



The effects of cognitive and physical training on physiological and psychological levels of anxiety in the female elderly

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Article Info	Abstract
<p>Original Article</p> <p>Article history:</p> <p>Received: 25 January 2021</p> <p>Revised: 21 February 2021</p> <p>Accepted: 28 February 2021</p> <p>Published online: 3 April 2021</p> <p>Keywords: anxiety, cognitive, elderly, obese.</p>	<p>Background: Increasing prevalence rate of anxiety disorders in elderly populations especially due to physical limitations has become a key concern for health authorities.</p> <p>Aim: The objective of the study was to investigate the effects of cognitive and physical training on physiological and psychological Levels of anxiety in the elderly.</p> <p>Methods: Forty-nine aged females (62.3±2.6 years) with BMI of 35-49.99 kg/m² were assigned to one of three groups: Cognitive (n= 17), Physical training [yoga] (n= 16) and control group (n= 10). The cognitive training protocol included breathing and imagery/visualization techniques, which lasted for an 8-week period, three sessions a week. Yoga practices comprising Asana and Pranaya training, three times a week, for two months. The State-Trait Anxiety Inventory was given before and after intervention training. Biofeedback devices was used to monitor galvanic skin resistance and resting heart rate (as physiological and psychological markers of anxiety) in pretest and pre-test phases. The data were analyzed using analysis covariance and Bonferroni post hoc test.</p> <p>Results: It was indicated that anxiety score in cognitive training was significantly lower than control group ($P= 0.002$) and also, anxiety score in physical Training was significantly lower than control group ($P= 0.01$). No significant difference was found between the two training groups ($P= 0.18$). Furthermore, both training groups had lower galvanic skin resistance ($P< 0.001$). In addition, physical training group had a better status of resting heart rate after intervention compared to the cognitive and control groups (respectively, $P= 0.04$ and $P= 0.001$).</p> <p>Conclusions: It was concluded that the health benefits of Physical training [yoga] isn't not specific to maintaining physical health, but also extends to lowering the anxiety in elderly with obesity. It was also suggested that cognitive training can mitigate the anxiety symptoms in the elderly while no physical changes were shown in cognitive training.</p>

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1. Introduction

The unexpected increase in the aging population is a phenomenon worldwide that has begun since the twentieth century, which is the century of aging of the world's population in world [1, 2, 3]. Aging is a natural process during human growth and development. During this process, changes occur in individuals' physiological, psychological and social dimensions [3, 4]. The aging process is gradual and progressive; and diet, environment, personal habits, and genetic factors can affect its severity and extent [4, 5]. In other words, aging is referred to spontaneous and progressive irreversible analytical changes in which both physical and mental forces are significantly impaired [6]. The aging process usually involves lowering the function of the body's systems and reducing physiological capacities along with increased susceptibility to disease [7].

It is a natural developmental stage in which particular physical, psychological, and social changes occur [8]. Given the increasing population of the older adults and attention to their health, the point that has received more attention in recent years is that health in old age can be determined by the individuals' perception of old age and quality of life in youth and middle age [9].

Aging anxiety is a factor which affects the individuals' lives before and during old age [10]. Anxiety can be defined as a set of physiological and behavioral responses that protect individuals from danger [11]. Nonetheless, anxiety is also clinically defined as an unpleasant, subjective state of vague and diffuse apprehension that is often accompanied by physical sensations, such as sweating, muscle tension, tremors, and tachycardia, among others [11].

Although anxiety occurs in all age groups, it is a common disorder in the aging

period and is more debilitating in the elderly [4, 12, 13]. Aging anxiety is a general fear that affects both men and women. A person with this fear may be young and healthy. This fear includes fear of the future and needing others to do everyday affairs. Many people also fear losing their active roles in society when they get old.

According to the World Health Organization, aging anxiety decrease life expectancy. These people develop disability earlier and live an average of 5 to 7 years less than those with positive attitude towards aging [13]. Aging is an inevitable process in all human beings [14]. Important and negative consequences of anxiety include decreased quality of life, disability and greater need for health services, and increased mortality; Therefore, early identification and appropriate treatment would prevent these consequences [15, 16, 17]. Prevalence of anxiety symptoms in the elderly is 15–52% and anxiety disorders occur in 3–15% of adults and are common in the elderly with chronic diseases in particular [16]. Anxiety mostly manifests as physical symptoms such as insomnia, behavioral, sensory, urinary, cardiovascular, and gastrointestinal disorders in the elderly [18, 19]. Psychological disorders have become the main focus in the world over the past decade affecting mostly half of the population.

