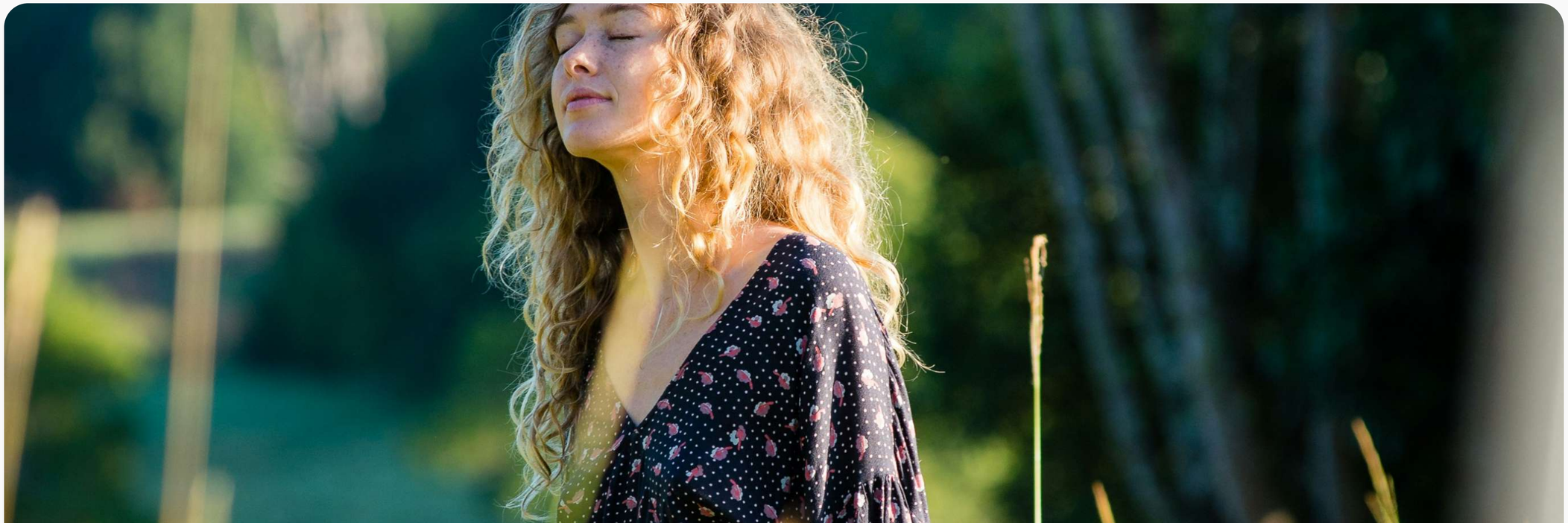
How effective are **diaphragmatic breathing** techniques in **reducing stress and improving mental health among women aged 25-44 in the workplace**, and what are the potential applications and implications of these practices in this context?

A research review

By John Breen, Jayden Troupe, and Thomas Meijer

01/21/23

UNIVERSITY OF WATERLOO



01

Background

Defined as an efficient integrative body-mind training for dealing with stress and psychosomatic conditions. **Diaphragmatic breathing** involves contraction of the diaphragm, expansion of the belly, and deepening of inhalation and exhalation, which consequently decreases the respiration frequency and maximizes the amount of blood gasses.

Psychological studies have revealed breathing practice to be an effective non-pharmacological intervention for emotional enhancement, including a **reduction in anxiety, depression, and stress.**

Resources

Ma, X., Yue, Z. Q., Gong, Z. Q., Zhang, H., Duan, N. Y., Shi, Y. T., Wei, G. X., & Li, Y. F. (2017). **The Effect of Diaphragmatic Breathing on Attention, Negative Affect and Stress in Healthy Adults.** *Frontiers in psychology*, 8, 874. https://doi-org.proxy.lib.uwaterloo.ca/10.3389/fpsyg.2017.00874

02

History of Breath

Yoga Origins

Over 5000 years ago

Bhagavad Gita

Over 2000 years ago

Holotropic Breathwork

1960s

The future?

Modern day

Resources

Alchemy of Breath

ALCHEMY of BREATH

03

Diaphragmatic and Deep Breathing

Diaphragmatic breathing could improve **sustained attention**, **affect**, and **cortisol levels**. This study provided evidence demonstrating the effect of diaphragmatic breathing, a mind-body practice, on mental function, from a health psychology approach, which has important implications for health promotion in healthy individuals.

