

REVIEW ARTICLE

TRENDS in
Sport Sciences

2022; 29(3): 85-89

ISSN 2299-9590

DOI: 10.23829/TSS.2022.29.3-1

Effects of yoga training in post-menopausal women

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Abstract

Aging is a multietiological process and a major risk factor for chronic diseases including geriatric. In the healthy aging, the proper implementation of exercise to improve disease-related symptoms and comorbidities in the general population is a high priority. However, there is still a gap concerning studies analyzing influence of yoga in older people especially in post-menopausal women. Therefore, the aim of this mini review is a brief summary of well-established findings in yoga as an exercise intervention. In this paper, we conducted a narrative mini review of the influence of practising yoga on aging especially in post-menopausal women, searching the online databases: Web of Science, PubMed and Google Scholar, and, subsequently, discuss possible mechanisms of this action. On the basis of this review, it is evident that practising the yoga seems to be a promising intervention especially recommended for the elderly.

KEYWORDS: BDNF, training, yoga, neurotrophic factors, post-menopausal women.

Received: 18 September 2022

Accepted: 18 September 2022

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Introduction

Yoga is one of the few systems that were developed more than 1,500 years ago and have survived to the present day. It was developed to promote health,

wellness and preventive health care. Yoga is a system of posture exercises aimed at self-discipline of the body and its proper functioning. It is a myofascial system that ensures the cooperation of anatomical bands, and because it is connected with the breath, it nourishes specific regions of the body. The precision of movements (aiming at reflecting the pattern of a given position (asana) established by the creators of yoga is aimed at focusing attention on the exercise without being distracted by external stimuli, favoring the achievement of a positive breathing pattern.

The effect of yoga training in elderly people is, currently, a frequently subject of research. Developed studies point to its positive influence on the human body and psyche and, among them, psychophysiological changes have a beneficial effect on how the circulatory and respiratory systems work, improving its efficiency within a few months from starting yoga practice [7, 13, 17]. Changes in cognitive functions are also seen [8, 11, 12, 14, 15, 16]. Moreover, it was also proven that during a 3-month isolation period with yoga, a reduction in the severity of anxiety was noticed as well as an increase in mindfulness correlating with an increase in plasma BDNF levels [1, 10]. The percentage of elderly people suffering from depression is growing rapidly worldwide. Yoga practices are associated with antidepressant effects, an increase in serum BDNF levels, and a decrease in serum cortisol levels [1, 2, 5, 11, 15]. Thus, to help create a demand-driven system, we would like to look at the changes accompanying yoga practice in women over 60. Research conducted by numerous teams proves that in consequence of appropriate training, it is possible to improve the functioning of the elderly. However, this

requires precise arrangements that would enable them to engage in appropriately designed exercises and adjust them to the health condition of exercising seniors.

The aim of this mini review is analysis of the influence of yoga on the physical fitness and cognitive abilities of post-menopausal women. The following issues seem to be the most interesting in the answering the question if yoga leads to (i) improvement in the levels of circulatory and respiratory fitness in postmenopausal women (ii) improvement in mental state of the respondents, including a reduction in depression severity and an increase in concentration of selected neurotrophins in blood, (iii) favourable metabolic changes; improvement of lipid profile, better glucose tolerance by regulating the secretion of hormones controlling metabolic changes.

Neurotrophic factors

In studies on yoga effects on cognition, concentration of brain-derived neurotrophic factor (BDNF) is usually analyzed. However, to our knowledge, the protein Glial cell line-derived neurotrophic factor (GDNF) is usually not included. Therefore, many authors analyse, both the concentration of GDNF, BDNF, growth factors (VEGF-A, IGF1) and selected muscle myokines (FNDC5). This knowledge contribute to developments of the field and scientific discipline, as by studying cognitive functions, cardiovascular and respiratory efficiency in postmenopausal age as well as the concentration of selected neurotrophins in the blood under the influence of yoga training, it will help to better understand healthy aging processes.