According to the World Health Organization, anxiety, depression, somatic symptoms, and high rates of comorbidity significantly contribute to the coexisting risk factors (e.g., negative experiences, stressors we face in life and gender-based role). Anxiety is a type of mental disorder that contributes significantly to coronary heart disease (CHD) and cardiac mortality [20]. Today, exercise is indicated in the treatment of a large number of medical

disorders [21]. According to a US Department of Health and Human Services report on physical activity, regular exercise significantly reduced causes of mortality by up to 30% for men and women [22].

Regular physical exercise reduces symptoms of anxiety and depression [23]. For instance, in one Finnish study, physically active individuals and lifelong exercisers over age 65 reported fewer depressive symptoms than sedentary individuals, over an 8-year period [24].

Yoga is one of the sports that attracts the attention of middle-aged and elderly people. It is a form of mental fitness that involves a combination of muscular activity and inward-directed mental focus on self-awareness, breath, and energy [25, 26]. Yoga is recognized as a type of mind-body medicine that combines the physical, mental and spiritual components of a person to improve aspects of health, especially stress-related illnesses. Yoga therapy involves teaching yoga exercises and teachings to prevent or reduce pain, suffering, or structural, physiological, emotional and spiritual limitations [27]. Yoga exercises strengthen muscle strength, physical flexibility, and respiratory and cardiovascular function [27]. It treats addiction and reduces the symptoms of stress, anxiety, depression and chronic pain [25].

It was suggested in a study that yoga exercises may be associated with great success to decrease fatigue, alleviate abnormally high muscle tone, spasticity, promote muscle relaxation and improving mood [28]. Yoga training has been shown to decrease sympathetic response (systolic pressure, diastolic pressure, mean pressure, heart rate and rate pressure product) after experimental stressors [29, 30].

The aims of this study are: to review the

impact of exercise interventions on psychological health in older adults, and provides a rationale for investigation of cognitive exercises and yoga as a protocol for promoting psychological health in older adults; Second, to provide a comprehensive review of the body of yoga research, which highlights the strengths and weaknesses of a yoga intervention for health and wellness purposes; Finally, to present the results of empirical investigation concerning the impact of yoga on psychological health in older adults and proposes cognitive-behavioral theory as a framework within which to understand the mechanisms of such mentioned exercises.

2. Materials and Methods

2.1. Participants

Forty-nine aged females with BMI of 35-49.99 kg/m², who were sedentary and had no history of physical limitations, were studied in two pretest and post-test phases. They were randomly assigned to one of three groups: Cognitive (n=17; 63±3.4 y); Yoga (n=16; 62±2.9 y), and Control group (n=16; 63.1±3.1 y). Four subjects were excluded due to the absence in the training sessions more than two sessions. Biofeedback devices including four channel biofeedback (manufactured by Parsadar Asia ltd, Model: PM-B128911) and polar (H10, Finland) were respectively used to monitor galvanic skin resistance (GSR) and resting heart rate (RHR) (as physiological and psychological markers of anxiety).

2.2. Training protocol

The cognitive training protocol included an 8-week mental imagery training, three sessions a week, taught by a psychologist. Controlling the thoughts, providing the positive thoughts and emotions; changing self-talk from negative to positive one; confronting negative thoughts, were of

major parts in the protocol. Other techniques used were breathing techniques, autogenic training, imagery/ visualization [31]. Their biofeedback signs (heart rate and galvanic skin response) were assessed before and after study intervention. Yoga practices comprising Asana training, Pranaya training, and meditation were done 3 times a week, for 8 weeks on the basis of keeping proper postures, stretching the muscles of the extremities, trunk and neck done in all postures of standing, sitting, supine and prone [32]. The state-trait anxiety inventory (STAI) was given before yoga and mental practices in order to measure the obtained differences of trait anxiety in groups. STAI consists of 20 questions concerning trait anxiety. The Internal consistency of inventory was reported 0.86 to 0.95; and its test-retest reliability coefficients was about 0.65 - 0.75 [33]. The questionnaire contains both anxiety questions (e.g. "I feel frightened.", "I feel upset.") and anxiety absent questions (e.g. "I feel calm.", "I feel relaxed.").

