

ORIGINAL ARTICLE

# Effect of Aerobic Exercise and Omega-3 Supplementation on psychological aspects and Sleep Quality in Prediabetes Elderly Women

Morteza Taheri<sup>1</sup>, Khadijeh Irandost<sup>2</sup>, Masoud Mirmoezzi<sup>3</sup>, Maryam Ramshini<sup>4</sup>

<sup>1</sup>Assistant Professor, Imam Khomeini International University, Faculty of Social Sciences, Department of Sport Sciences

<sup>2</sup>Associate Professor, Imam Khomeini International University, Faculty of Social Sciences, Department of Sport Sciences

<sup>3</sup>Ph.D. Candidate in Sport Sciences, Faculty of Physical Education and Sports Science, Islamic Azad University, Central Tehran Branch, Tehran, Iran

<sup>4</sup>Ph.D, Department of Psychology and Education of Exceptional Children, Faculty of Humanities and Social Sciences, Science and Research Branch, Islamic Azad University, Tehran, Iran

## ABSTRACT

Overweight and obesity along with complications such as psychological variables and sleep disturbance are important issues that have threatened the community of the elderly. Therefore, the purpose of this study was to evaluate the effect of aerobic training and omega-3 supplementation on the psychological aspects and quality of sleep in prediabetes elderly women. The subjects consisted of 28 obese women with an average age of  $63.1 \pm 2.7$  years; BMI  $\geq 30$ ; weight 75-80 kg who were selected by convenience sampling and randomly divided into two groups: aerobic training/ Omega-3 supplement (ATS) and aerobic training group (AT). DASS questionnaire and Pittsburgh Sleep Quality Index (PSQI) were used to assess the psychological aspects (stress, anxiety and depression) and quality of sleep before and after intervention. Dependent and independent t-test was used to analyze the data. The results suggested that psychological aspects (stress, anxiety and depression) and quality of sleep were significantly improved in both groups ( $p \leq 0.05$ ) while no significant difference was found in the variables in the two groups ( $p \geq 0.05$ ). Aerobic exercise has a significant effect on sleep quality and psychological aspects of pre-diabetic elderly and omega 3 supplementation doesn't inset positive effects on quality of sleep.

**Keywords:** Anxiety, Sleep quality, Omega-3 supplementation

## INTRODUCTION

One of the current problems facing the international community is the issue of overweight and obesity, which has led to the development of metabolic syndrome such

as diabetes and has incurred economic and social costs (Amini, Mirmoezzi, Salmanpour, & Khorshidi, 2018; Taheri & Irandoust, 2017). The positive effects of aerobic exercise on the improvement of metabolic syndrome have been shown in many studies, but the effectiveness of exercise training along with food interventions has been less widely studied (Ahmed & Haboubi, 2010). Based on research evidence, obesity, regardless of physiological and physiological effects, has led to behavioral disorders such as insomnia and sleep disorders (Irandoust & Taheri, 2018). In this regard, considering the appropriate exercise protocols for the prevention and treatment of these disorders has been of much interest among researchers. on the other hand, the desire of using herbal supplements

\*Correspondence: taheri\_morteza@yahoo.com  
Morteza Taheri, Department of Sport Sciences, Imam Khomeini International University, Qazvin, Iran  
Phone: 989124070721 Fax: 982833901606

Received: 06 July 2018 Accepted: 30 July 2018

Sleep and Hypnosis  
Journal homepage:  
[www.sleepandhypnosis.org](http://www.sleepandhypnosis.org)  
ISSN: 2458-9101 (Online)



in the community has created a more interest for research. Although, the positive effect of Omega-3 consumption on blood glucose control has been reported in several studies (Davidson, 2006; Ebbesson, Risica, Ebbesson, Kennish, & Tejero, 2005). They haven't been concerned with pre-diabetic elderly. People in the pre-diabetic phase can prevent diabetes by weight loss and changes in body composition, especially visceral fat (Irandoust, Taheri, Neto, & Lotfi, 2017).

