

Mental Health in The New Reality

Laszlo Ling MD

LingTraining®, Switzerland, laci@geneva-link.ch

Abstract: The COVID-19 pandemic has affected our lives in many areas. A new acronym developed: "BANI" (Brittle, Anxious, Non-linear, Incomprehensible) - referring to our world's unforeseen and frequently chaotic changes; it puts enormous pressure on us humans - how to adapt quickly and continuously. At the same time we have learned to highly value our health. The process of digital transformation has affected the healthcare worldwide. The use of digital technology has helped to preserve the health of many people in recent years. In our days "e-Health" is a widely used "buzzword". The number of advertisements and smartphone applications encouraging a healthy lifestyle is enormous. The purpose of this paper is: to draw attention to the everyday use of a very simple health-preserving method. This method can be used by everyone. It is easy to implement, effective and safe. It does not require the use of any digital device. Its effectiveness on a person's mental and physical state has been scientifically proven. This is the conscious deep ("diaphragmatic") breathing exercise. The author reviews some latest scientific evidence and explains what to do and how to implement it in practice in order to preserve our health.

Key words: e-health, "BANI", stress, physiology, slow diaphragmatic breathing (SDB)

1 Introduction

1.1 Changes in today's world

We all know that change is natural and constant in all areas of life. During and after the COVID-19 pandemic, changes have accelerated in an extreme way in the world.

Throughout history, philosophers, economists and scientists - working in various fields - have created various "models" to briefly describe the current situation, the "state of things".

The acronym "VUCA" (Volatility, Uncertainty, Complexity, Ambiguity) is created at 1985 by economists Warren Bennis and Burton Nanus (Bennis et al, 1986). "Volatility" covers the constant change of the world. "Uncertainty" is for: lack of knowledge about a situation or an event. Complexity mostly associated with the quantity of factors needed to analyse and with the relations between them.

Ambiguity associated with the inability to understand conditions or events, the lack of clarity. (Taskan et al, 2022)

In March 2022 Jamais Cascio - author and global thinker -, created the "BANI" model. This acronym states for: Brittle, Anxious, Non-linear, Incomprehensible. These words remind us: in our days many changes are not only surprising, but sometimes completely desorienting (Cascio J. 2020). Togan A. in her overview briefly analyzes the relationship between VUCA and BANI from a practical point of view. (Togan A., 2023). It seems that in today's world, the amount and speed of changes is greater than ever before. The logical consequences of all this has a strong influence on people's mental and physical health.

1.2 Changes is the field of healthcare

Usage of digital technologies is integral part of our daily live. During the pandemic we learned how to use digital technology in "remote consultation" with medical health care providers. More and more people are using smartphone applications which developed for healthy life. "e-Health" has become a widely used buzzword.

1.2.1 What is e-Health?

World Health Organization (WHO) defines e-Health as "the cost-effective and secure use of information and communications technologies in support of health and health-related fields, including health-care services, health surveillance, health literature, and health education, knowledge and research." (WHO, e-Health, 2023). WHO elaborated a Global Strategy on Digital Health 2020-2025, in order to promote healthy lives and wellbeing for everyone. (WHO, Digital Health 2023)

1.2.2 What is mental health?

Mental health is a complex continuum. "Mental health is a state of mental well-being that enables people to cope with the stresses of life, realize their abilities, learn well and work well, and contribute to their community." (WHO, Mental Health, 2022) It is obvious, the people's mental health is essential to personal, community and socio-economic development. Let's think about this part of the quoted definition: "Mental health... enables people to cope with the stresses of life..." The question is: how?

2 Stress

2.1 Meaning of the word "stress"

We use this word day by day frequently... In the scientific literature we can read large number of different definitions. The word "stress" is derived from the Latin *strictus* = tight (Arcanum, 2023). At the beginning is used in physics, to refer the interaction between a force and the resistance to counter that force. The Hungarian scientist Janos Selye was the first, who used this term to describe the "general adaptation syndrome" or "nonspecific response of the body to any demand"(Selye, 1936). Interesting to note, that Selye did not use the word "stress" in his above mentioned publication, but only ten years later. This word started to used widely in the 1950s (Siang Yong Tan, 2018). The german scientist Fabian Hutmacher in his conceptual analysis found that many psychology textbook characterize "stress" as the notion that *"things are getting too much and out of balance"* (Hutmacher F. 2021).WHO defines stress: "as a state of worry or mental tension caused by a difficult situation. Stress is a natural human response that prompts us to address challenges and threats in our lives. Everyone experiences stress to some degree. The way we respond to stress, however, makes a big difference to our overall well-being" (WHO Stress, 2023).