2.3. Ethical considerations

Written informed consent was obtained from all subjects and the study procedure was approved by ethical committee of Qazvin medical sciences university (Ref no: IR.QUMS.REC.1397.324). The research was performed in accordance with the ethical standards of the Helsinki

Declaration (1964). The data were analyzed analysis covariance and Bonferroni post hoc test

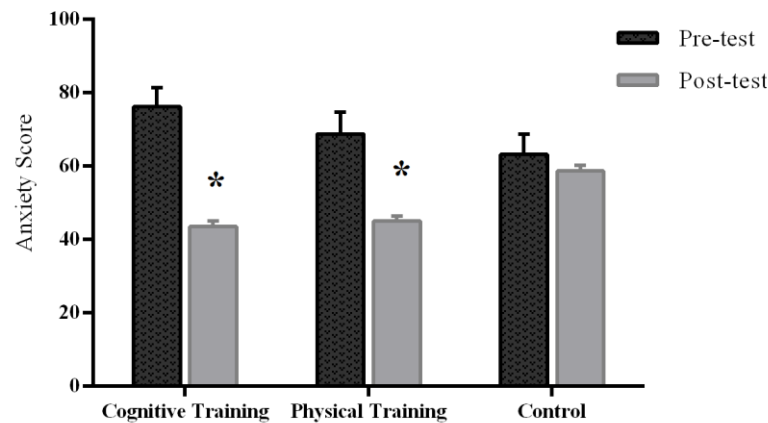
3. Results

Demographic data were compared between groups using ANOVA test for scale data (e.g., age, Height; Table 1). Homogeneity of variance was confirmed and residuals were normally distributed. So, One-Way ANCOVA was conducted to compare the effectiveness of cognitive and physical training on anxiety in the obese elderly in the three study groups. Figure 1 shows the results of analysis covariance and Bonferroni post hoc test in anxiety scale. The results showed a significant difference in mean for anxiety score ($F(2, 45) = 28.86, P < 0.001, \eta^2 = 0.56$). Figure 1 shows the post hoc test for comparison of the mean anxiety score in the three study groups. Accordingly, anxiety score in cognitive training is significantly lower than control group ($P = 0.002$) and also, anxiety score in physical training is significantly lower than control group ($P = 0.01$). No significant difference was found between the two training groups ($P = 0.18$). Furthermore, both training groups had lower galvanic skin resistance ($P < 0.001$). In addition, physical training group had a better status of resting heart rate after intervention compared to the cognitive and control groups (respectively, $P = 0.04$ and $P = 0.001$).

Table 1. Comparison of baseline characteristics

Groups	Cognitive Training (n=17)	Physical Training (n=16)	Control (n=10)	p-value
Demographics				
Age (y)	63.13 (3.41)	62.78 (2.90)	63.10 (3.16)	0.126
Height (cm)	161.17 (4.38)	159.52 (5.38)	159.91 (2.99)	0.445
Weight (kg)	94.35 (5.20)	95.18 (7.47)	95.57 (3.13)	0.314
Body mass index (kg/m ²)	36.42 (1.10)	37.54 (1.36)	37.33 (1.63)	0.780

Values are mean (SD).



* $P < 0.01$ significant difference with control group

Figure 1. Results of Bonferroni post-hoc test

4. Discussion and Results

Due to the growing tendency of Iranian elderly to participate in mindfulness exercises such as yoga and psychological interventions such as mental imagery, we were to study the effect of two different types of exercises (physical versus cognitive) on anxiety, resting heart rate and galvanic skin. The results suggested that cognitive and yoga training would alleviate anxiety in the elderly, however, no significant difference was found between the two training groups. On the other hand, both training groups had lower galvanic skin resistance compared to the control group. In addition, physical training group had a better status of resting heart rate after intervention compared to the cognitive and control groups.

In explaining the latter case, it can be stated that some physiological adaptations following physical training lead to better cardiovascular function [25, 34]. These results are consistent with the results of Guillot et al. (2021) [35], Meier (2021) [36], and Alsubiheen et al. (2015) [37]. They all suggested that common consequences of mental imagery include increased muscle strength; enriching perceptual skills and strengthening motor readiness in the elderly. According to the results of the

present study, it seems that mental imagery training would affect the mind and body of the elderly. Mindfulness is the process by which a person maintains functional stability and allows flexibility in new situations. Studies have shown that yoga techniques can reduce stress-related hormones and negative emotions and affect the functioning of the nervous system [26, 38].