Normally researchers include a biochemical test before and after the intervention. The combination of physical exercises (yoga) and breathing exercises (pranayama) allow to optimize the health-promoting effects of yoga in elderly people. Thus such analysis are addressed at the elderly for the sake of their physical health, cognitive functions and mental well-being, hence healthy aging.

During late adulthood, certain areas of the brain are atrophied. This contributes to the deterioration of cognitive functions and increases the risk of depression. There is scientific evidence that aerobic exercise can improve learning and memory functions, improve mood and prevent neurodegenerative changes [3]. Impaired BDNF function may be involved in the etiopathogenesis of the metabolic syndrome. BDNF plays a fundamental role in the development and survival of neurons, it is a real modulator of brain plasticity, influencing cognitive functions [6]. The concentration of neurotrophins depends on many factors and interventions. Among the scientific publications, the factor affecting the concentration

of neurotrophins is physical exercise, including the practice of hatha-yoga. An important element of the research is the demonstration of the effect of 8-week yoga training on the concentration of neurotrophins depends on many factors and interventions. Among the scientific publications, the factor affecting the concentration of neurotrophins is physical exercise, including the practice of hatha-yoga.

Selected studies have shown that physical exercise has an impact on the cognitive functions of the brain [9] and the practice of yoga as a combination of elements of work with the body and psyche affects the cognitive functions of the brain [8]. It has been shown that people suffering from depression are characterized by a low level of BDNF and an increased level of cortisol in the serum. The practice of yoga is associated with antidepressant effects, an increase in serum BDNF levels, and a decrease in serum cortisol levels [1, 11, 15].

Yoga as an intervention

Research conducted by many teams proves that, as a result of appropriate training, it is possible to improve the functioning of the elderly, but it requires precise arrangements that would entitle them to recommend appropriately designed exercises and adjust them to the health condition of exercising seniors. Pro-health training of elderly people is a special area of activity on the borderline of health prophylaxis, rehabilitation and even sports, because the elderly are much more diverse in terms of physical, cognitive and emotional condition, and are in different health conditions than young or average people century.

Based on our previous observations and analyzes, we suggest to introduce older people to the training in order to maximize the impact of training on the largest possible number of structures and processes of the exercising person. The most important elements taken into account in the exercise include muscle training to prevent sarcopenia and improve efficiency, functional fitness and gait quality, cognitive training as a prevention of premature aging of the central nervous system, expected increase in quality of life.

We expect that the combination of exercises designed according to the concept described above in one training unit may be associated with a well-proven slowing down of sarcopenia progressing with age, and an increase in general condition and functional fitness, on the other hand, with an increase in mental well-being.

The preliminary theoretical analyzes carried out for the purpose of the application provided the foundations justifying the design of a training model for the elderly

and the development of future recommendations for training the elderly. However, there are few reports of the metabolic basis of changes in CNS function under training conditions. We assume that post-training affective changes may be associated with an increase in the blood level of BDNF and GDNF and other indicators of exercise metabolism. In the light of numerous studies on the level of BDNF, there is little information regarding the influence of exercise training on the level of GDNF in humans. More extensive animal studies, mainly rodents, provide data on GDNF levels in the hippocampus of stressed rats, Parkinson's disease mice, and spinal cord and skeletal muscle in response to exercise. The direction and size of changes in the concentration of neurotrophins depend on the duration of training, its intensity, the type of exercise performed and the health condition of the respondents [3].

Contrary to typical endurance training, the beneficial effects of which are the result of metabolic changes related to muscle work, yoga with music additionally stimulates the brain by increasing the secretion and transport of dopamine. This neurotransmitter conditions learning processes, affects our motivation and mood, and stimulates neurogenesis. The action of these neurotrophins influences the function of serotonergic and dopaminergic neurons. Exercise of an appropriate intensity and duration causes the occurrence of metabolic changes in the muscle, where we observe an increase in the secretion of growth factors (VEGF), insulin-like growth factor (IGF 1), interleukin-6 (IL-6) and adipomokines [4]. Thus, a huge influence of metabolites of muscle origin on the expression of the BDNF gene in the hippocampus and angiogenesis in the CNS was demonstrated. The effect of muscle activity on the life expectancy and plasticity of neurons, observed in numerous studies, may be a non-pharmacological method of treating and preventing depression and other diseases related to neurodegeneration in the course of the aging process [8, 11].