- A **1-day** breathing exercise was found to relieve the emotional exhaustion and depersonalization induced by job burnout.
- A **30-day-session** intervention with a daily duration of 5 min can significantly decrease the anxiety of pregnant women experiencing preterm labor.
- **Cardiac vagal tone** is assumed to form part of the shared physiological basis of breathing and emotion. It is influenced by breathing and is also integral to vagal nerve stimulation that is closely associated with the physiological basis of emotion.

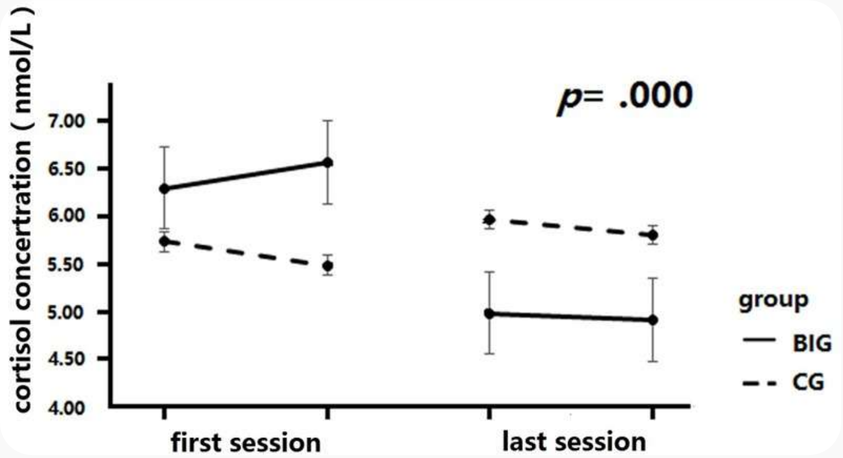
Resources

Ma, X., Yue, Z. Q., Gong, Z. Q., Zhang, H., Duan, N. Y., Shi, Y. T., Wei, G. X., & Li, Y. F. (2017). **The Effect of Diaphragmatic Breathing on Attention, Negative Affect and Stress in Healthy Adults.** *Frontiers in psychology*, 8, 874. https://doi-org.proxy.lib.uwaterloo.ca/10.3389/fpsyg.2017.00874

HARVARD MEDICAL SCHOOL

Cortisol, a steroid hormone of the glucocorticoid class, is released in response to stress. **Cortisol release is associated with depression**, anxiety, and other negative emotions.

- A simple effect measurement revealed that the **BIG (breathing intervention group)** showed a **significant decrease in salivary cortisol concentration** after the intervention, whereby the concentration was significantly lower in test 3 and test 4 as compared to test 1 and test 2.



Resources

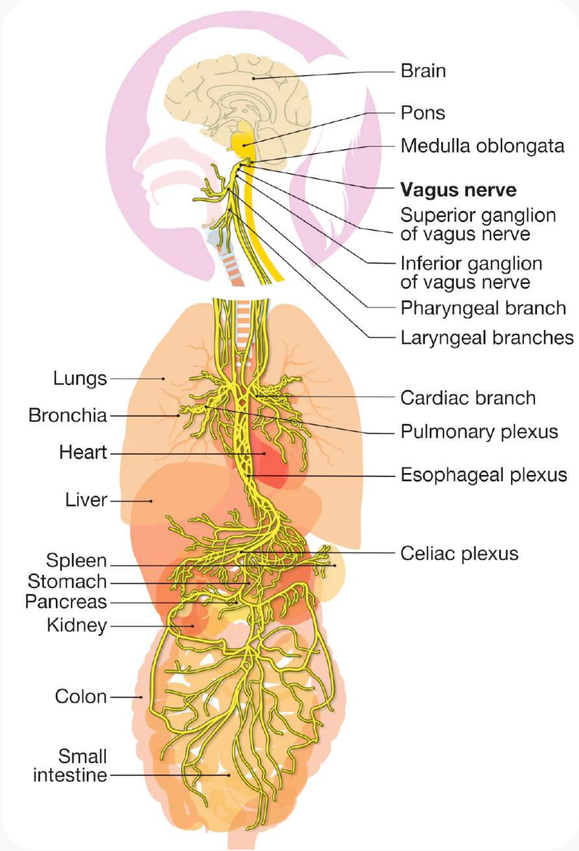
Ma, X., Yue, Z. Q., Gong, Z. Q., Zhang, H., Duan, N. Y., Shi, Y. T., Wei, G. X., & Li, Y. F. (2017). **The Effect of Diaphragmatic Breathing on Attention, Negative Affect and Stress in Healthy Adults.** *Frontiers in psychology*, 8, 874. https://doi-org.proxy.lib.uwaterloo.ca/10.3389/fpsyg.2017.00874

HARVARD MEDICAL SCHOOL

04

Cardiac Vagal Tone

The **Vagus Nerve** runs from the brain through the face and thorax to the abdomen and directly affects the nervous system.



