reactions including maintenance of pH, oxygen dissociation and key chemical reactions involving carbon compounds. The functions of CO_2 are elaborated in most standard physiology texts, many books and articles on the Buteyko Method as well as in Chapters 1, 3 and 4 of this book, so will not be discussed here.

Prevalence of chronic hypocapnia

Buteyko's views on the universal prevalence of chronic hypocapnia in conditions treated by the Buteyko Method is not supported by research studies available at this time. The English language scientific literature reports that somewhere between 5–10% of people have evidence of chronic hypocapnia (Folgering 1999). Individuals with asthma, panic disorder, sleep apnoea, cardiovascular disorders and other chronic illness responsive to breathing therapy do have a greater tendency to hyperventilate than normal healthy individuals, but hypocapnia is not consistent, the extent varies between individuals and many individuals with these diseases have normal levels of CO_2 (Courtney 2011, Perna et al 2004). Any clinician who regularly uses a capnometer will find that chronic hypocapnia is not consistently present in patients. However, since hyperventilation tendencies are often only made evident under conditions of physical or psychological stress or during disease exacerbations, it is possible that patients with normal resting CO_2 have unrecognized tendencies to episodic hyperventilation that destabilize biochemical aspects of breathing homeostasis.

Relationship between hypocapnia and symptoms

It is well established that hypocapnia affects many body systems and can compromise health, however the relationship between hypocapnia and symptoms is not linear or highly predictable. A series of studies in the early 1990s found that there was an inconsistent relationship between symptoms of hyperventilation syndrome and both acute and chronic CO_2 deficit (Hornsveld & Garsson 1997). These studies threw doubt on the very existence of this syndrome and by implication on Buteyko's theory that CO_2 is central to symptom production in over 150 different syndromes and diseases. In recent years it has become increasingly clear that the extent of symptoms and the distress they cause patients is not only due to hypocapnia but also clearly influenced by other physiological and psychological factors and by altered breathing pattern (Courtney et al 2011).

In asthmatics the association between hypocapnia and symptoms is probably closer than for other conditions treated by the Buteyko Method. The acute asthma attack is often accompanied by hyperventilation and hyperpnoea and both of these factors can aggravate bronchospasm. It is therefore highly likely that these are important factors in destabilization of asthma in susceptible individuals (Bruton & Holgate 2005). Further research is needed to explore to what degree the extent of asthma symptoms is tied to carbon dioxide status as compared to other mechanisms.

Disease as a defence mechanism against loss of CO_2

One aspect of Buteyko's carbon dixoide theory is that asthma is not a disease but a defence mechanism against hyperventilation and that the primary purpose of this disease is to help the body retain CO_2. This explanation of asthma which attributes the complex immune and inflammatory changes of asthma to hyperventilation is an obvious oversimplification. A more moderate version of this theory which says that the hyperventilation and hyperpnoea aggravates asthma is more plausible as there is sufficient evidence showing that both these factors can contribute to bronchoconstriction (Bruton & Holgate 2005).

Do improvements in CO_2 sufficiently explain the Buteyko effect?

The few studies that have tried to elucidate the mechanisms of the Buteyko Method, while not conclusive, have not tended to support Buteyko's carbon dioxide theory (Al-Delaimy et al 2001, Courtney & Cohen 2008). The tight relationship claimed by Buteyko to exist between length of breath-holding time and an individual's end tidal CO_2 has not been confirmed (Courtney & Cohen, 2008) and end tidal CO_2 has not been shown to increase after Buteyko breathing training (Bowler et al 1998). Most of the randomized controlled trials on the Buteyko Method have not evaluated CO_2 levels before and after treatment which makes it difficult to draw firm conclusions until these types of data are available. However, it is unlikely that increased levels of CO_2 are the sole reason for the health improvements seen in patients who learn the Buteyko Method.

Is a more comprehensive theory for the Buteyko Method more useful?

The mechanisms of the Buteyko Method are likely to be complex and to include psychophysiological, neurological and biomechanical mechanisms in addition to biochemical mechanisms centred on CO_2. The prolonged breath holds which are generally repeated every 5 minutes as part of standard Buteyko practice produce mild intermittent hypoxia (IH). IH is known to be an important influence on respiratory motor plasticity. It produces adaptive effects that are salutogenic and increase the body's homeostatic capacity. Beneficial effects of IH include improving the tone of upper airway dilator muscles by increasing the activity of the vagal and hypoglossal nerves, improving oxygen metabolism and antioxidant status, reducing inflammation and increasing stress adaptation.

In asthmatics, the Buteyko Method control pause has a statistically significant positive correlation with extent of thoracic-dominant breathing, but not with carbon dioxide levels (Courtney & Cohen 2008). This suggests that factors affecting breathing pattern (and probably respiratory drive) are at least as important as a patient's carbon dioxide status in explaining dyspnoea threshold. This possibility is strengthened by the finding that improved breathing pattern after breathing training is associated with decreased dyspnoea (Courtney et al 2011).