The theoretical background was based on the interventions proposed by Suzuki et al. [21], applied/administered to people diagnosed with mild dementia. The proposed intervention aims to stimulate physiological processes in the musculoskeletal system, and consequently also affect the overall efficiency of the body, but also mobilize cognitive processes. The above-mentioned processes should, in effect, also affect such parameters of physical health as circulatory and respiratory parameters, cardiovascular parameters, gait quality, psychomotor parameters, neuroplasticity of the central nervous system, quality of life, functioning of cognitive processes, general health. In addition, based on our preliminary observations, an

attempt should be made to include in the intervention a combined training model understood as a combination of physical, cognitive and mindfulness exercises in one training unit, as a training strategy for influencing the healthy aging process. It is worthy to examine whether the applied yoga training positively mobilizes the body and mind of a senior and has a positive effect on the health parameters and functioning of the body of people aged 60-75 years.

Observations suggest that yoga practices can be used as psychophysiological stimuli to increase endogenous melatonin secretion, which in turn may be responsible for improving well-being.

Another important parameter is cortisol, it plays a key role in maintaining the hormonal balance of the body, the reduction of which contributes to better well-being, cognitive functions, and maintaining the balance of hormones. In many scientific publications, after the intervention of yoga, a decrease in the level of cortisol in saliva, a decrease in blood glucose levels along with a decrease in the level of plasma renin and the level of norepinephrine and adrenaline during the day are shown [19, 20].

The hypothalamic-pituitary-adrenal axis (HPA) is an endocrine system consisting of numerous structural and functional interrelationships between the hypothalamus, pituitary gland and adrenal gland [18].

Due to the negative feedback in this system, there is a constant exchange of information. The HPA axis plays an important role in the processes of adaptation and the body's response to stress. The hypothalamic-pituitary-adrenal system coordinates the secretion of glucocorticoids (such as cortisol) from the adrenal cortex into the blood, thereby preparing the body for a fight-or-flight response. In addition, the HPA axis is involved in regulating emotions, mood and sexual behavior. The activity of this system depends on the action of neurotransmitters of the nervous system.

Benefits

Benefits might be expected for the respondents both in the physical and mental aspect and, consequently, it may lead to the achievement (gaining) of an increase in a positive attitude to life and a positive feeling of quality of life (Thirhalli). The preliminary theoretical analyzes provided the foundations justifying the design of a training model for the elderly and an attempt to develop future training recommendations for the elderly beyond the parameters of intensity, volume and weekly frequency, including cognitive and mindfulness elements in one training unit.

The importance of yoga training programmes results for the development of a given field and scientific discipline. On the basis of the obtained research results – a new, alternative exercise program for the elderly, due to the nature of low-intensity exercises performed during yoga classes, they are recommended to be performed by the elderly. It is possible to perform exercises in elderly people with low body efficiency, which have a positive effect on the overall improvement of health. During yoga practice, the practitioner learns, among others: proper breathing, increases the range of mobility within the spine, lower and upper limbs, strengthens and tones the body, preventing the risk of falls, improving the correct gait function, contributing to the reduction of hospitalizations. The pelvic floor muscles are strengthened, the strengthening of which is a prevention of stress urinary incontinence. By stimulating the muscles, yoga training influences the secretion of neurotrophic factors, stimulating neurogenesis in the hippocampus, thus preventing dementia and cognitive decline in the elderly. Summarizing, yoga seems to be a promising intervention especially recommended for the elderly.

Conflict of interest

The authors declare no conflict of interest.

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