Altered chest wall mechanics I:

**Dysfunctional breathing**

Reinventing an old disease - again

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No relationships to disclose
‘Difficult’ Asthma

- Wrong diagnosis
- Asthma and something else
- Not taking medication effectively
  - poor regimen compliance
  - device compliance - competence & contrivance
- ['bad asthma']

Dysfunctional Breathing

‘When I use a word,’” Humpty Dumpty said in a rather scornful tone, “it means just what I choose it to mean, neither more nor less”

De Costas syndrome
dysfunctional breathing
hyperventilation syndrome [HVS]
disproportionate breathlessness
behavioural breathlessness
anxiety related breathlessness
sighing dyspnoea
psychogenic breathlessness
functional breathing disorders
somatoform respiratory disorders
Pattern disordered breathing
paradoxical vocal cord dysfunction (pVCD)
fictitious asthma
functional stridor
episodic laryngeal dyskinesia
hysterical croup
psychogenic stridor
EILO
El laryngomalacia

Lewis Carrol Through the Looking-Glass 1872
HVS

1871 ‘De Costa’s syndrome’

Symptoms included palpitations, chest pain, shortness of breath or oppression on exertion, indigestion, abdominal distention, and diarrhea, headache, giddiness, disturbed sleep, dizziness, fatigue, anxiety, tingle, aching limbs

1919 ‘Soldiers heart’

1922 ‘forced ventilation’

1930’s Hyperventilation test

1951 Dr A Winter Brown paper bag

‘HVS’ characteristic’ breathing - ‘heaving of the upper sternum and lack of lateral costal expansion’

• failure to identify hypocapnea in the majority of subjects (inc those with ‘panic attacks’)
• the lack of specificity of the ‘hyperventilation test’
• ‘normal’ individuals develop asymptomatic hypocapnea during normal activities
• breathing retraining can have a huge impact on symptoms, without significantly affecting a patient’s pCO₂
• hyperventilation equating to ‘panic attack’ and ‘neurosis’
• high levels of undiagnosed asthma in those presenting to an ED with ‘hyperventilation’
• Adult pts presented across specialties
• ‘mad or bad’
**Dysfunctional Breathing as a cause of 'Difficult' Asthma**

*BTS/SIGN Asthma Guidelines*
dysfunctional breathing should be considered as part of a difficult asthma assessment.

It remains unclear what is the best mechanism of identifying and managing this problem.

*GINA [2014]*
Breathing techniques may be a useful supplement to medication [Grade A]

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*BTS/ACPRC Guidelines for the physiotherapy management of the adult, medical, spontaneously breathing patient*

**SECTION 2b Disordered breathing (hyperventilation syndrome and vocal cord dysfunction)**

Hyperventilation syndrome for the purpose of this document maybe defined as abnormal breathing that results in the sensation of

- breathlessness, often described as “air hunger”, a sensation of an inability to take an apical breath, which may present with other symptoms; for example, chest tightness, anxiety, dizziness or paraesthesiae.

- These symptoms collectively characterise a syndrome, commonly referred to as hyperventilation syndrome or dysfunctional breathing. Many asthmatics hyperventilate chronically and can be treated, therefore, in the same way.

*Bott et al Thorax 2009 BTS/ARCP guidelines*
**Dysfunctional breathing**

‘alteration in the normal biomechanical patterns of breathing that result in intermittent or chronic symptoms’

**A habituated response**

Anxiety / stress/ emotional reaction can all drive increased sympathetic activity one of features appears to be increased use of upper chest muscles [intercostals/accessory] and minute ventilation [often feedback loops]

fluoroscopic studies showing that when a subject is exposed to emotional stress the diaphragm becomes flattened, hypertonic and relatively immobile

exercising vs observing horror movies: ‘Overall, exercise had a greater impact on respiratory volumes while anxiety was associated with greater irregularity of breathing’

postural component may contribute

Lung disease with hyperinflation

‘It’s all in the mind’ / psychological pathology / neurosis

‘Hypersensitivit’ of the larynx - gastroesophageal reflux, ‘post nasal drip’
**Exercised Induced Asthma**

Weinburger 2009

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Exercise induced asthma</th>
<th>Poor physical fitness</th>
<th>Habit cough</th>
<th>Vocal cord dysfunction/sigh dyspnoea</th>
<th>No diagnosis</th>
<th>Normal exercise controls</th>
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</thead>
<tbody>
<tr>
<td>Number</td>
<td>8/52 (15.4%)</td>
<td>12/52 (23.1%)</td>
<td>7/52 (13.5%)</td>
<td>14/52 (26.9%)</td>
<td>11/52 (21.1%)</td>
<td>8</td>
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</tbody>
</table>

Seear et al 2005

Sudden onset throat tightness, dysphonia or stridor often assoc. with intermittent sighing and sensation lungs could not be filled

