BREATHING RETRAINING

A role in assessment and management of asthma and other respiratory disorders

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www.buteykobreathing.nz
Glenn’s story – Five days that changed my life
Fifteen years ago I learned how to better manage my asthma and now I help others do the same.

www.buteykobreathing.nz/blog/asthma-buteyko-case-study.html
TALK OUTLINE

- Functional and dysfunctional breathing
- The signs and symptoms of breathing dysfunction
- What causes breathing dysfunction
- Consequences of breathing dysfunction
- Breathing dysfunction and craniofacial development
- How to assess breathing dysfunction
- What you can do - breathing exercises and lifestyle guidelines to help relieve symptoms of breathing dysfunction
- Call to action: incorporating breathing assessment and retraining into general practice
<table>
<thead>
<tr>
<th>Breathing Parameter</th>
<th>Normal characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Route</td>
<td>Nose: rest, physical exercise, sleep</td>
</tr>
<tr>
<td>Location (dominant)</td>
<td>Diaphragm</td>
</tr>
<tr>
<td>Respiration rate</td>
<td>8-12 breaths per minute</td>
</tr>
<tr>
<td>Minute volume</td>
<td>4-6 litres per minute</td>
</tr>
<tr>
<td>Appearance of breathing</td>
<td>Slight movement of abdomen</td>
</tr>
<tr>
<td>Feel of breathing</td>
<td>Easy, comfortable, satisfying</td>
</tr>
<tr>
<td>Rhythm</td>
<td>Regular, smooth</td>
</tr>
<tr>
<td>Sound</td>
<td>Inaudible; at rest, sleep</td>
</tr>
<tr>
<td>End tidal CO$_2$</td>
<td>$&gt; 35$ mm Hg Pa CO$_2$</td>
</tr>
</tbody>
</table>

After Graham, T 2012, Relief from snoring and sleep apnoea

**what is functional breathing?**
### Dysfunctional Breathing

<table>
<thead>
<tr>
<th>Breathing Parameter</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Route</strong></td>
<td>mouth breathing or heavy nose breathing</td>
</tr>
<tr>
<td><strong>Location (dominant)</strong></td>
<td>Thoracic dominant</td>
</tr>
<tr>
<td><strong>Respiration rate</strong></td>
<td>&gt; 14 breaths per minute</td>
</tr>
<tr>
<td><strong>Minute volume</strong></td>
<td>&gt; 9 litres per minute *</td>
</tr>
<tr>
<td><strong>Appearance of breathing</strong></td>
<td>obvious upper chest or abdominal movement</td>
</tr>
<tr>
<td><strong>Feel of breathing</strong></td>
<td>Heavy, windy full breaths</td>
</tr>
<tr>
<td><strong>Rhythm</strong></td>
<td>Irregular: sighs, yawns, coughs, sniffs, apnoeas</td>
</tr>
<tr>
<td><strong>Sound</strong></td>
<td>Audible; at rest, sleep (snoring)</td>
</tr>
<tr>
<td><strong>End tidal CO₂</strong></td>
<td>&lt; 35 mm Hg Pa CO₂</td>
</tr>
</tbody>
</table>

After Graham, T 2012, Relief from snoring and sleep apnoea
DYSFUNCTIONAL BREATHING

WHAT TO LOOK FOR

• Mouth breathing
• Upper chest movement
• Audible breathing
• Yawning
• Frequent sighing
• Frequent sniffing, snorting
• Obvious signs of breathing
• Catch-up breaths
• Large breaths when speaking

what is breathing dysfunction?
Temperature: 37 degrees C
Pulse: 60 - 80 beats/min
Blood pressure: 120 / 80 mm Hg
Blood sugar: 4 - 8 mmol/l
Blood pH: 7.35 – 7.45
Minute volume: 4-6 litres /min

PHYSIOLOGICAL “NORMS” AND BREATHING DYSFUNCTION

Minute volume: 14 litres

What is breathing dysfunction?
DYSFUNCTIONAL BREATHING

Temperature Pulse Respiration

Up until the 1960s respiratory rate was routinely monitored along with temperature and pulse. It is rarely measured today and 15-20 breaths/minute is now considered the norm.

