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Review Paper

Concept of Dysfunctional Breathing and Retrained Breathing Programme: A Comprehensive Review

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ABSTRACT

Dysfunctional breathing is a respiratory disorder marked by an inefficient breathing pattern, which can be managed through a breathing retraining program. This program uses simple, non-drug interventions to help restore natural, efficient breathing. Breathing retraining positively impacts the cardiorespiratory and autonomic nervous systems and serves as an effective complement to medication for conditions such as hypertension, poorly controlled asthma, anxiety-related dyspnea, hyperventilation syndrome, and chronic obstructive pulmonary disease (COPD). This review emphasises the concept of dysfunctional breathing, its components, physiological effects, and the benefits of the retrained breathing programme. Future studies should focus on investigating the effectiveness of the retrained breathing programme across various conditions involving dysfunctional breathing.

INTRODUCTION

The pattern of breathing has a significant impact on an individual's physical state. A rise in breathing rate without physical exertion leads to various physiological changes. When a person hyperventilates, carbon dioxide is expelled from the blood and tissues, leading to a state known as hypocapnia. This reduction in carbon dioxide causes an alkalosis in the body, which results in the constriction of arterial smooth muscle, particularly in the cerebral blood vessels. This

eventually leads to cerebral hypoxia, thereby intensifying feelings of anxiety and panic. Prolonged hyperventilation can lead to exhaustion and heightened anxiety. This condition is identified as dysfunctional breathing, which is described as an alteration in the normal biochemical breathing pattern, causing intermittent or chronic symptoms.

Dysfunctional breathing is characterised by several key features, including upper thoracic breathing, irregular respiratory patterns, excessive

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sighing, mouth breathing, and increased respiratory rates. Patients exhibiting a dysfunctional breathing pattern often present with uncontrolled coughing that is not accompanied by phlegm, as well as a frequent occurrence of sighing. Dysfunctional breathing is a recognised yet poorly defined disorder that often coexists with various conditions like asthma, COPD, etc. It can also manifest as an isolated condition, leading to symptoms such as dyspnoea, coughing, loss of voice, chest tightness, anxiety, and fatigue.

Achieving control over one's breathing pattern involves deliberately slowing the breathing rate and adjusting the style or technique of inhalation and exhalation. Dysfunctional breathing, characterised by irregular or inefficient patterns, can often be effectively managed through specific interventions that focus on breathing retraining. Various studies have shown that these interventions can lead to significant improvements in various systemic functions and overall well-being, as evidenced by positive outcomes reported in various clinical studies. Through consistent practice and tailored exercises, individuals can develop healthier breathing habits that promote both physical and emotional well-being.

CONCEPT OF BREATHING RETRAINING [5-7]

Retraining refers to the process of acquiring new skills or reinforcing existing ones. It involves the systematic updating, development, and enhancement of an individual's competencies through targeted training and additional learning. Breathing retraining is a simple non-pharmacological intervention aiming to achieve physiologically normal breathing by correcting dysfunctional breathing patterns. It involves shifting from shallow, rapid chest breathing to slower, calmer, nasal and deeper diaphragmatic (belly) breathing, restoring a normal, relaxed rhythm.

Breathing retraining is a structured set of exercises designed to restore a natural, efficient breathing pattern to reduce anxiety, breathlessness, and promote relaxation, along with various relaxation exercises, positionings and controlled breath holds.

Breathing retraining programs facilitate a normal breathing pattern and improve quality of life for patients with a dysfunctional breathing pattern in conditions like asthma with poor control, anxiety-related dyspnoea, hyperventilation syndrome and COPD.

Aims of breathing retraining:

- To eliminate over-breathing and develop slow, controlled breathing.
- To reduce respiratory rate and minute volume, leading to a reduction in hyperventilation.
- To strengthen diaphragmatic and nasal breathing.
- To increase the decreased ETCO₂ level.

COMPONENTS OF RETAINED BREATHING PROGRAMME [6-9]

Breathing retraining exercises consist of structured, progressive multi-component techniques designed to address dysfunctional breathing patterns. These elements focus on awareness, technique correction, and habit formation. Key components involve awareness, relaxation, focusing on core breathing techniques and regular practice, often guided by a physiotherapist, to achieve a normal resting pattern.

Core Components

1. Awareness Training and Education: This phase involves initial monitoring of respiratory rate, depth, and breathing patterns for self-awareness and recognising faulty patterns like upper-chest or rapid breathing through rest rates, speech, and activity.



2. **Relaxation Training:** This phase comprises progressive muscle relaxation techniques targeting the jaw, shoulders, neck, upper chest and accessory muscles. These include guided sessions for tension release, promoting progressive muscle tightening or relaxation for the whole body.
3. **Core Breathing Training:** This phase incorporates the various forms of breathing techniques.
 - a. **Diaphragmatic (belly/abdominal) breathing:** Abdominal-focused inhalation through the nose (belly rises, chest minimal), with prolonged exhalation via pursed lips or mouth.
 - b. **Slow nasal breathing:** Emphasis on nose-only breathing to reduce the respiratory rate to 12-16 breaths/min, incorporating controlled breath holds post-exhalation. This breathing pattern focuses on small, quiet breaths to reduce anxiety and breathlessness.
4. **Structured regular sessions:** This component involves regular practice of the structured exercise programme comprising the training techniques. These promote technique correction and habit formation. The structured sessions include core breathing techniques with breath holds and relaxation techniques with activity integration in daily activities.