In a study by Spiegel et al. (2005), it was found that either 24 hours of sleep deprivation or sleeping more than 12 hours resulted in increased resistance to insulin which led to impaired Glucose tolerance, increased hunger, and food intake and consequently, diabetes (Spiegel, Knutson, Leproult, Tasali, & Cauter, 2005). In another study, Hall and colleagues also showed that low quality of sleep is associated with high levels of insulin resistance (Hall et al., 2008). Broussard, et al. (2015) stated that sleep loss could increase levels of free fatty acids in a similar condition to pre-diabetic conditions in healthy young men (Broussard et al., 2015). Generally, It's an accepted notion that physical and psychological issues are interchangeably interrelated, there is a need to focus more on such an issue. Since the relationship between psychological parameters and sleep quality is one of the factors that can better determine the effectiveness of aerobic exercise (Monleon, Hemmati Afif, Mahdavi, & Rezaei, 2018), this relationship has also been studied in terms of hypothesis. According to the evidence, any solution leading to weight loss, would improve the health-related indices of diabetes, sleep quality; and anxiety. Thus, the aim of this study was to investigate the effect of aerobic exercise and omega-3 supplementation on psychological variables (anxiety, stress and depression) and sleep quality in prediabetes elderly women.

## METHOD

The subjects consisted of 28 prediabetes women with an average age of  $63.1 \pm 2.7$  years who were selected by convenience sampling and randomly divided into two groups: aerobic training supplement (ATS) and aerobic training group (AT). The inclusive criteria included obesity

(BMI $\geq$ 30); lack of sensitivity to Omega 3 or fish; no regular exercises within the past six month. Aerobic training program was performed for eight weeks, three sessions, for 50 minutes. Exercise intensity was controlled using the Polar device (T31 manufactured in Finland). The exercise program was carried out as follows: Warm-up (10 minutes): consisting of 6 minutes of slow running and 4 minutes of stretching and relaxation exercises; Specific training sessions: 30 minutes of aerobic exercise with intensity of 50-60% of the maximum heart rate for the first 4 weeks, and 60-70% of maximum heart rate in the final four weeks; Cooling phase (10 minutes): 3-4 minutes of soft running and walking, followed by 5 minutes of stretching. Ethical considerations: All subjects signed the consent form to participate in the research, and this project was conducted on the basis of License No. 17628 of the Ethics Committee of the Imam Khomeini International University.

The Pittsburgh Sleep Quality Index (PSQI) as a self-report questionnaire was used to assess sleep quality. The PSQI yields a score ranging between 0 and 21. The participants filled out the PSQI at the beginning and end of the study to identify sleep problems. Total score was calculated as a sleep quality scale for each subject. DASS questionnaire was used to analyze the psychological aspects of subjects before and after intervention. It is a Self-assessment of depression, anxiety and stress with 41 questions and three subscales considering anxiety, depression and stress. Validity and Reliability of the instrument has been confirmed by Rahimi, et.al (Rahimi, Ahamadi, & Gholiaf, 2006). Inclusive Criteria included BMI $>$  30, no history of neuropsychiatric disease, lack of chronic diseases, lack of drug use, non-use of cigarettes, Insensitivity to omega-3 supplementation or fish. Considering the voluntary selection of subjects and the existence of a primary difference between the two groups, independent t-test was used to analyze the data (difference between pre-test scores and Posttest).

## RESULTS

The general characteristics of the participants in two groups are presented in Table 1. As shown, no significant difference was found in baseline ( $p \geq 0.05$ ).

Paired t test results suggested that all Psychological Aspects including stress, anxiety and depression were improved significantly in both groups (see table 2).

As it can be seen in Figure1, There were no significant difference between the two groups in psychological aspects of stress (p=0.24), anxiety (p=0.19) and depression (p=0.41).

Changes related to the obesity status of subjects in both groups are shown in Table 3. There was a significant change in the weight and abdominal obesity in both groups in the post-test (p≤0.05) (dependent t-test), independent t-test results showed no significant difference between the two groups in neither of these two groups (p≥0.05).

