Dysfunctional Breathing in Clinical Practice - The Tip and the Iceberg

Lecture for ACNEM July 2018
Dr. Rosalba Courtney ND, DO, PhD

Osteopath, Integrative Health, Breathing Therapies

Dr. Rosalba Courtney 2018
DYSFUNCTIONAL BREATHING:
ITS PARAMETERS
MEASUREMENT AND
RELEVANCE

Rosalba Courtney
School Health Sciences,
RMIT University, Melbourne,
Australia

Thesis available for download:
www.rosalbacourtney.com

Dysfunctional Breathing
Common Yet Overlooked

1 in 10 at least

More in patients with:
• respiratory diseases (30-65%)
• anxiety disorders (GAD -75%)
• cardiovascular diseases
• sleep apnea
• chronic long term illnesses
• medically unexplained physical symptoms
Correcting dysfunctional breathing can be key to...

- Better Treatment Response
- Break vicious cycles of disease and dysfunction
- Correct DB
- Symptom Reduction esp. medically unexplained
- Improved Homeostasis

Dr. Lums landmark study on patients with chronic hyperventilation syndrome-

- 700 cases - Papworth Hospital.
- Chronic symptoms up to 25 yrs
- 85% - no detectable pathology
- 15% - pathology + disproportionate Sx
- Unresponsive to treatment

Multiple symptoms previously unresponsive to Rx. effectively resolved in 75% of patients within 6 weeks of systematic and intensive breathing retraining.

History Of Hyperventilation Syndrome (HVS) - from Lum to Now

Pre-1980’s
Accepted diagnosis patients with anxiety, disturbed breathing and unexplained “psychosomatic” symptoms. Argued to be common, yet infrequently recognized (Lum 1975; Lum 1976; Magarian 1982).

Increasing doubts about the specific role of CO₂ in symptoms of HVS and HVPT

After 1980’s

Recommended that the term hyperventilation syndrome be discontinued (Hornsveld 1997)

1990’s

Term dysfunctional breathing comes into use

NOW

Hyperventilation part of broader concept “dysfunctional breathing”

HVS not back.

More recent studies - different name “medically unexplained symptoms” similar treatment and results

RCT - 38 adults

Therapy had robust effect on complex somatic symptom presentations.

Improvements in severity and frequency of symptom, self-reported functioning and psychological state.

“Dysfunctional breathing”- recent examples

- Courtney, R., Breathing training for dysfunctional breathing in asthma: taking a multidimensional approach. ERJ Open Research, 2017.

Dysfunctional breathing. What is it?

- Inability to breathe deeply and freely
- Irregular/chaotic breathing
- It’s mouth breathing
- It’s unexplained breathing discomfort
- It’s thoracic, asynchronous breathing
- Abnormal perception of breathing
- Hyperventilation and CO2 deficit
A working definition of DB - key characteristics

• “Dysfunctional breathing is maladaptive and does not efficiently fulfil its primary or secondary functions.
  • It produces symptoms and disturbs homeostasis.

• DB is a multidimensional with at least 3 key distinct, partially overlapping and measurable components - Biochemical, Biomechanical and Psychophysiological”.

Dysfunctional Breathing is Multidimensional
Dysfunctional Breathing is maladaptive: not Efficient, Adaptive, Appropriate, Responsive, Supportive
No - (EAARS)

- Dysfunctional breathing is maladaptive.
- It does not efficiently adapt to appropriately meet the changing needs of the individual and responds to changes in the internal and external environment.
- It does not adequately supports homeostasis and functions of any body systems.

Breathing has two way interactions with multiple systems - DB has multiple causes and symptoms
Medical conditions with DB connections - Increased prevalence of DB and/or responsive to breathing retraining

- Asthma
- Somatic syndromes
- Medically Unexplained symptoms
- Panic Disorder
- GI disorders
- PTSD and Complex Trauma
- Depression
- Nasal allergy and obstruction
- Heart Disease
- Functional cardiac disorders
- Fibromyalgia
- Anxiety disorders
- Mitochondrial Dysfunction
- Epilepsy
- Sleep apnea
- Rhetts syndrome
- ADHD- Autism Spectrum.
- Back, neck, pelvic pain
- Incontinence
- Burnout/Exhaustion Syndrome
- Empty Nose Syndrome
- Etc...........

Main conditions where the *right breathing retraining can be game changing

- Asthma
- Somatic and MUPS
- Panic Disorder
- Functional GI disorders
- PTSD and Complex Trauma
- Depression and Anxiety
- Nasal “disuse”
- Functional cardiac disorders
- Epilepsy
- Sleep apnea
- Back, neck, pelvic pain
- Incontinence
- Burnout/Exhaustion Syndrome

* Individualised, multi-dimensional, appropriately targeted, sufficiently intensive.
DB complicates asthma....