Resources

Alchemy of Breath

ALCHEMY of BREATH

How the Vagus Nerve Affects Organ Systems

Brain

Helps keep anxiety and depression at bay. Opposes the sympathetic response to stress.

Liver

Regulates insulin secretion and glucos homeostasis in the liver.

Blood Vessels

Decreases vascular tone, lowering blood pressure.

Gut

Regulates insulin secretion and glucos homeostasis in the liver.

Heart

Decreases heart rate, vascular tone.

Inflammation

Suppresses inflammation via the cholinergic anti-inflammatory pathway.

Resources

Alchemy of Breath

Benefits from one session of deep and slow breathing on vagal tone and anxiety in young and older adults.

- DSB (low inhale/exhale ratio) seems to **reduce anxiety level and increase vagal outflow** (which are negatively correlated with each other) in both young and older adults.

- DSB could have a greater effect on parasympathetic activity in older adults. This greater effect could reflect a greater **benefit of vagal tone contributing to better emotional regulation strategies with age or possibly a compensation mechanism promoting efficient anxiety management.**

Resources

Magnon, V., Dutheil, F. & Vallet, G.T. **Benefits from one session of deep and slow breathing on vagal tone and anxiety in young and older adults.** *Sci Rep* 11, 19267 (2021). https://doi.org/10.1038/s41598-021-98736-9

ACU
AUSTRALIAN CATHOLIC UNIVERSITY

The main assumption of this model is that the **higher the vagal tone**, the better executive **cognitive performance, as well as better emotional and health regulation.**

- The biological behavioural model (Grossman and Taylor, 2007) focuses on the fact that **vagal tone** plays a **primary role in regulation of energy exchange** by synchronizing respiratory and cardiovascular processes during metabolic and behavioural changes.

- The psychophysiological coherence model (McCraty and Childre, 2010) shares similarities to Lehrer, in that a **higher vagal tone** can be **achieved through slow paced breathing**. They also postulate that slow paced breathing coupled with positive emotions **will produce a broad range of positive outputs linked to personal, social, and global health.**

Resources

Laborde, S., Mosley, E., & Thayer, J. F. (2017). **Heart Rate Variability and Cardiac Vagal Tone in Psychophysiological Research - Recommendations for Experiment Planning, Data Analysis, and Data Reporting**. *Frontiers in psychology*, 8, 213. https://doi-org.proxy.lib.uwaterloo.ca/10.3389/fpsyg.2017.00213

Deutsche Sporthochschule Köln
German Sport University Cologne

UNICAEN
UNIVERSITÉ CAEN NORMANDIE

Southampton SOLENT University

BOURNEMOUTH UNIVERSITY

OHIO STATE

05

Deep breathing exercise at work: Potential applications and impact

DBE can improve certain important aspects of human health, including reduced BP and psychological stress, which may indirectly increase **productivity through less utilization of sick time.**

- As an exercise that can be performed virtually anywhere without any equipment required, there are **few barriers to DBE**, relative to traditional exercise strategies. The workplace serves as a source of stress for many adults, while simultaneously resulting in long periods of sedentary time for a large portion of the US workforce in our increasingly automated society.

- **Chronic stress** and high levels of sedentary time contribute directly to the **development and worsening of cardiovascular disease** (CVD) (Diaz et al., 2017; Kivimäki and Steptoe, 2018), the **leading cause of death throughout the world for the last two decades** (World Health Organization, 2020).

Resources

Tavoian, D., & Craighead, D. H. (2023). **Deep breathing exercise at work: Potential applications and impact**. *Frontiers in physiology*, 14, 1040091. https://doi-org.proxy.lib.uwaterloo.ca/10.3389/fphys.2023.1040091

CVD-related disability **negatively impacts workplace productivity.** Above-normal BP (≥120/80 mmHg) is a primary modifiable risk factor for CVD, and adults with above-normal BP face a**nnual healthcare costs that are approximately $2,000 higher on average** than normotensive adults, making BP reduction a key therapeutic target.

- Both chronic stress and depression independently increase CVD risk (Strike and Steptoe, 2002; Kivimäki and Steptoe, 2018), and the workplace is a primary source of stress for many adults, with 85% of respondents to a 2021 survey indicating that workplace stress affects their mental health (Mental Health America, 2021), while a separate report found that 76% of working US adults reported experiencing at least one symptom of a mental health condition (i.e., **burnout, depression, anxiety**) due to work in the last year (Partners, 2021).