**History**

- Frequent sighing/yawning
- Symptoms at rest
- Absent at night
- **Air Hunger**
- Typical triggers
- Chest pain
- ‘Difficult’ asthma
- Partial / transient response to β-agonists
- Tingling fingers
- Fatigue
- **Normal saturations**
- **Inspiratory stridor**
- **Difficulty breathing in**
- Performance symptoms
- Choking sensation
- Anxiety
**Exercised Induced Asthma**

*Silverman M & Anderson SD 1971*

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**Air hunger:** a need to take a deep, satisfying breath, accompanied by a feeling of difficulty in inflating the lungs - is both common and highly suggestive. It is due to the characteristic overinflation of the chest *(Claude Lum 1975)*

**Difficulty breathing in**

<table>
<thead>
<tr>
<th>No (‘%’ of patients)</th>
<th>Breathing in more difficult</th>
<th>Breathing out more difficult</th>
<th>Both or do not know</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>84 (70.6)</td>
<td>22 (18.5)</td>
<td>13 (10.9)</td>
<td>119</td>
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<tr>
<td>Age range (years)</td>
<td>12–73</td>
<td>14–74</td>
<td>36–71</td>
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<tr>
<td>Mean age (years)</td>
<td>35.1</td>
<td>39.4</td>
<td>53.1</td>
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<tr>
<td>Men</td>
<td>40</td>
<td>7</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>44</td>
<td>15</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Mailed questionnaire to children aged 12–17 years</td>
<td>21</td>
<td>2</td>
<td>0</td>
<td>23</td>
</tr>
</tbody>
</table>

*Morris BMJ 1981*
Examination
‘the effortless heaving of the upper sternum and lack of costal expansion’
Frequent sighing/yawning
Variable frequency and volume

[MARM]

Tests?

Structured light plethysmography
Trigger - Exercise induce symptoms

<table>
<thead>
<tr>
<th>Respiratory Rate</th>
<th></th>
<th>&lt;58</th>
<th>76</th>
<th>-</th>
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<tr>
<td>GAS EXCHANGE</td>
<td></td>
<td>Rest</td>
<td>AT</td>
<td>Peak</td>
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<tr>
<td>VO2 (l/min)</td>
<td></td>
<td>0.312</td>
<td>2.618</td>
<td>2.740</td>
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<tr>
<td>VE/VO2</td>
<td></td>
<td>30</td>
<td>34</td>
<td>40</td>
</tr>
<tr>
<td>VE/VCO2</td>
<td></td>
<td>39</td>
<td>34</td>
<td>41</td>
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</table>

Exercised Induced Laryngeal Obstruction

James Hull
Physiotherapists are Invaluable

- Education
- Breathing retraining
  - relaxed, rhythmical nose–abdominal (diaphragmatic) breathing
- Postural correction
- Relaxation
- +/- Sniffing etc for upper airways

‘I loved it – I am not used to curing people’

BTS/ACPRC Guidelines for the physiotherapy management of the adult, medical, spontaneous breathing patient

Breath-Works Clinic
Service evaluation

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Male : Female</td>
<td>16:18</td>
</tr>
<tr>
<td>Asthmatic</td>
<td>20</td>
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<tr>
<td>Upper airway component</td>
<td>5</td>
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Effect of Breathing Retraining

Mean quality of life scores for children and parents at different stages of treatment

Breath-Works Clinic

Mean Nijmegen scores at different stages of treatment
Treatment of Dysfunctional Breathing?

Psychology – no evidence

Hypnotherapy
EMG feedback

anti-cholinergics prior to exercise

Heliox
Intubation
Tracheostomy
Botox

Dysfunctional Breathing

High quality care involves doing the simple things well

Not sexy but you can transform the lives of your patients [and physios]

The PM integrates five components, the principal one being specific breathing training:

- Breathing training, including teaching of appropriate minute and tidal volume and the development of a pattern of breathing suitable to current metabolic activity. Elimination of dysfunctional breathing, including hyperinflation and hyperventilation patterns is discussed. A specific Papworth method diaphragmatic breathing technique is taught to replace the use of inappropriate accessory muscles of respiration. Emphasis, when relaxed, is placed on calm slow nasal expiration. Patients are encouraged to “nose-breathe” rather than “mouth-breathe” and eradication or reduction of habits such as yawning, sighing, etc is taught and practised.
- Education, with the emphasis on the recognition and physical management of stress responses and specifically the interaction with breathing patterns.
- Relaxation training, specific and general.
- Integration of “appropriate” breathing and relaxation techniques into daily living activities. Initially the techniques are taught in a semi-recumbent position progressing to sitting, then standing and during daily living activities. Finally, the integration of breathing and relaxation techniques into speech is taught and practised.
- Home exercises with an audiotape or CD containing reminders of the breathing and relaxation techniques are supplied at the third treatment. Encouragement is given to practise at least once a day with the tape.

Holloway, West 2007