- Medically unexplained Sx.
- Inaccurate – perception Sx
- Dyspnoea

Control

- Asthma control
- Breathing control

QOL

- Psychological component
- Perceived health

Aims - (Questions)
1. How do different dimensions of DB impact on asthma symptoms and control?
2. How successfully do different breathing therapies correct DB dimensions?
3. What does an ideal protocol look like?
Hyperventilation prevalent in asthma

- Found in acute and chronic symptomatic asthma and in mild asymptomatic asthma.
- Asthmatics more likely to hyperventilate in response to a range of challenges:
  - muscle tension
  - dynamic exercise
  - increased airway resistance
  - psychological stress
  - conditioned response to innocuous inhaler
Hypocapnia can contribute to bronchoconstriction, decreased lung compliance and lung damage (Sterling 1968; McFadden Jr, Stearns et al. 1977; O’Cain, Hensley et al. 1979; Kolbe, Kleeherger et al. 1987; Van Den Elshout 1991; Lindeman, Croxton et al. 1998; Laffey 2003; Bruton and Holgate 2005).

The mechanisms of lung injury by hypocapnia, which are ameliorated by supplemental CO2, include increased pulmonary capillary permeability, parenchymal injury and decreased surfactant (Laffey 2003).

Hyperventilation - effects on breathing control

Fly-wheel effect - hyperventilation leads to more hyperventilation.

Altered CO2 set-point and altered perception of what is normal.

Various breathing therapies for asthma aim to correct hyperventilation

- Capnometry assisted biofeedback (CART)
- Buteyko Method
- Physical therapy-based breathing retraining

Don’t always measure it as part of the protocol.

Is normalisation of hyperventilation the mechanism explaining positive effect of breathing therapies?

- **No** - statistically significant change in CO2 after breathing therapy even though patients improved (Bowler 1998, Thomas 2009)
  
  AND

- **Yes** - Change in CO2 correlated with improvement when measured during treatment as part of protocol (Ritz 2009, Grammatopoulou 2011)

**Indicates**
1. importance of measuring and targeting appropriately
2. other mechanisms also involved ie **biomechanical** and **psychophysiological**
Dimensions of Dysfunctional Breathing

**Biomechanical**
**Neuromuscular**
**Habits**
**Patterns**

Breathing pattern disorders (BPD)

- Thoracic/upper rib cage:
  - (vertical upper rib cage, dominant, asynchronous, paradoxical breathing)
- Excessively irregular:
  - sighing dyspnea, breath holding
- Inhalation and/or exhalation dominant muscle patterns
- Mouth breathing

Dysfunctional when not:
- Efficient
- Adaptive
- Appropriate
- Responsive
- Supportive
Neuromuscular system impacts on dyspnea and breathing control through neuro-mechanical uncoupling

Short, hypertonic muscles less able to respond to motor command.

Increased ventilation

Increased respiratory drive

Hypertonicity Respiratory Muscles

Dyspnoea

Dynamic Hyperinflation

Neuro-mechanical uncoupling

Respiratory muscles short and functionally weak
Breathing therapies for asthma that focus on breathing pattern

- Heart rate variability biofeedback (resonance frequency breathing)

- Physical therapy-based breathing retraining

Don’t always measure it as part of the protocol.

Problems with not measuring and continuing to assess biomechanical dimension

- Poorly taught deep “diaphragmatic” breathing can make dyspnoea worse by contributing to hyperinflation and neuromechanical uncoupling.

- Poor diaphragm function inhibits ability to achieve “resonance frequency” and therefore its beneficial effects.
Dimensions of Dysfunctional Breathing

Respiratory psychophysiology: A complex interplay

- Mind & emotions
- Biochemical and biomechanical aspects of breathing control
- Dysfunctional breathing behaviours and symptoms
Psychophysiological factors in asthma

- 4x greater incidence of anxiety and panic disorder in asthma
- Physiological hyperarousal from anxiety and asthma contribute to DB
- Fear and anxiety disrupt ANS homeostasis
- Psychophysiological factors e.g. conditioning, sensitisation contribute to symptom “learning”

Dyspnea activates limbic neural circuitry associated with fear and threat

- The extent of activation of this neural circuitry predicts the magnitude of inflammation and lung function decline (Rosenkranz 2009).

- Increased fear and anxiety reduce tolerance and increase sensitization to dyspnea and other symptoms (De Peuter 2004)
Asthmatics with dysfunctional breathing have a decreased sense of coherence and control

Sense of Coherence  
Sense of Control

Fear of dyspnea  
Symptoms

Psychophysiological effects of breathing retraining

• Reduce arousal
• Re-frame dyspnea and reduce fear
• Increase sense of coherence and control
• Improve ANS regulation
Improving psychophysiological effects of breathing retraining

• Reduce arousal
• Re-frame dyspnea and reduce fear
• Increase sense of coherence and control
• Improve ANS regulation

Do these deliberately
Assess and measure.