What is breathing dysfunction?
DYSFUNCTIONAL BREATHING

Hyperventilation: breathing more than metabolic requirements

Normal breathing volume: 4-6 litres of air/minute at rest

Hyperventilation > 9 litres of air/min at rest

Normal minute ventilation at rest (70kg human):
- 4-6 litres/min for older physiological textbooks
- 6-9 litres/min for some modern textbooks

what is breathing dysfunction?
The Sympathetic N.S. (Fight or Flight)
what is breathing dysfunction?

BREATHING DURING STRESS

• Faster breathing rate
• Bigger breaths – increased breathing volume
• More mouth breathing
• Upper chest breathing
• Irregular breathing; sighs, gasps
• Noticeable breathing
If the stress is prolonged, over-breathing becomes the norm.
What causes dysfunctional breathing to become habitual?

**MODERN LIFE**

- Stress
- Over-eating, skipping meals, too much refined carbs, low protein
- Caffeine, nicotine, alcohol, recreational drugs
- Lack of exercise, athletes over-training
- Excessive talking
- Promotion of deep breathing techniques
- Excessive use of screen technology
- Illness, infection
- Some medications
HUMAN BREATHING VOLUMES HAVE DOUBLED IN FIFTY YEARS

Information sourced from 24 medical studies – Rakhimov 2005

what is breathing dysfunction?
What’s wrong with breathing more air?

**THE AIR WE BREATHE**

- Nitrogen: 78%
- Oxygen: 20%
- Carbon Dioxide: 0.03%
- Water and other gases...

**THE AIR IN OUR LUNGS**

- Nitrogen: 75%
- Oxygen: 14%
- Carbon Dioxide: 6.5%
- Water and Other Gases: 4.5%

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**What is breathing dysfunction?**
What’s wrong with breathing more air?

Christian Bohr - 1904

what is breathing dysfunction?
What’s wrong with breathing more air?

Over-breathing - CO\textsubscript{2} deficit and smooth muscle constriction

- Bronchi/bronchioles - asthma, bronchiectasis
- Nasal sinuses - nasal congestion, sinusitis
- Cardiovascular - primary hypertension, angina pectoris, Raynaud's, migraines, anxiety/panic attacks, epileptic seizures
- Gastrointestinal tract - Gastric reflux, IBS, Diverticulitis
- Eustachian tubes/ear canal - glue ear, problems equalising
- Urinary tract - incontinence, nocturnal enuresis
Deep breaths are good for you

Hyperventilation and acute CO$_2$ deficit

NOT

Deep breaths are good for you

consequences of breathing dysfunction?
The right hand image shows a 40% reduction in brain oxygen after one minute of big volume breathing. This explains the sensation of dizziness that often accompanies a panic attack. (source Litchfield 1999)
Over-breathing all day long can lead to symptoms
<table>
<thead>
<tr>
<th>BREATHING DYSFUNCTION POSSIBLE SYMPTOMS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Asthma</strong></td>
</tr>
<tr>
<td><strong>Chronic nasal congestion</strong></td>
</tr>
<tr>
<td><strong>Allergic rhinitis (hay fever)</strong></td>
</tr>
<tr>
<td><strong>Sinusitis</strong></td>
</tr>
<tr>
<td><strong>Allergies</strong></td>
</tr>
<tr>
<td><strong>Chronic cough</strong></td>
</tr>
<tr>
<td><strong>Anxiety/panic attacks</strong></td>
</tr>
<tr>
<td><strong>Sleep apnoea</strong></td>
</tr>
<tr>
<td><strong>Snoring</strong></td>
</tr>
<tr>
<td><strong>Insomnia</strong></td>
</tr>
<tr>
<td><strong>Primary hypertension</strong></td>
</tr>
<tr>
<td><strong>Angina pectoris</strong></td>
</tr>
<tr>
<td><strong>Epileptic seizures</strong></td>
</tr>
<tr>
<td><strong>Migraine headaches</strong></td>
</tr>
</tbody>
</table>
Average tidal volumes of **950ml** and average minute volumes of **15 litres/minute** during the day were recorded in males diagnosed with sleep apnoea.