**Table 1. The general characteristics of the participants in pretest.**

Group	Exercise-supplement	Exercise	P-value
Age (yr)	63.1±2.2	62.9±1.9	0.88
Height (cm)	4.3±157.2	3.9±156.4	0.47
Weight (kg)	4.4±77.7	4.6±78.6	0.46
WHR (cm)	0.25±0.98	0.04±0.99	0.44

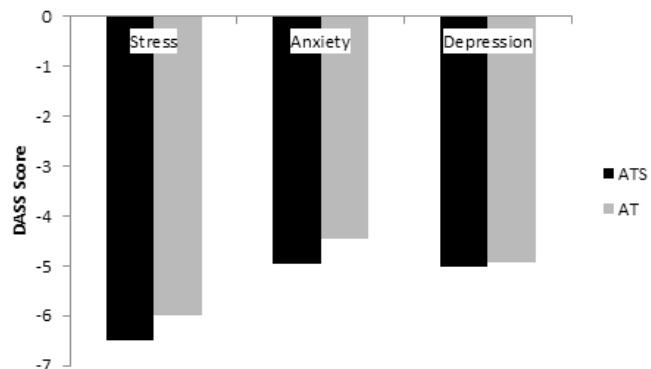
**Table 2. The effect of exercise and supplement on Psychological Aspects of subjects.**

Tests	Group	Exercise-supplement n=12					Exercise n=13				
		Pretest	Post test	Mean Difference	t	P	Pretest	Post test	Mean Difference	t	P
Psychological Aspects	Stress	11.01±3.12	4.52±1.87*	-6.49	12.02	0.001*	11.17±3.25	5.18±2.4*	-5.99	8.990	0.001*
	Anxiety	7.12±2.19	2.17±0.9*	-4.95	19.05	0.001*	6.9±3.14	2.45±1.1*	-4.45	14.59	0.001*
	Depression	8.32±2.4	3.3±0.82*	-5.02	21.74	0.001*	8.14±2.1	3.21±0.93*	-4.93	20.83	0.001*

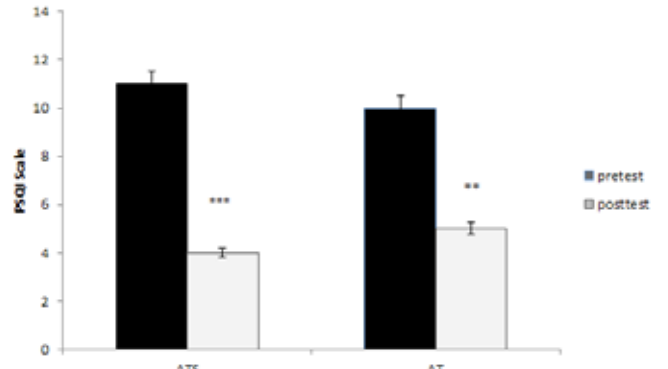
\*: p≤0.001

**Table 3. Obesity status of subjects before and after intervention.**

variable	group	ATC		AT	
		pretest	posttest	pretest	posttest
weight		77.8±4.4	75.2±4.3***	77.6±3.4	75.3±3.1***
WHR		0.99±0.04	0.97±0.46***	0.99±0.25	0.97±0.37***



**Figure 1. Comparing the psychological aspects of groups (mean difference: posttest-pretest difference)**  
ATS: Aerobic Supplement Group; AT: Aerobic Group



**Figure 2. The effect of aerobic exercise and omega-3 supplementation on quality if sleep.**  
\*\*\*: p≤0.05; \*\*, p≤0.01

According to figure 2, quality of sleep was improved in both groups ( $p \leq 0.05$ ), while no significant difference was found in the two groups ( $p = 0.54$ ).

## DISCUSSION

The high prevalence of metabolic syndrome diseases, such as diabetes, has led researchers to identify the best possible strategies before starting treatment. Therefore, the purpose of this study was to investigate the effect of aerobic training and omega-3 supplementation on psychological aspects and Sleep Quality in Prediabetes Elderly Women. As indicated in the results section, all psychological aspects including stress, anxiety and depression and quality of sleep were significantly improved in both groups and no significant difference was found in the variables in the two groups.