Common exercises involved in the retrained breathing programme that are found to be beneficial and effective for dysfunctional breathing conditions are:

- Diaphragmatic breathing
- Pursed lip breathing
- Buteyko method
- Coordinated breathing with respiratory exercises
- Manual expiratory passive therapy manoeuvres.

PHYSIOLOGICAL EFFECTS OF RETRAINED BREATHING PROGRAMME [8,10-12]

Retrained breathing, or breathing retraining exercises, induces specific physiological adaptations across the respiratory, cardiovascular, and autonomic nervous systems through improvement in breathing efficiency, normalising dysfunctional breathing patterns and modulating autonomic function. These exercises also modulate the body's stress response and improve oxygenation efficiency.

❖ Respiratory Effects

- **Lowers the respiratory rate:** Rhythmic, nasal inspiration and diaphragmatic breathing, by long expiration and by breath holding at functional residual capacity, results in normalisation of respiratory rate and/or depth of breathing. This also decreases the dysfunctional breathing rate to 12-16 breaths/min, thereby increasing the tidal volume without fatigue via diaphragmatic dominance.
- **Improves ventilation efficiency:** Slow breathing reduces "dead space" ventilation, thereby increasing arterial oxygen saturation. This elevates end-tidal CO₂ and reduces hyperventilation, further correcting hypocapnia and respiratory alkalosis resulting from hyperventilation. However, it can reverse the airway bronchoconstriction in patients with stable asthma.
- **Lung function improvement:** Retraining results in a significant increase in FEV₁% predicted, and a reduction of hyperventilation and better ventilator efficiency is achieved through recruitment of the diaphragm.
- **Improves and strengthens respiratory muscle function:** Breathing retraining promotes biomechanical organisation, reducing the

work of breathing and strengthening the diaphragm and intercostal muscles, while relaxing the accessory muscles of respiration. This results in a significant improvement in thoraco-abdominal coordination and ventilator-perfusion matching. Improvement in peak flow rate results in a decrease in the use of salbutamol.

❖ **Autonomic Nervous System Regulation**

- Slow breathing initiates the vagus nerve stimulation, which is the primary channel of the parasympathetic nervous system and shifts toward parasympathetic dominance, reducing sympathetic overdrive.
- Diaphragmatic breathing also decreases sympathetic activity and increases parasympathetic tone, thereby reducing galvanic skin resistance (GSR).

❖ **Cardiovascular Effects**

- Effects on blood pressure: Deep breathing increases the venous return and synchronises blood pressure oscillations with the cardiac cycle. Regular practice can significantly lower systolic and diastolic blood pressure. Exercises enhance the body's natural baroreflex mechanism, which regulates acute changes in blood pressure.
- Effects on HRV (Heart rate variability): Slowed respiration boosts heart rate variability and promotes parasympathetic activation, dominating sympathetic overdrive and increased blood pressure. Paced breathing specifically at a resonating frequency is found to maximise HRV, indicating a more resilient and flexible nervous system.

❖ **Biochemical and Neuroendocrine Effects**

- Hormonal impact: Acute and chronic breathing exercises are found to significantly

decrease levels of a primary stress hormone, salivary cortisol.

- Slow deep breathing is associated with an increase in antioxidant activity and reduction in oxidative markers in older adults and athletes.

❖ **Psychological Effects**

- Retrained breathing enables patients with dysfunctional breathing to learn about conscious control over breathing and to overcome the psychological impacts of dysfunctional breathing. These exercises have the added benefits of reducing anxiety and stress.
- Breathing retraining helps to control symptoms of asthma, decreases the frequency of panic attacks and degrees of depression and anxiety, with consequent improvement in an asthmatic's QOL.

❖ **Impact on Quality of Life and Behaviour:**

- Breathing retraining following regular practice results in an increase in awareness of breathing and development of new breathing habits.
- Breathing retraining, along with relaxation techniques, improves quality of life and physiological parameters over time.
- Breathing retraining changes breathing behaviour, further accomplishing good asthma control and achieving self-management of their symptoms.

BENEFITS OF RETRAINED BREATHING PROGRAMME^[6,7,9-11,15]

- Reduction in medication use: lowers dependency on medication without compromising lung function.
- Cost-effective treatment: In comparison to the high cost of the medications, breathing



retraining proves to be a low-cost treatment intervention.

- Wide acceptance: due to its non-pharmacological nature, breathing retraining in regular practice is well accepted by patients with dysfunctional breathing.

CONCLUSION

Breathing retraining is a non-pharmacological intervention that is an effective adjunct medication, especially for patients with dysfunctional breathing and for managing conditions like hypertension, asthma with poor control, anxiety-related dyspnoea, hyperventilation syndrome and COPD. Breathing retraining exercises can be considered as a beneficial option as they are non-pharmacological and holistic in nature. These exercises also boost an individual's confidence in effectively managing their symptoms.

Retrained breathing programmes result in a reduction of symptoms, particularly when combined with reliever medications, and enhance the quality of life for individuals with asthma. It is recognised as an evidence-based secondary line of treatment for adults whose symptoms of asthma remain uncontrolled despite standard therapies. Regular practice of breathing retraining can establish new habits, increase awareness of breathing patterns, and serve as an effective strategy for changing health behaviours. It can be concluded that adapting a breathing retraining programme during leisure-time and during physical activities may also contribute to a complementary reduction in dysfunctional breathing and an improvement in the various aspects of quality of life.

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