Normal tidal volume = **500 ml**
Normal minute volume = **< 9 litres/minute**

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1 Radwan et al., Eur Resp J 1995
BREATHING DYSFUNCTION AND ASTHMA

Average MV for asthmatics in Brisbane Buteyko trial
- 15 litres per minute (normal 10 litres) ¹

Hyperventilation whether spontaneous or exercise induced, is known to cause asthma ², ³, ⁴

Loss of CO₂ through hyperventilation can trigger bronchoconstriction in asthmatics ⁴, ⁵

² Demeter & Cordasco The American Journal of Medicine 1986
³ Clarke PS, Gibson, JR Aust Fam Physician 1980
⁴ Sterling, GM., Clin Sci, 1968 vol 34
⁵ van den Elshout, FJJ et al., Thorax, 1991
Hypoventilation exercises for asthma

Controlling Asthma by Training of Capnometry - Assisted Hypoventilation vs Slow Breathing
A Randomized Controlled Trial

‘Brief interventions aimed at raising PCO$_2$ or slowing respiratory rate provide significant, sustained, and clinically meaningful improvements in asthma control. Raising PCO$_2$ was associated with greater benefits in aspects of lung function and long-term symptoms.’

Ritz et al., Chest 2014; 146(5): 1237 - 1247
BUTEYKO STUDIES FOR ASTHMA
Published studies 1998 - 2013

- Reductions in asthma reliever medication of 85-100%
- Reductions in inhaled steroid medication of 40-50%
- Symptom reduction (improved quality of life scores)
- No deterioration in lung function despite medication reduction

Bowler et al., Medical Journal of Australia 1998
Opat et al., Journal of asthma 2000
McHugh, et al., New Zealand Medical Journal Dec 2003
Cooper et al., Thorax 2003
McHugh et al., New Zealand Medical Journal May 2006
Slader et al., Thorax 2006
Cowie et al., Respiratory Medicine, May 2008
Zahra et al., Egyptian Journal of Chest Diseases and Tuberculosis 2012
Narwal Ravinder et al., Indian Journal of Physiotherapy and Occupational Therapy 2012
Adelola O.A., et al., Clinical Otolaryngology 2013
Hyperventilation Syndrome (HVS) should be included in the differential diagnosis of patients presenting with nasal congestion, particularly after failed nasal surgery. One possible explanation is increased nasal resistance secondary to low arterial PCO$_2$ levels.

BREATHING DYSFUNCTION AND HYPERTENSION

‘Slow breathing reduces blood pressure and enhances baroreflex sensitivity in hypertensive patients. These effects appear potentially beneficial in the management of hypertension.’

‘Breathing-control lowers blood pressure.’

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Breathing Dysfunction CO₂ deficit and inflammation

Hypocapnia (CO₂ deficit) can trigger mast cell de-granulation and histamine release

• airways – asthma, hay fever
• skin – eczema
• gut – food allergies, irritable bowel (IBS)

Coakley et al. Jnl of Leukocyte Biology 2002:71
Kontos et al. American Jnl of physiology 1972
Perera, J. The hazards of heavy breathing. New Scientist, Dec 1988
Strider et al., Allergy 2010

consequences of breathing dysfunction?
• The teeth sit in the neutral position between the cheeks and the tongue.
• During nasal breathing the tongue rests in the roof of the mouth.
• During mouth breathing the tongue drops to the floor of the mouth and the cheeks then exert force on the teeth causing constriction of the maxilla.
Mouth breathing and tongue posture

- Nasal breathing with tongue in the roof of the mouth helps ensure wide dental arches and straight teeth.