The particular combination of techniques that are used during Buteyko practice, i.e. relaxed reduced-volume breathing, gentle slow breathing and post-exhalation breath holds may be particularly effective at improving the biomechanics of breathing by reducing dynamic hyperinflation of the lungs. In dynamic hyperinflation, the muscles of respiration, including the diaphragm and accessory muscles, are short and hypertonic. These shortened and partially contracted respiratory muscles are weak and ineffective at responding to signals to breathe sent by the motor cortex at the onset on inspiration. The situation known as afferent re-efferent dissociation is an important contributor to dyspnoea and poor breathing control in patients with asthma and COPD (O'Donnell et al 2007). It also tends to result in upper thoracic breathing patterns and paradoxical breathing. When the volume of air in the lung is reduced, the diaphragm increases its curvature, functional length and strength thus improving neuromechanical coupling and increasing the freedom and ease of breathing.

It is worth noting that breathing at both low lung volumes and involving sudden deep breaths, both of which tend to occur during a standard Butyeko breathing session, can induce bronchodilation. Reduced-volume breathing has been shown to induce bronchodilation through mechanical effects (Douglas et al 1981) and bronchodilation can result from the large-volume breaths that follow the Maximum Pause as a result of pulmonary hysteresis.

Psychophysiological factors

The impact that the Buteyko Method has on psychological factors should also be considered. Affective states such as fear of bodily sensation and sense of control all influence the quality and extent of dyspnoea (De Peuter et al 2004). The Buteyko Method can conceivably reduce fear and help the asthmatic patient have an increased sense of control, because it trains and encourages the patient's willingness to accept and be present with unpleasant sensations.

The Buteyko Method's comprehensive and plausible CO_2-deficiency model of asthma helps the reattribution of symptoms to a controllable cause with clear instructions as to how to beneficially modify the problem. When students voluntarily pursue a slight lack of air sensation during breathing practice, and train themselves to relax while doing so, the relationship to dyspnoea changes from one of fear and avoidance to acceptance, thus empowering the patient and increasing their sense of self-efficacy.

The effects of the two-way interaction between the body and the mind is very evident in asthma. Asthmatics have been found to suffer from much higher levels of anxiety, depression and panic disorder than the average population (Lehrer et al 2002). Aggravation of depression or anxiety is often accompanied by exacerbation of asthma, whereas successful treatment is associated with improvement in asthma. In asthma there is increased activity of the brain's emotional neural circuitry involving structures in the limbic system such as the insula and anterior cingulate gyrus that are part of the brain's fear network. The extent of activation of this neural circuitry predicts the magnitude of lung function decline (Rosenkranz & Davidson 2009). Rosenkranz argues that it is likely that this circuitry is activated not just from psychological causes or external threat, but also as a response to the internal threats generated from physiological responses linked to chronic inflammation and immune system activation. Breathing therapies that increase sense of control and reduce the sense of anxiety and threat conceivably will reduce the activation of this affective neural circuitry with far-reaching implications for the mind–body aspects of asthma.

FUTURE DIRECTIONS FOR THE BUTEYKO METHOD

Despite its success the Buteyko Method is still considered controversial and is not well accepted by the medical and scientific community or widely utilized.

Training of practitioners in the Buteyko Method tends to vary enormously around the world with training courses varying from 2-day courses that focus primarily on techniques to courses lasting several months that provide extensive training in Buteyko theory and business techniques. The shorter courses are generally targeted to health professionals. The longer courses tend to appeal more to people who are not health professionals, often asthmatics who have successfully used the Buteyko techniques to improve their own health. The latter group tend to be averse to any critical analysis of Buteyko.

There are two aspects to the Buteyko Method, the practical techniques and the theoretical basis. The techniques are unique and effective and it should be acknowledged that Buteyko has made a valuable contribution to the field of breathing therapy. However, many aspects of Buteyko's theoretical teachings which are intricately woven into most Buteyko Method training packages are not supported by current research. To gain wider acceptance, Buteyko theory and training of practitioners need to evolve to embrace a more complex model of breathing dysfunction and a broader understanding of the mechanisms of breathing therapy.

The Buteyko breathing method is one of several successful breathing therapies for asthma (Burgess et al 2011). Further research on the mechanisms of Buteyko and other breathing therapies is needed to clarify which patients will benefit most from which particular set of breathing exercises.

It is likely that the best approach to treating conditions such as asthma with breathing therapy is one that is patient centred rather than therapy centred, with treatment individualized to the needs of the patient. For example, it is believed that asthmatics with dysfunctional breathing are the ones most likely to benefit from breathing therapy (Prys-Picard & Niven 2008, Thomas et al 2001). Because breathing dysfunction can take several forms and arise due to different causes, it is important that clinicians measure and evaluate the various dimensions of breathing dysfunction, their causes and patients' responses to treatment so that breathing therapy and other treatment can be modified as necessary to maximize benefits (Courtney 2011).

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