2.2 Some physiological changes in human body caused by stress

The autonomic nervous system is divided into the sympathetic nervous system (SNS) and the parasympathetic nervous system (PNS). When our body is stressed, the SNS contributes to what is known as the "fight or flight" response. During this response in our body there are lots of quick physiological changes. (Eg.: the adrenalin and cortisol level increases in our blood, heart beats faster, blood pressure rises, our breathing is hurried and superficial, etc.). Once the crisis is over, the SNS activity decreases parallel the PNS activity increases, and as a result our body returns to the pre-emergency state (APA, 2023; Yaribeygi H. et al, 2017).

3 Stress management

3.1 Healthy lifestyle

We are all aware of its components: balanced diet, sufficient daily water intake, healthy sleep habits, regular physical exercises, satisfactory social interactions. The author of this article convinced that the above list is not complet. Certainly all of them are essential for our health. One thing is missing from this well known list.

This is the deep "diaphragmatic breathing exercise" that should be done regularly. Before discussing this in details, let's review some basic biological facts related to breathing.

4. The human respiratory system

4.1 Some facts - from practical point of view

Respiration is a fundamental function of the human body, and it can be defined as: the exchange of oxygen and carbon dioxide between the organism and the environment via the cyclic act of ventilation (Mitsea E. et al 2022). In the microstructure of the two lungs, gas exchange happens in millions of microscopic alveolar units. Gas exchange takes place through the walls of these alveolar units (Berne & Levy, 2010). The human lungs' surface area for gas exchange is approx. 140 quadratmeter (Knudsen et al, 2018).

Breathing is an automatic process. From the moment we are born, we breath throughout our entire lives. Most adult people breath 12-16 times per minute. - It means, during a day we take around 20'000 breath! The physiological regulation of breathing is extremely complicated. - At the same time, we can voluntary control our mode of breathing - certainly within certain limits. At rest, during normal quiet inspiration with each breath we inhale approx. 500 ml of fresh air. With maximum inspiration ("take a very deep breath") 2'500 - 3'000 ml air enters into our lungs (Berne & Levy, 2010).

The major respiratory muscle is the diaphragm. This large, dome-shaped muscle located below the lungs and it divides the chest cavity from the abdominal cavity. During inspiration the diaphragm contracts and protrudes into the abdominal cavity and moves the abdomen outward to create negative pressure in the chest. It creates negative intrathoracic pressure, so the air from outside flows into the lungs. During quiet breathing the diaphragm moves approximately 1 cm; however, during very deep breathing it can move as much as 10 cm. In rest, our expiration is passive, the diaphragm returns to its domed resting configuration, as a result, the lungs deflate and expel air (Berne & Levy, 2010).

Buzsaki writes in his book: "Life is governed by rhythm. Brain functions are governed by oscillatory activity" (Buzsaki, 2006). Breathing is also a rhythmic, cyclical activity. The respiratory system is one of the most integrated systems of the body and breathing is bidirectionally related with stress, emotion, and pain (Pratschner et al, 2023). Boyadzhieva and Kayhan in their detailed overview of the literature summarized how respiration modulates neural, cognitive and emotional processes (Boyadzhieva and K. 2021).

4.2 Nose breathing

Nasal breathing has important physiological functions by filtering, warming and humidifying inhaled air and in the nose cavity and the so called paranasal sinuses are producing an important gas: nitric oxide (NO). In 1998 the Nobel Prize in Physiology or Medicine was awarded to three pharmacologists for their discoveries concerning "The nitric oxide as signaling molecule in the cardiovascular system" (Nobel Prize, 1998). Research confirmed that nitric oxide is physiologically important in airway regulation, reduces respiratory tract infections by antibacterial activity and by inactivating viruses (!) (Martel et al 2020). Nasal nitric oxide remotely controls pulmonary function as well (Martel et al 2020; Jeong J-H, 2021; Spector, 2023).

Certainly the nose enables olfaction. The olfactory cleft is at the roof of the nasal cavity. During nasal breathing the airflow stimulates olfactory sensory neurons in the olfactory bulb, which synchronizes respiratory rate and neural oscillations in the different parts of the brain (Boyadzhieva, 2021). Breathing mode (nose vs mouth) and respiratory phase (inspiration vs expiration) can influence memory performance (Zelano et al. 2016). Molle and Benoit summarize the effect of breathing through the nose on memory (Molle et Benoit, 2019).

The practical benefit of this knowledge: "If you are in a dangerous environment with fearful stimuli our data indicate (tells Christina Zelano in the Northwestern's University's YouTube video) you can respond more quickly if you are inhaling through your nose" (Zelano, YouTube 2017).