- The tongue is one of the strongest muscles in the body, capable of exerting 500 grams of pressure.

- Mouth breathers carry the tongue in the floor of the mouth potentially leading to narrow dental arches, crowded teeth, receding chin, smaller jaw, narrower upper airway and risk of sleep apnoea and other respiratory disorders.
Possible Consequences of low tongue posture

CT SCANS

nose breather

mouth breather

Breathing dysfunction and craniofacial development
Possible Consequences of low tongue posture

- crooked teeth
- narrow dental arches
- receding chin
- protruding nose
- narrow airway
- and high risk of developing obstructive sleep apnoea by the age of thirty

Breathing dysfunction and craniofacial development
Observations
Breathing rate
Rhythm
Minute volume estimate
Mechanics - thoracic : diaphragmatic
Route - mouth : nose
Posture

Other :
Pulse
Pulse Oximetry
Capnometer assessment
BREATHING ASSESSMENT AND GUIDED BREATHING EXERCISE

1. Pulse

2. Control pause – comfortable breath-hold

3. Nose unblocking exercise

4. Guided breathing exercise

5. Re-take pulse and compare with first pulse

breathing assessment
BREATH HOLD TEST – CONTROL PAUSE
Measurement of breathing reflex in response to arterial carbon dioxide levels

1. Keeping your mouth closed; take a small breath in and out through your nose
2. Hold your breath, gently pinching the nose after exhaling
3. Hold your breath until the very first urge to breathe
4. Time the breath-hold in seconds

Keep your mouth closed throughout the exercise

breathing assessment
# BREATH HOLD TEST – CONTROL PAUSE

<table>
<thead>
<tr>
<th>Seconds</th>
<th>Arterial CO$_2$ mm Hg Pa CO$_2$</th>
<th>Minute volume litres/min</th>
<th>Hyperventilation - over breathing</th>
</tr>
</thead>
<tbody>
<tr>
<td>45&lt;</td>
<td>40</td>
<td>4-5</td>
<td>normal</td>
</tr>
<tr>
<td>30-45</td>
<td>35</td>
<td>8-10</td>
<td>mild to moderate</td>
</tr>
<tr>
<td>15-30</td>
<td>33</td>
<td>12-15</td>
<td>moderate to severe</td>
</tr>
<tr>
<td>15 &gt;</td>
<td>30</td>
<td>16-20</td>
<td>severe</td>
</tr>
</tbody>
</table>

breathing assessment
1. Breathe in and out gently through nose
2. Hold on the out breathe for as long as is comfortable
3. Then gradually resume very gentle breathing

It may help to pinch the nose and nod your head a few times

In stubborn cases or when the blockage is due to a cold, the exercise may need to be repeated several times
<table>
<thead>
<tr>
<th>STRESS BREATHING</th>
<th>RELAXED BREATHING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faster</td>
<td>Slower</td>
</tr>
<tr>
<td>Bigger</td>
<td>Reduced volume</td>
</tr>
<tr>
<td>More mouth</td>
<td>Nasal</td>
</tr>
<tr>
<td>Upper chest</td>
<td>Diaphragm</td>
</tr>
<tr>
<td>Irregular, sighs</td>
<td>Smooth, rhythmic, even</td>
</tr>
<tr>
<td>Noticeable</td>
<td>Soft, gentle</td>
</tr>
</tbody>
</table>

Breathing gently through the nose and breathing diaphragmatically is calming and helps engage the parasympathetic branch of the ANS.

breathing retraining
1. Place one hand on upper chest, one hand on belly
   - take two breaths in and out through the nose and note relative hand movements
2. Repeat, this time breathing through open mouth
GUIDED BREATHING EXERCISE

• Sit with an upright posture
• Lips lightly touching, teeth unclenched
• Breathe gently through the nose
• Place tongue in the roof of the mouth
• Feel the breath in the belly
• Slow the breathing – breathe less
• Breathe softly – breathe quietly

Practise for 3-5 minutes, 2-3 times a day after physical exercise, after work, before bed
ARE THEY BREATHING TOO MUCH?

