

Mirko Ostojić**THE KNOWLEDGE OF BREATHING**

Mirko Ostojić's book *The Knowledge of Breathing* is a unique work of its kind both in our country and in the world. It is the first book of scientific and professional observations, wise and inspired thoughts, comments and conclusions, which refers the role of breathing in controlling and regulating the human body.

In the *Preface* to *The Knowledge of Breathing*, Ostojić introduces readers to two groundbreaking discoveries in science that dealt with the issue of breathing. He states that it first happened in America, in the first half of the 20th century, by a team gathered around Dr. Yandell Henderson. He managed to collect the research results of several prominent personalities of that time (Christian Bohr, John Holden, etc.) and determine the carbon dioxide as the primary regulatory respiratory parameter. Another scientific discovery refers to Dr. Buteyko, the chief leader of the Center for Biological Research in Novosibirsk (as part of the Soviet program for space research), who established a correlation between a specific way of holding the breath and physiological oxygen saturation of cells. His work led to the development of practical breathing techniques that helped hundreds of thousands of people, first in the USSR, and with the fall of the Berlin Wall around the world.

In Chapter 1, the author talks about the *idea* of writing and the *purpose* of his work. In Chapter 2, *Physiology of the Respiratory System*, he describes the anatomical and physiological respiratory system settings. Emphasizing the muscle function as an integral part of respiratory function, and that it is a kind of "engine" of this system, the author felt the need to describe the anatomy and functioning of muscle fibers, as well as parameters related to the respiratory organs. Here, he presented an original approach that reflects six unique places serving as modeling the path for the two most essential gases, oxygen, and carbon dioxide. Also, it clarifies the functioning of all critical physiological processes of oxygen transport and the uptake of excess carbon dioxide within four additional sites.

In Chapter 3, *Respiratory Regulation and Control Parameters*, Ostojić explains the fundamental respiratory and neurological system relations, as well the system of biochemical control of respiration, within *medical norms* of numerous respiratory parameters can be perceived. The author acquaints the reader with the control role of carbon dioxide in the regulation of breathing, emphasizing the way of functioning of the Bohr and Holden effect. He explains in detail Buteyko's KP test and its connections with physiological parameters, as well as the results that occur during chronic hyperventilation. In the next, Chapter 4, *Respiratory parameters and health status*, the author, through the analysis of a large number of references in the last hundred years, presented the relations of ventilation and possible pathological conditions, as well as the results of numerous grouped papers on hyperventilation and various pathologies. At the end of this chapter, he focused on the central issue of the role of carbon dioxide and the bilateral relationship with health, and possible recovery.

In Chapter 5, *Evolution and Ranges of the Respiratory System*, the author's desire to show the reasons for the imperfections of the respiratory system and the practical necessity of conscious understanding

of the problem of respiration in the current atmosphere, as well as the maximum ranges of human evolutionarily relatively close relatives, e.g., to current world records in various underwater breath-holding disciplines. In this context, through taxonomy, he gave a more understandable overview of the change in outside air pressure in both directions. On the one hand, he observed a decrease in the partial pressure of oxygen during the conquest of mountain peaks, and on the other hand, its increase during diving. He also considered the influence of various effects during pilot acrobatics and the problem of the impact of changes in angular velocities. Finally, he referred to the potentially significant *hibernation effect*, in which many mammals fall spontaneously during one part of the year. He states that the importance of studying hibernation lies in the fact that only wholly healthy and well-fed animals can survive hibernation, with an exceptional reduction in minute ventilation and heart rate. He says that a similar phenomenon spots in spiritual people of different traditions, so it is not uncommon for their remains to show no signs of rot, decay, or unpleasant odors for weeks. In the last part of this chapter, the author listed the masters of scuba diving and the results of authentic yoga teachers. In Chapter 6, the author performed the original muscular equation of respiration (MER), which points for the professional population, showing the relationship between the current state of partial tissue pressure of carbon dioxide, respiratory muscle activity, and total current physical activity over time. The author proposed three zones of interest in which the state of partial tissue pressure of carbon dioxide can be.

In Chapter 7, *History of Breathing Techniques*, the author looks first at various methods within several yoga schools, then at the connection with Ayurveda and traditional Chinese medicine, as well as reflections in the light of the latest concepts and knowledge of quantum physics and electrical models of brain activity. Afterward, he referred to folk traditions and customs in the light of respiratory effects. He then listed the more prestigious schools of breathing and theoretical directions from the last century. He also mentioned the certain misconceptions that were often maintained at the level of entire countries, as was the case with the *USSR*, in the middle of the last century, when exercises with deep breathing were encouraged. In finding and filtering the best, and in the light of MER, he also mentioned a well-known method, such as the example of the Grof's holotropic breathing. He pointed out the danger of *ad hoc* acceptance of a "portion" of a technique that includes breathing in its practice, and whose procedure should by no means become a standard pattern of breathing. Finally, he gave an overview of the Soviet School of Voluntary Elimination of Hyperventilation (VEHV). In Chapter 8, *Regulation of respiration through voluntary elimination of hyperventilation*, Ostojić offers an insight into practical breathing. It offers techniques at the primary level and possibilities for the removal of various factors that support the state of hyperventilation. He gave an overview of the basic exercises according to Buteyko, but also the relevant 12 exercises of Streljnikova (from the book *Gymnastics of Breathing*, 2004). He also described some auxiliary devices, as well as their effect on the normalization of breathing. For the first time, he also presented several original techniques, as well as the great benefit of integrating yoga asanas into breathing techniques. He believes that this automatically closes the respiratory integrative circle "skeleton-muscles-nervous system-subconscious" around the nearest more useful state.