Resources

Tavoian, D., & Craighead, D. H. (2023). **Deep breathing exercise at work: Potential applications and impact.** *Frontiers in physiology*, 14, 1040091. https://doi-org.proxy.lib.uwaterloo.ca/10.3389/fphys.2023.1040091

As a result, a record number of adults are leaving their jobs in what is coming to be known as the “**Great Resignation**”, with at least **half of adults who left their jobs citing mental health reasons.**

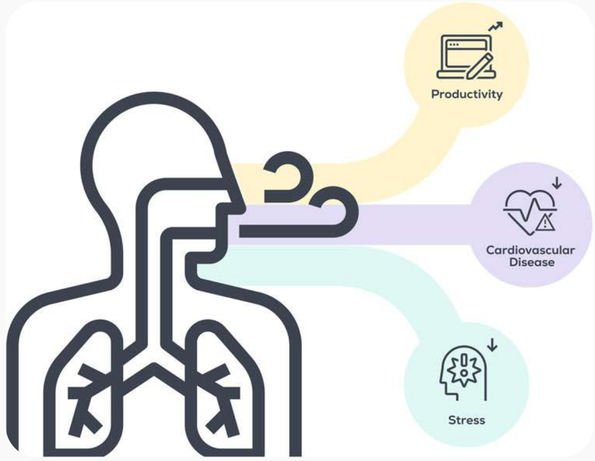
Resources

Tavoian, D., & Craighead, D. H. (2023). **Deep breathing exercise at work: Potential applications and impact.** *Frontiers in physiology*, 14, 1040091. https://doi-org.proxy.lib.uwaterloo.ca/10.3389/fphys.2023.1040091

Less than half of US adults exercise regularly; **a trend that will likely continue** despite decades of national programs/ initiatives to increase physical activity levels.

- Common barriers to traditional exercise strategies in non-exercising adults (e.g., lack of energy, poor health/physical disabilities, equipment/facilities access, work commitments/lack of time, cost, fear of pain/discomfort, bad weather, lack of knowledge, and low motivation.

- **Providing time and/or space for DBE** in the **workplace** will help to overcome many of the remaining barriers. However, **lack of knowledge and low motivation are two interconnected hurdles that must be addressed prior to widespread participation.**



Resources

Tavoian, D., & Craighead, D. H. (2023). **Deep breathing exercise at work: Potential applications and impact**. *Frontiers in physiology*, 14, 1040091. https://doi-org.proxy.lib.uwaterloo.ca/10.3389/fphys.2023.1040091

Medicine Phoenix

University of Colorado **Boulder**

So how do we fix this crisis?

1) increasing DBE adoption on a national or international scale

2) promoting long-term adherence to DBE by new and current participants by removing as many barriers to DBE as possible

Resources

Tavoian, D., & Craighead, D. H. (2023). **Deep breathing exercise at work: Potential applications and impact**. *Frontiers in physiology*, 14, 1040091. https://doi-org.proxy.lib.uwaterloo.ca/10.3389/fphys.2023.1040091

The **workplace is an ideal venue to implement DBE at a large scale**, however, there are some key considerations that employers should keep in mind.

While there may be concerns that frequent breaks will reduce productivity, current evidence suggests no negative effects of short, regular breaks on productivity (Waongenngarm et al., 2018), and, in fact, they can reduce perceived tiredness, stress, and job errors (Mitra et al., 2008; Taylor, 2011; Randolph, 2016).

- 1) Regular DBE breaks throughout the day must become part of the culture at work and employers/manager should lead by example.
- 2) Employers attitudes toward breaks must be perceived as positive by employees and there should not be pressure from management to work during breaks.
- 3) It must be clear that these short breaks are added on top of breaks already in place (e.g., lunch break) and not replacing them.
- 4) Employees should feel that their physical and mental health is valued more than their productivity.
- 5) Break time should be protected (those practicing DBE should not be interrupted for work responsibilities until break time is over).

Resources

Tavoian, D., & Craighead, D. H. (2023). **Deep breathing exercise at work: Potential applications and impact.** *Frontiers in physiology*, 14, 1040091. https://doi-org.proxy.lib.uwaterloo.ca/10.3389/fphys.2023.1040091

simplicity of the technique

few barriers to participation

low energetic cost

lack of negative effects

DBE can be performed essentially anywhere

high benefit/cost ratio

no negative effects on performance or productivity

Resources

Tavoian, D., & Craighead, D. H. (2023). **Deep breathing exercise at work: Potential applications and impact.** *Frontiers in physiology*, 14, 1040091. https://doi-org.proxy.lib.uwaterloo.ca/10.3389/fphys.2023.1040091