All dimensions of DB impact on asthma –
Assess and treat them all
Integrative Breathing Assessment

**Basic principles:**

- Evaluate biochemical, biomechanical and psychophysiological dimensions.
- Evaluate at rest and under challenge.
- Consider breathing in context of overall health.
- Consider causes and contributing factors.

% of DB according to a range of DB measures

- **Biochemical**
  - CO2 Resting
  - Challenge
  - 10-26%

- **Breath Holding Time**
  - Post exhale
  - Till first sensation
  - Maximum
  - 40%

- **Symptoms**
  - Nijmegen Questionnaire
  - Self Evaluation of Breathing Questionnaire
  - 50-60%

- **Biomechanical**
  - Breathing pattern assessment
  - 30-40%

‘85 individuals with concerns about their breathing’
DB speech and breathing signs during history taking

- Hurried speech with obvious and frequent inhalation and few pauses
- Frequent sighing, yawning and gasping
- Shoulders - lifting during speech
- Wheeze on inspiration

Common signs of DB

- Visible tightness and hyper tonicity of scalenes, sternomastoid and trapezius.
- The superficial anterior neck fascia appears tight and ropey in appearance.

➢ Mouth Breathing?
Short breath holding time-

• Signals from respiratory muscles/ diaphragm
• Psychophysiological factors
• High CO2 set point
• Low bicarbonate

Dysfunctional Breathing Questionnaires

• Nijmegen Questionnaire

• Self Evaluation of Breathing Questionnaire
Causes of DB symptoms

Symptoms not explained by hypocapnia alone.

They are also due to the interplay of biomechanical and psychological factors and perceptual-cognitive processes.

Symptoms
- Chest pain
- Feeling tense
- Dizzy spells
- Feeling confused
- Faster deeper breathing
- Short of breath
- Tight feeling in the chest
- Bloated feeling in the stomach
- Tingling fingers
- Unable to breathe deeply
- Stiff fingers/arms
- Tight feelings around the mouth
- Cold hands and feet
- Palpitations
- Feelings of anxiety

Dimensions of the Nijmegen Q.

Central Neurovascular

Peripheral Neurovascular

Tension/Anxiety

Breathing –Dyspnoea
Self Evaluation of Breathing Questionnaire (SEBQ items)

biochemical
- Short of breath talking
- Cant catch breath
- Breathless in association with other sx
- Breathless out of proportion to fitness
- Air is stuffy
- Breathless when anxious

biomechanical
- Cant take deep or satisfying breath
- Stuck or restricted breathing
- Irregular breathing
- Rib cage tight
- Shallow breathing
- Rapid breathing

---

The Self Evaluation of Breathing Questionnaire (V3)
Scoring this questionnaire: (0) never/least true at all, (1) occasionally/a bit true, (2) frequently-mostly true, and (3) very frequently-very true

<table>
<thead>
<tr>
<th>Item</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I get easily breathless out of proportion to my fitness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I notice myself breathing shallowly</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>I get short of breath reading and talking</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>I notice myself sighing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>I notice myself yawning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>I feel I cannot take a deep or satisfying breath</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>I notice that I am breathing irregularly</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>My breathing feels stuck or restricted</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>My ribcage feels tight and can't expand</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>I notice myself breathing quickly</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>I get breathless when I'm anxious</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>I find myself holding my breath</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>I feel breathless in association with other physical symptoms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>I have trouble coordinating my breathing when speaking</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>I can't catch my breath</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>I feel that the air is stuffy, as if not enough air in the room</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>I get breathless even when resting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>My breath feels like it does not go in all the way</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>My breath feels like it does not go out all the way</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>My breathing is heavy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>I feel that I am breathing more</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>My breathing requires work</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>My breathing requires effort</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Capnometry - End tidal CO2

- At rest
- Minimum 5 minutes
- Activity/ Challenge
- Mental, physical, task specific
- Hyperventilation provocation test
- Time to recovery (< 3 minutes)
- Onset of HV symptoms during or in recovery period

Use accurate validated instruments.

Correcting breathing dysfunctions
Basic Principles of Integrative Breathing Therapy

• Assess, tailor treatment, reassess
• Train for breathing functionality
• Always consider causes and contributing factors

“I wake up every day and I think, 'I'm breathing! It's a good day.'” - Eve Ensler
Next Integrative Breathing Practitioner Training

Melbourne March 22-24 2019

For further info:

www.rosalbacourtney.com
contact@rosalbacourtney.com
(02) 9918-3460