Regarding the beneficial role of mental imagery technique on anxiety, it can be stated that mental imagery is capable of improving the motivation [39], self-efficacy [40], self-confidence [39], and controlling competitive anxiety [40]. Conclusively, cognitive strategies are reliably associated with anxiety improvement. The typical consequences of mental imagery comprise the muscle fatigue reduction; increased muscular strength; enrichment of perceptual skills and enhancement of motor preparation in the elderly.

Since the health benefits of exercise induced weight loss has been concerned a key reason for anxiety improvement in athletes, conducting the same study is highly recommended in future studies. As suggested, yoga as an exercise treatment is not specific to maintaining psychophysiological health, but also

extends to lowering the anxiety in elderly with obesity. Evidences suggest that both sympathetic nervous system (SNS) and parasympathetic nervous system (PNS) are often posited as the mechanism through which yoga reduces stress [41]. Researchers have just begun to understand how sports such as yoga promote personal growth, health and well-being. Considering the unity of mind, body and soul, mental fitness programs (i.e. yoga) would help people achieve more peace, tranquility and integration. Healthcare professionals, health educators should be aware of the potential of yoga and cognitive exercises as important components of a personal health program.

One of the limitations of this study was the low number of participants and the lacking the physiological assessment of hormonal factors. On the other hand, a comprehensive study regarding the psychological and physiological aspects can strengthen such a study.

5. Conclusion

The results of this study showed that yoga exercise, in addition to cognitive exercises, affects mental health. It has also been shown that mental imagery training reduces anxiety symptoms in the elderly. It is recommended that in future studies, the effect of yoga exercise on psychophysiological factors in different population is examined.

Conflict of interest

The authors declared no conflicts of interest.

Authors' contributions

All authors contributed to the original idea, study design.

Ethical considerations

All research processes and methods have been approved by the Ethics Committee in

the Research of the Qazvin medical sciences university (Code: IR.QUMS.REC.1397.324).

Data availability

The dataset generated and analyzed during the current study is available from the corresponding author on reasonable request.

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References

- [1] Abdessalem R, Boukhris O, Hsouna H, Trabelsi K, Ammar A, Taheri M, et al. "Effect of napping opportunity at different times of day on vigilance and shuttle run performance". *Chronobiology International*. 2019; 36(10): 1334-42. doi: 10.1080/07420528.2019.164290. PMID: 31368367.
- [2] Taheri M, Irani K. "The effect of water-based exercise programs and KSD protocol on general health questionnaire and optimal physical fitness factors affecting female elders balance". *Journal of Motor Behavior*. 2014; 6(16): 15-28.
- [3] Irandoust K, Taheri M. "The effect of strength training on quality of sleep and psychomotor performance in elderly males". *Sleep and Hypnosis* (Online). 2018; 20(3): 160-5. doi: 10.5350/Sleep.Hypn.2017.19.0148.
- [4] Amini M, Mirmoezzi M, Salmanpour M, Khorshidi D. "Eight weeks of aerobic exercises improves the quality of life in healthy aged sedentary men". *Int J Sport Stud Hlth*. 2018; 1(1): e67514. doi: 10.5812/intjssh.67514.
- [5] Frouzandeh S, Foroughan M, Hosseini MA, Farhadi A, Biglarian A. "The relationship of nursing home caregivers' awareness and attitude towards elderlies with their job". *Journal of North Khorasan University of Medical Sciences*. 2018; 9(3): 445-52. doi: 10.29252/nkjmd-09039.
- [6] Fiori KL, Smith J, Antonucci TC. "Social network types among older adults: A multidimensional approach". *The Journals of*