This is consistent with Yari, et al who concluded that aerobic exercise can lead to improvement of depression status. one possible explanation for the obtained results can be due to body composition changes. As it turned out, both groups had a significant change in abdominal obesity and weight after interventions. Additionally, our finding provides some insight into the constructive effect of a aerobic exercise protocol on quality of sleep deprivation and psychological aspects of elderly in prediabetes who are prone to psychological problems and sleep disorders that is consistent with Taheri, et.al (Irandoust & Taheri, 2018) who reported the positive effect of exercise on quality of sleep. Another finding of this study was the improvement of sleep quality in both groups. As a result, it can be concluded that in the pre-

diabetes stage, aerobic exercise can be an effective and controlling factor. Since the health benefits of exercise induced weight loss have been concerned a key reason for improving the sleep quality and psychological status, conducting the same study is highly recommended for different age groups in future studies. As suggested, exercise as a treatment is not specific to maintaining Psychophysiological health, but also extends to improving the sleep quality in obese prediabetes elderly.

One limitation of the research was the small number of subjects, limiting the extent to which the results can be applied to elderly women in general. Additional studies involving more subjects, a more controlled environment with different varieties of psychological and physical tests are required in order to make conclusive assumptions about a larger population.

## CONCLUSION

Aerobic exercise with Omega-3 supplementation has a significant effect on sleep quality and psychological aspects of pre-diabetic elderly and the aerobic exercise insets positive effects on quality of sleep, while omega 3 supplementation doesn't inset positive effects on quality of sleep.

**Conflict of interest:** The authors declare no conflict of interest.

**Informed consent:** Informed consent was obtained from all the participants included in the study.

**Funding:** This project was granted by Imam Khomeini International University (No. 11821).

## References

- Ahmed, T., & Haboubi, N. (2010). Assessment and management of nutrition in older people and its importance to health. *Clinical interventions in aging*, 5, 207.
- Amini, M., Mirmoezzi, M., Salmanpour, M., & Khorshidi, D. (2018). Eight Weeks of Aerobic Exercises Improves the Quality of Life in Healthy Aged Sedentary Men. *International journal of Sport Studies for Health*, 1(1), e67514. doi:10.5812/intjssh.67514
- Broussard, J. L., Chapotot, F., Abraham, V., Day, A., Delebecque, F., Whitmore, H. R., & Tasali, E. (2015). Sleep restriction increases free fatty acids in healthy men. *Diabetologia*, 58(4), 791-798.
- Davidson, M. H. (2006). Mechanisms for the hypotriglyceridemic effect of marine omega-3 fatty acids. *The American journal of cardiology*, 98(4), 27-33.
- Ebbesson, S. O., Risica, P. M., Ebbesson, L. O., Kennish, J. M., & Tejero, M. E. (2005). Omega-3 fatty acids improve glucose tolerance and components of the metabolic syndrome in Alaskan Eskimos: the Alaska Siberia project. *International Journal of Circumpolar Health*, 64(4), 396-408.
- Hall, M. H., Muldoon, M. F., Jennings, J. R., Buysse, D. J., Flory, J. D., & Manuck, S. B. (2008). Self-reported sleep duration is associated with the metabolic syndrome in midlife adults. *Sleep*, 31(5), 635-643.

- Irandoost, K., & Taheri, M. (2018). The effect of strength training on quality of sleep and psychomotor performance in elderly males. *Sleep and Hypnosis*, 20(3), 160-165.
- Irandoost, K., Taheri, M., Neto, G. R., & Lotfi, L. (2017). Physical and physiological literacy feedback improves the exercise behavior in TOFI governors and chief executive officers. *Journal of Exercise Physiology Online*, 20(6), 24-30.
- Monleon, C., Hemmati Afif, A., Mahdavi, S., & Rezaei, M. (2018). The Acute Effect of Low Intensity Aerobic Exercise on Psychomotor Performance of Athletes with Nocturnal Sleep Deprivation. *International journal of Sport Studies for Health*, 1(1), e66783. doi:10.5812/intjssh.66783
- Rahimi, A., Ahamadi, F., & Gholiaf, M. (2006). Effects of applying continuous care model (CCM) on stress, anxiety and depression in hemodialysis patients. *Research in Medicine*, 30(4), 361-369.
- Spiegel, K., Knutson, K., Leproult, R., Tasali, E., & Cauter, E. V. (2005). Sleep loss: a novel risk factor for insulin resistance and Type 2 diabetes. *Journal of applied physiology*, 99(5), 2008-2019.
- Taheri, M., & Irandoost, K. (2018). The exercise-induced weight loss improves self-reported quality of sleep in obese elderly women with sleep disorders. *Sleep and Hypnosis*. 20(1):54-59.