



Psychophysiological Responses to Cognitive and Physical Training in Obese Elderly

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Abstract

Objectives: Increasing prevalence rate of anxiety disorders in elderly populations especially due to physical limitations has become a key concern for health authorities. Therefore, the objective of the study was to investigate the effects of cognitive and physical training on anxiety in the Elderly.

Methods: 49 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), yoga (n = 16) and control group (n = 16). The cognitive training protocol focusing on breathing techniques, autogenic training, imagery/visualization, included an 8-week period, three sessions a week. Yoga practices comprising Asana training, Pranaya training, and meditation were conducted 3 times a week, for 8 weeks. The State-Trait Anxiety Inventory was given before yoga practice and cognitive training. Biofeedback devices were used to monitor galvanic skin resistance and resting heart rate. The data were analyzed using independent *t*-test and one-way ANOVA test.

Results: The results indicated that both cognitive and physical training had a significant difference on Anxiety in the training groups ($P \leq 0.05$), while no significant change was found for control group ($P \geq 0.05$). Furthermore, both training modes decreased the skin potential response (SPR) ($P < 0.001$). In addition, physical training group had lower resting heart rate after intervention compared to the cognitive and control groups (respectively, $P = 0.04$ and $P = 0.001$) lower heart rate and skin conductance level over the entire measurement period.

Conclusions: It was concluded that the health benefits of yoga aren'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.

Keywords: Yoga, Cognitive, Training, Aged

1. Background

Currently, there is an epidemic of sedentary lifestyle, obesity and psychological disorders in elderly populations worldwide which has become a key concern for health authorities (1-5). On the other hand, obesity as a health risk factor has been significantly increased among older adults (6). Although pharmacological treatments may not be highly recommended for older adults due to the side effects, non-drug strategies such as exercise therapy has been widely recommended by researchers with the aim of improving the quality of life (7). In this regard, exercise is often the first step in lifestyle modifications for the prevention and management of physical and psychological disorders from childhood to aging (8, 9). Two common exercise types are commonly used for getting a more profit

in elderly, either physical or cognitive training. The benefits of mental imagery as a cognitive strategy for athletes have been well documented in some studies (10, 11). As a strategy for improving the motor control in the elderly, it has been shown that mental imagery not only contribute to the lowering the muscle fatigue, but also extend to increasing the muscular strength, perceptual motor skills and motor preparation (10, 11). Increasing prevalence rate of anxiety disorders in elderly populations especially due to physical limitations has become a key concern for health authorities. In line with the aforementioned aims, our study strategy predominantly included considering the effect of either cognitive (mental imagery) or physical training (yoga) on anxiety and biofeedback responses (resting heart rate and galvanic skin resistance) in obese elderly females.

2. Methods

A randomized controlled trial was conducted to test the effects of cognitive and physical training on anxiety in the obese elderly. 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 posttest phases. They were randomly assigned to one of three groups: Cognitive (n = 17; 63 ± 3.4 years); yoga (n = 16; 62 ± 2.9 years) and control group (n = 16; 63.1 ± 3.1 years). 4 subjects were excluded due to the absence in the training sessions more than 2 sessions. Biofeedback devices including four channel biofeedback (manufactured by Parsadar Asia Ltd, Model: PM-B128911) and polar were used to monitor galvanic skin resistance (GSR) and resting heart rate (RHR) respectively.

2.1. Training Protocol

The cognitive training protocol included a 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 technique used, were breathing techniques, autogenic training, imagery/visualization. Their biofeedback signs (heart rate and galvanic skin response) were assessed before and after study intervention (12). 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.

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 (13). 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). Written informed consent was obtained from all subjects and the study procedure was approved by ethical committee of Imam Khomeini International University (Ref no: 17628). The research was performed in accordance with the ethical standards of the Helsinki Declaration (1964). The data were analyzed using dependent *t*-test and one-way ANOVA test.

3. Results

As seen in Table 1, there was a significant difference in anxiety score of subjects after exercise treatment ($P =$

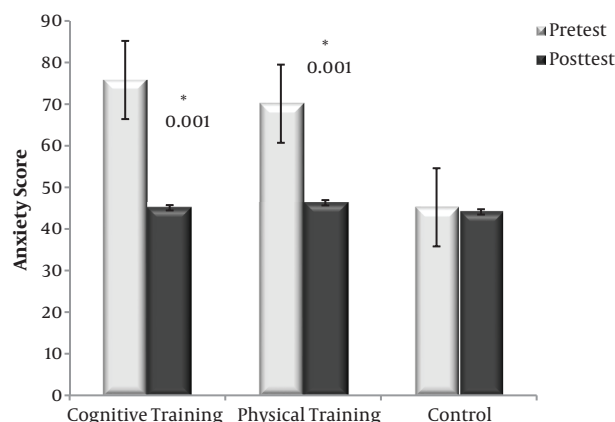


Figure 1. The effect of cognitive vs physical training on the anxiety of aged women

0.001).

Post-hoc LSD test suggested that both experimental groups (physical and cognitive training) had a significant improvement in the anxiety after study treatment ($P = 0.001$) while no significant difference was found between the two experimental groups ($P = 0.18$). Dependent *t*-test result is shown in Figure 1. Both experimental groups had a significant improvement in anxiety ($P = 0.001$), while no difference was found for control group ($P = 0.71$).

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 $P = 0.001$).

4. Discussion

Considerable evidence exists that aerobic exercises tends to improve psychophysiological performance of elderly population. Given the increasing tendency of Iranian elderly to participate in mindfulness practices such as yoga, and psychological intervention like mental imagery, we were to study the effects of two different exercise types (physical versus cognitive) on the anxiety status, resting heart rate and galvanic skin resistance of aged persons. Although all Psychophysiological responses (Anxiety, GSR, and RHR) were improved in both intervention groups, physical training group (yoga) just had a significant improvement in RHR. In the explanation of the last one, it can be stated that there are some physiological adaptations following resistance exercises leading to the better cardiovascular functions (14). Regarding the beneficial role of mental imagery technique on anxiety, It can be stated that mental imagery is capable of improving the motivation

Table 1. Comparing the Anxiety Symptoms Among Elderly (ANOVA)

Source	SS	df	Mean of Square	F	P
Between groups	1523.88	2	761.942		
Within groups	651.952	46	14.173	53.761	0.001
Total	2175.83	48			

(11), self-efficacy (11, 15), self-confidence (11), and controlling competitive anxiety (15). 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 (16), 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.

4.1. Conclusion

It was concluded that the health benefits of yoga aren'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.

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