- Gerontology Series B: Psychological Sciences and Social Sciences*. 2007; 62(6): 322-30. doi: 10.1093/geronb/62.6.p322. PMID: 18079416.
- [7] Nabevi S. "The study of Catariya Yoga on depression of elders infielder centre of Tehran Farzanegan". Tehran: Islamic Azad University, Breach Science & Research. 2013.
- [8] Allender J, Rector C, Rector C, Warner K. *Community & Public Health Nursing: Promoting the Public's Health*. Lippincott Williams & Wilkins. 2013.
- [9] Taheri M, Irandoust K. "The effect of Omega-3 supplementation and functional exercises on the psychomotor performance of aged women in Qazvin". *Iranian Journal of Ageing*. 2019; 14(1): 2-13. doi: 10.32598/sija.13.10.100.
- [10] Zielińska-Więczkowska H, Muszalik M, Kędziora-Kornatowska K. "The analysis of aging and elderly age quality in empirical research: Data based on University of the Third Age (U3A) students". *Archives of Gerontology and Geriatrics*. 2012; 55(1): 195-9. doi: 10.1016/j.archger.2011.07.011. PMID: 21962545.
- [11] Mochcovitch MD, Deslandes AC, Freire RC, Garcia RF, Nardi AE. "The effects of regular physical activity on anxiety symptoms in healthy older adults: a systematic review". *Brazilian Journal of Psychiatry*. 2016; 38: 255-61. PMID: 27579597. PMCID: PMC7194273. doi: 10.1590/1516-4446-2015-1893.
- [12] Alipour F, Sajadi H, Forouzan A, Nabavi H, Khedmati E. "The role of social support in the anxiety and depression of elderly". 2009; 4 (1): 53-61.
- [13] Cheniaux E. *Manual de psicopatologia*. 4a edicao. Rio de Janeiro: Guanabara. 2011.
- [14] Firozeh Moghadam S, Borjali A, Sohrabi F. "The efficiency of happiness training to increase the hope in elderly people". *Iranian Journal of Ageing*. 2014; 8(4): 67-72.
- [15] Boyd MA. *Psychiatric Nursing: Contemporary Practice*. Lippincott Williams & Wilkins. 2008.
- [16] Ryan J, Scali J, Carrière I, Scarabin PY, Ritchie K, Ancelin ML. "Estrogen receptor gene variants are associated with anxiety disorders in older women". *Psychoneuroendocrinology*. 2011; 36(10): 1582-6. doi: 10.1016/j.psyneuen.2011.04.011. PMID: 21570196.
- [17] Smalbrugge M, Pot A, Jongenelis K, Beekman A, Eefsting J. "Prevalence and correlates of anxiety among nursing home patients". *Journal of Affective Disorders*. 2005; 88(2): 145-53. doi: 10.1016/j.jad.2005.06.006.
- [18] Bergua V, Meillon C, Potvin O, Bouisson J, Le Goff M, Rouaud O, et al. "The STAI-Y trait scale: psychometric properties and normative data from a large population-based study of elderly people". *International Psychogeriatrics*. 2012; 24(7): 1163-71. doi: 10.1017/S1041610212000300.
- [19] Atashi V, Mohammadi F, Dalvandi A, Abdollahi I, Shafiei Z. "Effect of slow stroke back massage on anxiety in patients with stroke-A randomized clinical trial". *Journal of Clinical Nursing and Midwifery*. 2014; 2(4): 45-52.
- [20] Chang MY, Yeh SCJ, Chu MC, Wu TM, Huang TH. "Associations between Tai Chi Chung program, anxiety, and cardiovascular risk factors". *American Journal of Health Promotion*. 2013; 28(1): 16-22. doi: 10.4278/ajhp.120720-QUAN-356. PMID: 23470186.
- [21] Pedersen BK, Saltin B. "Evidence for prescribing exercise as therapy in chronic disease". *Scandinavian Journal of Medicine & Science in Sports*. 2006; 16(S1): 3-63. doi: 10.1111/sms.12581.
- [22] Health UDo, Services H. *Physical Activity fundamental to Preventing Disease*. Washington, DC: US Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation. 2002.
- [23] Camacho TC, Roberts RE, Lazarus NB, Kaplan GA, Cohen RD. "Physical activity and depression: evidence from the Alameda County Study". *American Journal of Epidemiology*. 1991; 134(2): 220-31. doi: 10.1093/oxfordjournals.aje.a116074. PMID: 1862805.
- [24] Lampinen P, Heikkinen RL. "Gender differences in depressive symptoms and self-esteem in different physical activity categories among older adults". *Women in Sport and Physical Activity Journal*. 2002; 11(2): 171-97. doi: 10.1111/1475-6773.12285. PMID: 25630931 PMCID: PMC4600361.
- [25] Irandoust K, Taheri M. "Effect of peripheral heart action training and yoga exercise training on respiratory functions and C-reactive protein of postmenopausal women". *Women's Health Bulletin*. 2019; 6(2): 1-7. doi: 10.5812/whb.88027.
- [26] Irandoust K, Taheri M. "The impact of yoga and pilates exercises on older adults". *Iranian Journal of Ageing*. 2016; 11(1): 152-61. doi: 10.18502/tbj.v21i3.10896.
- [27] Taheri M, Modabberi S. "The effect of yoga