Due to the facts listed above important to emphasize and keep in mind: *always breath in through your nose while your mouth is closed.*

5 Conscious breathing exercises

5.1 General overview

In the tradition of ancient eastern cultures, the health-preserving benefit of regularly performed breathing exercises - as part of the Yogi and the martial arts - known for thousands of years. Many of the relevant statements of these cultures make about the breath in our days verified through science. In recent decades, scientific interest increased worldwide: what physiological effect these breathing exercises have. (Bu B. et al, 2010; Hamasaki, 2020; Jayawardena et al. 2020; Moore et al. 2023).

Regular breathwork practices have emerged as potential tools for stress management and well-being, because of the respiratory system has influence on different brain regions, which regulate behavior, thinking and emotion (Balban, 2023; Ficham 2023).

I ask the reader to pause and do the following simple exercise: stand or sit comfortably with a straight back and relaxed shoulders. Place one palm in the center of your chest and the other on your belly (Figure 1). Take a few deep breath through your nose with your mouth closed and observe how much your abdominal wall moves.



Figure 1.

Inhale slowly and deeply through the nose with a minimum movement of the chest

Slow breathing in research has been defined as a respiratory rate less than 10 breaths a minute (Russo et al, 2017). It has been known for a long time that slow breathing increases the variation in time intervals between heartbeats (Brown 2005). Healthy humans were studied and have found that controlled slow breathing, 6 breaths per minute, is associated with positive effect on blood pressure, compared to breathing 12-16 per minute (Bernardi, 2001; Chang 2013, Zhang 2016).

5.2 Slow diaphragmatic breathing

Slow diaphragmatic breathing (SDB) also called "deep breathing", "belly breathing", "abdominal breathing".

5.2.1 How to practice slow diaphragmatic breathing?

There are countless breathing exercises - with different approaches. The author of this study himself practices the following:

A. *Mindset* - decide that you will focus exclusively on your breathing for the next five minutes.

B. *Body position* - this exercise can be done standing, sitting or lying on your back position. Place one palm in the center of your chest and the other on your belly.

C. *Start the controlled ventilation:*

1.) Inhale through your nose (with closed mouth) and inflate your belly like a balloon, feeling it gently press into your hand, while counting to four in your mind;

2.) Hold your breath, while counting to three in your mind;

3.) Exhale slowly through your mouth and contract your abdominal muscles, while counting to six in your mind;

4.) Hold your breath, while counting to three in your mind.
Repeat the cycle for five minutes.

Why you should focus on making your exhales longer (counting to six) than your inhales (counting only to four)? Because of during longer exhales the parasympathetic nervous system is more active, and it sends the message to your brain: "calm down". This slow, diaphragmatic breathing exercise can give you a sense of relaxed energy. The number "365" is a good reminder. Three times a day take six slow diaphragmatic breath per minute - during five minute - and repeat all 365 days of the year (Saulnier N, 2021).

5.2.2 Scientific evidence for the effectiveness of diaphragmatic breathing

Magnon V. and his research team were studying 25 young adults and 22 older adults subjective and objectively measured changes after deep and slow breathing exercise. The participants' subjective anxiety and physiological stress significantly decreased after only a 5 minutes deep and slow breathing exercise (Magnon V. et al 2021). Daily deep breathing exercise can lower resting blood pressure and reduce psychological stress and anxiety" (Birdee, 2023; Tavoian 2023).

Hamasaki conducted a literature review regarding the current evidence of the effect of diaphragmatic breathing on health. Mr. Hamasaki, who in addition to being a practicing medical doctor, also regularly practices martial arts. His own personal experience reinforces the effectiveness of diaphragmatic breathing. He summarizes in his study: "Diaphragmatic breathing has an impact on the brain and cardiovascular, respiratory, and gastrointestinal systems through the modulation of the autonomic nervous function" (Figure 2); (Hamasaki, 2020).

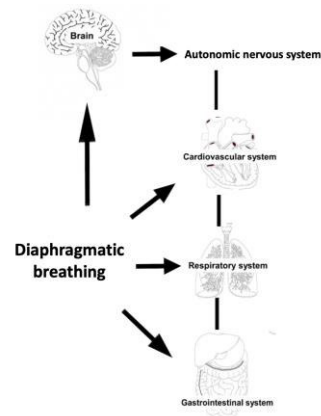


Figure 2

The effect of diaphragmatic breathing on various organs
(this figure is based on Hamasaki's figure 1 (Hamasaki, 2020))

Due to the physiological effect of diaphragmatic breathing exercises, it can improve the function of the autonomic nervous system, which regulates the general balance of the human body.

Conclusion

We live in a fast-paced, stressful world. In order to maintain our physical and mental health - additionally to the well known advices as balance diet, sufficient daily water intake, healthy sleep habits, regular physical exercises, satisfactory social interactions - it is advisable to start practicing regularly the slow diaphragmatic breathing exercises.

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