

Breath holding as a specific type of breathing training from the viewpoint of Avicenna

To the Editor We read with great interest the article titled “Effects of device-guided slow breathing training on exercise capacity, cardiac function and respiratory patterns during sleep in male and female patients with chronic heart failure” by Kawecka-Jaszcz et al.¹ The authors investigated slow breathing training (SBT) as a new non-pharmacologic treatment in chronic heart failure; however, there is a substantial body of evidence suggesting that this method was already in use many centuries ago.²

A study of ancient medical books reveals that Avicenna (980–1037 AD), the best-known Persian medical scholar,³ was one of the first scientists to emphasize exercise as a beneficial factor in the treatment and prevention of cardiopulmonary diseases and recommended specific exercise in these patients. He discussed the essential lifestyle factors for health maintenance in the second section of the first volume of *The Canon of Medicine* and recommended exercise as the most important lifestyle factor. In the section on physical activity, he described the various types of physical activity and their effects on body functions, particularly on the cardiovascular system. On numerous occasions, he put considerable emphasis on several rounds of deep inhalation followed by breath holding (BH) as a kind of exercise. He wrote: “taking a deep breath and holding it is an exercise for the whole body and will open and dilate its ducts.”²

Avicenna believed that the disposal of waste from the body, which improves arteriosclerosis and opens the arteries, is the main result of physical activity, especially BH. He also mentioned that BH had a positive effect on vasodilation.² In another section, he described that BH improved performance of respiratory and circulatory function, especially in elderly patients, strengthened chest muscles, increased lung capacity, decreased abnormal respiratory tract secretions, and that it might be used in the treatment of some pulmonary disorders, such as cough, as well as in cardiopulmonary rehabilitation.² Finally, he listed some contraindications to BH, such as hernia, ecchymosis, and especially eye diseases like exophthalmia.²

A recent study has revealed that similarly to SBT BH stimulates the baroreceptors, and a rapid

increase in blood pressure, decrease in heart rate, and activation of the baroreceptor reflex have been reported.³ Another study has suggested that the practice of BH could improve tolerance to hypoxemia in static and dynamic apnea.⁴

Many people are not able to do exercise for various reasons, such as disability, musculoskeletal pain, or aging. Considering the phenomenon of population aging across the world and its wide-ranging implications, such as the increasing prevalence of cardiovascular disease, there is a burning need to design and introduce alternative types of exercise that could be practiced by everyone irrespective of age or disability. It seems that this topic has been of interest to scientists for many centuries now, while Avicenna can be considered as the pioneer of clinical medicine and his hypotheses and theories have been corroborated by a significant number of recent studies.⁵ Further studies on BH as an exercise and rehabilitation method, especially for elderly and disabled people, may be useful.

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Authors' reply We wish to thank Gorji et al¹ for their comment on our study on the effects of breathing exercise in heart failure patients by putting its results in a wider historical context, while underlining the inestimable contribution of Avicenna to medicine. We have to add that, besides the cited works of Avicenna, breathing exercises constitute an important part of several other time-honored practices, frequently positioned on the frontier between medicine, religious practice, and personal health and fitness. Such practices, involving in most cases slow, deep, and regular breathing, include for instance yoga mantras, rosary prayer, or tandem breathing performed by zen practitioners.

Of course, breath holding (BH) described by Avicenna and slow breathing (SB) do share many common features, but there are also some major differences which make BH and SB two distinct types of breathing exercise. Both deep SB and BH (when performed after deep inspiration) activate lung stretch receptors, with an immediate effect of inhibiting vagal control of heart rate, thus inducing respiratory sinus arrhythmia. Prolonged lung inflation present in both cases may also induce peripheral vasodilation due to sympathetic inhibition. In both cases, the modified respiratory pattern is also responsible for changes in intrathoracic pressure. These changes modify venous return with consequent modulation of cardiac stretch receptors. They also cause oscillations in blood pressure countered by arterial baroreflex.² As far as differences are concerned, BH usually involves the Valsalva maneuver with a major increase in intrathoracic pressure, not present in SB if properly performed. Moreover, prolonged BH may briefly reduce blood oxygenation. Conversely, SB in hypoxic conditions such as CHF or high-altitude exposure was shown to have a pronounced opposite effect with an increase in blood oxygen saturation.^{3,4} Obviously these differences do not imply that one technique is superior to the other, but they merely indicate that they are not to be considered equivalent.

With the available laboratory techniques, it is relatively straightforward to demonstrate immediate cardiovascular effects of altered breathing pattern but it is more difficult to show the long term effects of regular breathing exercises. This is because such exercises are difficult to standardize, the subjects' adherence is variable, and the effect size may be modest. It is also difficult to perform high-quality trials because of the difficulty with proper control (there is no perfect

"placebo" for this type of exercise). Moreover, it is not easy to distinguish purely physiological responses to the exercises from their psychological effects, given that breathing exercises are frequently perceived as relaxing. Nonetheless, the available evidence suggests that SB may indeed provide long-term cardiovascular benefits represented by blood pressure lowering and sensitization of arterial baroreflex.²

The information on health and well-being effects of respiratory exercises coming from historical sources dealing with traditional medicine and philosophy may be extremely valuable and stimulating. Having said this, notwithstanding the difficulties described above, the duty of modern medicine is to provide evidence on the ability of such approaches to produce actual benefits in patients. Such evidence should derive from studies performed according to valid scientific methods. We sincerely hope that our work meets these criteria.⁵

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