Six things to look for

1. Open mouth posture at any time
2. Upper chest movement at rest
3. Yawning or sighing a lot
4. Irregular breathing pattern
5. Big gasps through mouth when speaking
6. Symptoms related to breathing dysfunction
SIX TIPS FOR EASIER BREATHING

1. Keep mouth closed and lips gently together

2. Breathe through the nose at all times, even during strenuous activities like climbing stairs, playing games or sport

3. Tongue should sit in the roof of the mouth

4. Suppress the urge to yawn sigh, gasp or cough where possible

5. 3-5 minutes of diaphragmatic breathing exercises
   2-3 times per day and especially prior to bed-time

6. Reduce inflammatory and congestion promoting foods:
   especially dairy and refined carbohydrates

what you can do
CALL TO ACTION

Screening for mouth-breathing and other signs and symptoms indicative of breathing pattern dysfunction be included as part of health/medical assessment in general practice.

Widespread availability of comprehensive breathing retraining services in the public health sector throughout New Zealand

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The National Respiratory Strategy is a call to action to:

**Reduce the incidence of respiratory disease**
Identifying dysfunctional breathing patterns, plus knowledge about, and attention to restoring correct breathing will help reduce the incidence of asthma and OSA (as dysfunctional breathing pattern is a known trigger).

**Reduce the impact of respiratory disease**
With all the conditions named, improved breathing efficiency can improve symptoms and lessen the impact of the diseases.

**Eliminate inequalities in respiratory health in New Zealand.**
Having breathing pattern assessment part of standard medical diagnostic practice will help eliminate inequalities – health workers in private practice, hospital and community would be on the lookout for dysfunctional breathing patterns and be aware of treatment options.
Six things to instruct patients

1. Comfortable nasal breathing at all times:
   - awake
   - asleep
   - at rest
   - when eating
   - during physical exertion

what you can do
2. Correct tongue and lip rest posture

Rest the tongue in the roof of the mouth

Gently place the tip of the tongue against the roof of the mouth just behind the upper two front teeth

Lips touching lightly and do not clench your teeth
Six things to instruct patients

2. Correct tongue and lip rest posture

Low tongue posture

Correct tongue posture

what you can do
Six things to instruct patients

3. Diaphragm breathing

- The diaphragm is a postural muscle and like the heart, does not fatigue.
- The diaphragm is the primary respiratory muscle.
- At rest, 80% of the breathing effort should be diaphragmatic.
- Poor diaphragm tone can contribute to digestive problems like gastric reflux. ¹

Six things to instruct patients

4. Try to suppress, yawns, sighs, gasps, coughs, snorts, sniffs etc..

Frequent sighing, yawning, habitual cough, throat clearing, or sniffing dehydrates and irritates airways and will perpetuate breathing dysfunction (Chronic hyperventilation).
5. Breathing and speaking

Singers, actors, public speakers, teachers, radio and TV presenters are especially at risk.

Excessive breathing when speaking can reduce oxygen to the brain by 50% which can activate the fight or flight response (stage fright).

Six things to instruct patients

5. Breathing and speaking

- Try to talk less
- Talk more slowly
- Breathe in through the nose – not the mouth
- Do not take big breaths when speaking
- Breathe more gently and quietly when talking
- Speak in shorter sentences
Six things to instruct patients

6. Reduce or remove inflammatory and congestion promoting foods

- Refined carbohydrates
- Pasteurised dairy products
- Soy milk, protein shakes
- Heated refined oils
- Caffeine
- Alcohol
- Processed foods, food additives

what you can do
Six things to instruct patients - OK one more!

7. Breathe Less

For all activities and levels of exertion (from walking to the mail box to running a marathon)

what you can do