In Chapter 9, *Habits and Breathing*, the author deepens the concept of the weakest link, which reflects in the practice of such a breathing technique that must be integrated into numerous daily routines, leaving no "cracks" (errors) within 24 hours to disrupt the desired breathing rhythm. He believes that once the optimal state achieves, it can be easily maintained, provided that proper breathing becomes a part of everyday life. The author illustrated specific pedagogical approaches for the youngest and the concept of "*Breathing through play*." In Chapter 10, *The Future of Breathing Methods*, Ostojić tried to show the trend of the possibility of developing breathing techniques in all directions of interest to

man, and thus to the top sport itself. He suggests new ideas to those who are interested in scientific research work in this area. Still, he does not neglect the position that individual results of experiments should check on an even broader population. For the first time in this book, he presented some new settings related to the phenomenon of breathing.

At the end, we want to acquaint reader with breathing in three cases, derived from the *muscular equation of breathing*, according to Ostojić. He mentioned two extremums (extremum function is the name for the maximum or minimum value at the observed interval), which are on the verge of the complete collapse of the respiratory system in cases of breathing in practice. At the same time, the third refers to ideal breathing most often achieved in sports (Subchapter 6.3, 6.4 and 6.5, pp. 232-236).

From the muscular equation of respiration:

$$P_{CO_2} \sim e^{\frac{A-A_p}{A_p}} - 1 = e^{(C_p-1)} - 1$$

one observes that the carbon dioxide concentration may cross the red line indicating the allowed upper threshold. Then, it can be below the blue line, which shows the minimum, necessary level of carbon dioxide concentration and the last case – optimal, when the carbon dioxide concentration is between these two lines for an extended period (ideally).

An example of a tired cheetah

With its specific body morphology, the cheetah is the fastest runner who can reach speeds of as much as 130 km / h. The most common preys are fast antelopes and impalas, whose chance to escape lies in greater endurance.



Figure 1. Cheetah just before giving up chasing a prey

When running at its maximum power, the cheetah is above the red line on the MER graph (Subchapter 6.3). In practice, this means that more carbon dioxide produces than releases from the cells. The body enters acidosis, which leads to weakness and malaise, which naturally leads to the need to rest and take a passive position for some time.

An example of panic and other attacks

If the human body exposes to hyperventilation for a more extended period, the system will enter the zone below the blue line (pp. 232-233), which indicates the minimum demanding carbon dioxide level, which leads to spasm of nerve cells, muscles, and other cells. Ostojic states that if a person is genetically predisposed to panic attacks, then an extended stay in the lower zone of the chart is the trigger for that attack. They also feel the psychological spasm and aura that precedes these attacks, which is a sure sign of hypoxia of cells, especially nerve cells.

Marathoners Example

The marathon is the best example of staying in the space between the blue and red zones of the graph of the muscular equation of respiration. During running for over two hours, the marathon runner's

breathing system must not "fall out" of this zone. The goal is to run as good a result as possible, that is, to achieve the shortest possible time. It means that the so-called *quiet operating point* (a term with an engineer for optimal functioning of any machine or system in a very long time) and focus on training towards a defined goal of rational energy consumption. Ostojic believes that the space between the lines should not be left. Still, it is ideal for getting as close as possible to the red line because, concerning his potential, training, and local conditions, the marathoner (like every athlete) asymptotically strives for this ideal.



Figure 2. Female marathoners

In a word, the book directs the reader to raise awareness of the importance of the process of respiration in improving health, which can one achieves through physical, emotional, mental, and spiritual balance.

The reader should get acquainted with the author of this book - *The Knowledge of Breathing*. Mirko Ostojic completed full-time studies at the Faculty of Electrical Engineering, University of Belgrade, majoring in *Electronics and Telecommunications*, as well as postgraduate studies - *Medical Electronics and Biophysics*. The scientific research focus is on brain activity signals, the connection brain-heart signals, and nowadays, he is more focused on the central role of respiration in the control and regulation of the human body functioning.

In addition to scientific research, Ostojic is active and very successful in sports practice - the president and chief instructor of *Bujinkan OM Dojo*. He is the holder of the highest title of the 15th DAN (*JuuGoDan*) - the warrior name Black Tiger (*Kuroi Tora*). He has been a top athlete and martial arts coach for decades, dealing with multidisciplinary consideration of the phenomenon of breathing in the function of health.

But this work is far more than that: it is a composed and originally conceived monograph, partly scientific, partly professional, literary, sometimes relaxed, philosophical-psychological, naturally noble at the same time, a truly unusual book by a creator who is unobtrusive and spontaneous in himself: United an expert and an independent God-given messenger. Thus, thanks to him, for the first time, a comprehensive book about breathing came to the fore, with which everything is possible; therefore: breath is omnipotent without our heads being powerless.

The Knowledge of Breathing, at the same time, a fragmented and in-depth book, synthetic and analytical, providing the reader with an unexpectedly relaxed and intimate approach to man's most complicated philosophical problems and intricate psyche, and quickly unraveling the complex, explaining what was unspoken so far. It represents an excellent professional and accurate reading for every man who wants to deepen his knowledge of the phenomenon of breathing, gradually reached, a great realization: "the thoughts with which the so-called sages fools itself are empty, in front of healthy feet that always think constructively."

The realization of the author, as a man of science and practice, provides exceptional value to the reader. He presented his ideas through a holistic approach of getting acquainted with the importance of raising awareness about the process of respiration, following personal possibilities, and affinities. Reading this book, you have in front of you an inspired author, who, by collecting, studying and presenting knowledge and wisdom from the phenomenon of breathing, tried to find some (his) place in the world. That is why this valuable work I warmly recommend to be in the hands of those who are primarily interested in improving their health.

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