- exercise on selective attention of collegiate athletes following short-term sleep deprivation". *Hormozgan Medical Journal*. 2019; 23(3): e93835-e. 10.5812/hmj.93835.
- [28] Oken BS, Kishiyama S, Zajdel D, Bourdette D, Carlsen J, Haas M, et al. "Randomized controlled trial of yoga and exercise in multiple sclerosis". *Neurology*. 2004; 62(11): 2058-64. doi: 10.1212/01.wnl.0000129534.88602.5c . PMID: 15184614.
- [29] Vijayalakshmi P, Madanmohan BA, Patil A, Babu K. "Modulation of stress induced by isometric handgrip test in hypertensive patients following yogic relaxation training". *Indian J Physiol Pharmacol*. 2004; 48(1): 59-64. PMID: 15270370.
- [30] Goyal R, Lata H, Walia L, Narula MK. "Effect of pranayama on rate pressure product in mild hypertensives". *International Journal of Applied and Basic Medical Research*. 2014; 4(2): 67. doi: [10.4103/2229-516X.136776](https://doi.org/10.4103/2229-516X.136776). PMID: PMC4137644. PMID: 25143878.
- [31] Keilani M, Hasenöhr T, Gartner I, Krall C, Fühnhammer J, Cenik F, et al. "Use of mental techniques for competition and recovery in professional athletes". *Wiener Klinische Wochenschrift*. 2016; 128(9): 315-9. doi: 10.1007/s00508-016-0969-x. PMID: PMC4875065. PMID: 26932798.
- [32] Irandoust K, Taheri M. "The impact of yoga and pilates exercises on older adults". *Sälmand*. 2016; 11(1): 152-61. doi: 10.21859/sija-1101152.
- [33] Spielberger CD. "State-Trait anxiety inventory". *The Corsini Encyclopedia of Psychology*. 2010 . doi: 10.1002/9780470479216.corpsy0943.
- [34] Jafari M, Pouryamehr E, Fathi M. "The effect of eight weeks high Intensity interval training (HIIT) on e-selection and p-selection in young obese females". *Int J Sport Stud Hlth*. 2018; 1(1): e64336. doi: 10.5812/intjssh.64336.
- [35] Guillot A, Rienzo FD, Frank C, Debarnot U, MacIntyre TE. "From simulation to motor execution: a review of the impact of dynamic motor imagery on performance". *International Review of Sport and Exercise Psychology*. 2021: 1-20. doi: 10.1080/1750984X.2021.2007539.
- [36] Meier D. "The effect of mental imagery practice on maximal voluntary strength: A meta-analysis and systematic review: The University of Texas at San Antonio". 2021.
- [37] Alsubiheen A, Petrofsky J, Daher N, Lohman E, Balbas E. "Effect of tai chi exercise combined with mental imagery theory in improving balance in a diabetic and elderly population". *Medical Science Monitor: International Medical Journal of Experimental and Clinical Research*. 2015; 21: 3054. PMID: 26454826. PMID: PMC4603617. doi: 10.12659/MSM.894243.
- [38] Sharma V, Das S, Mondal S, Goswami U, Gandhi A. "Effect of Sahaj Yoga on neuro-cognitive functions in patients suffering from major depression". *Indian Journal of Physiology and Pharmacology*. 2006; 50(4): 375. PMID: 17402267.
- [39] Slimani M, Tod D, Chaabene H, Miarka B, Chamari K. "Effects of mental imagery on muscular strength in healthy and patient participants: A systematic review". *Journal of Sports Science & Medicine*. 2016; 15(3): 434. PMID: 27803622 PMID: PMC4974856.
- [40] Beauchamp MR, Bray SR, Albinson JG. "Pre-competition imagery, self-efficacy and performance in collegiate golfers". *Journal of Sports Sciences*. 2002; 20(9): 697-705. doi: 10.1080/026404102320219400. PMID: 12200921.
- [41] Riley KE, Park CL. "How does yoga reduce stress? A systematic review of mechanisms of change and guide to future inquiry". *Health Psychology Review*. 2015; 9(3): 379-96. doi: 10.1080/17437199.2014.981778.