Original Article

Effect of Aerobic Training and *Rosa damascena* Supplement on the Memory of Obese Women

Masoumeh Razipour, Khadijeh Irandoust, Morteza Taheri

Department of Sport Sciences, Imam Khomeini International University, Qazvin, Iran

ORCID:
Masoumeh Razipour: https://orcid.org/0000-0003-4828-4877
Khadijeh Irandoust: https://orcid.org/0000-0001-5839-9753

Abstract

Aims: The purpose of this study was to determine the effect of 8-week aerobic training and supplementation of *Rosa damascene* on the memory of obese women. **Materials and Methods:** Thirty-two obese women (age: 34.3 ± 5.6 years; fat percentage: above 35%; and waist-to-hip ratio: above 0.85) were selected based on convenience sampling in a quasi-experimental study, with pre- and post-test design with control group. The women were randomly divided and allocated into aerobic exercises with *R. damascene* supplement group (TS Group) ($n = 9$); aerobic training group with placebo (TP Group) ($n = 8$), aerobic training group (T Group) ($n = 7$), and control group (C Group) ($n = 8$). The memory status was evaluated by the Wechsler questionnaire at pretest and posttest. ANCOVA and paired *t*-test were performed for analyzing the data by SPSS for Windows. **Results:** The results suggested that all the three experimental groups had a significant improvement in memory index ($P \leq 0.05$). The results also indicated that TS group had a significant improvement in memory condition compared to other groups ($P \leq 0.05$). **Conclusion:** The results showed that the use of *R. damascene* with aerobic exercise had a significant effect on the memory of obese women. Therefore, given the positive effects of *R. damascene* and aerobic exercise, this strategy can be used to improve the memory of obese women.

Keywords: Exercise, memory, obese, *Rosa damascene*

INTRODUCTION

Obesity is one of the most important global health concerns that has now become an epidemic worldwide.[1,2] Overweight and obesity are due to excessive energy intake and lack of physical activity.[3,4] In addition, genetic and socio-psychological factors, neurological disorders, and excessive feeding in childhood are among the factors of obesity.[5] Obesity increases the risk factors for chronic diseases such as metabolic syndrome, which include a combination of disorders or diseases such as high blood pressure, type 2 diabetes, high blood cholesterol and triglycerides, cardiovascular disease, and asthma.[6-9] The nervous system is one of the human body systems that is highly affected by obesity. In this system, the structure called hippocampus is a very important key to consolidation, storing information, and forming long-term memory. Lifestyle, unhealthy diet, overweight, obesity, and genetic factors are among the essential factors influencing the memory.[10,11] In

some studies, fatty tissue has been shown to release a substance called cytokine, which can cause inflammation in various tissues of the body, including brain tissue that affects memory. In addition, abnormal fat metabolism creates a risk of memory and learning. People with large amounts of abdominal fat are 3.6 times more likely to have memory deficits and dementia.[12] Studies have also shown that obesity reduces the amount of white matter that is believed to be linked to obesity with brain aging.[13] Given that memory loss and dementia are the complications of overweight and obesity,[14,15] it is necessary to provide the persons with obesity with preventive strategies such as exercise and supplements. The effect of exercise on the function of various organs of the human being, such as the heart, lung, and skeletal muscle, is well documented.

Address for correspondence: Dr. Khadijeh Irandoust,
Imam Khomeini International University, Qazvin, Iran.
E-mail: irandoust@ikiu.ac.ir

Access this article online	
Quick Response Code:	**Website:** http://iahs.kaums.ac.ir
	DOI: 10.4103/iahs.iahs_6_19

According to research, the brain responds to physical activity at anatomical, cellular, and molecular levels. Many of these changes occur in some of the brain structures involved in memory, learning, and cognitive functions.[16-20] In addition to exercise, the use of herbal supplements on memory has often been considered in research. Esfandiari *et al.* in a study showed that the animal model of Alzheimer's disease was controlled and treated somewhat by the administration of *Rosa damascena* extract.[21] It has been extensively used to prevent and treat many diseases, such as stomach pains, sore throats, fever, ophthalmic problems, chest pain, menstrual bleeding, breast tenderness, constipation, and other digestive problems.[22-26] The mechanism of *Rosa damascena* is purifying the purulent waste accumulated in the nerve tissue, which saves it from the risk of dysfunction and ultimately cell death, and even causes the proliferation of neural cells. Therefore, preventive measures for overweight and obese people who are prone to memory loss can be the most important means of controlling the disease in addition to exercise. According to various studies, there was no research on the effect of aerobic exercises and the use of *Rosa damascena* on the memory of obese people. Therefore, the effect of aerobic exercises along with *Rosa damascena* on the memory of obese women was investigated in the current study.

MATERIALS AND METHODS

Participants

This was a quasi-experimental study, with pre-test and post-test design with control group. The statistical population of this study constituted obese women who were referred to Qazvin clubs. Among them, 32 obese women (age: 34.3 ± 5.6 years; fat percentage: above 35%; waist-to-hip ratio [WHR]: above 0.85) were selected based on convenience sampling. All experiments were conducted in the exercise physiology laboratory of Imam Khomeini International University. The inclusion criteria included the following: (a) insignificant depressive symptoms as assessed by the Beck Depression Inventory (score <13) (depression is considered as an effective factor on memory status); (b) lacking the history of cognitive or other neurological disorders; (c) not taking any medication that would affect the cognitive performance; (d) The Pittsburgh Sleep Quality Index ≤5 (sleep quality is considered as an effective factor on memory status);[27] (e) being nonsmoker; and (f) lack of regular participation in sports activities during the past 6 months. The participants were informed about the study procedure, and they completed the consent form in the study. The participants were randomly divided into three experimental and control groups. The groups consisted of aerobic exercises with *Rosa damascena* supplement (TS Group) (*n* = 9); aerobic training group with placebo (TP Group) (*n* = 8); aerobic training group (T Group) (*n* = 7); and control group (C Group) (*n* = 8).

Procedure

The nutrition status of participants (both micro- and macro-nutrients) as an effective factor on memory status was
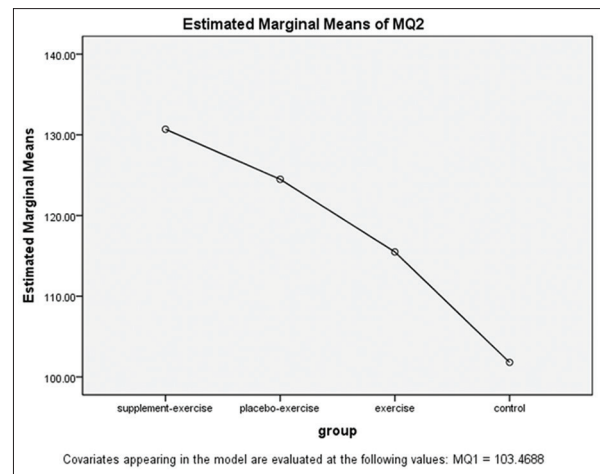

Figure 1: Comparison of memory status of groups in posttest

monitored by 24-h calorie intake questionnaire. Recommended calorie intake was prescribed based on their basal metabolic rate and their total energy expenditure measured by body composition analyzer (InBody, 320, Korea). Furthermore, the obesity index was recognized as fat percentage above 35% and WHR above 0.90 as measured by body composition analyzer in pretest and posttest. The memory status was evaluated by the Wechsler questionnaire at pretest and posttest. The validity and internal consistency of this test have been reported in various studies in Iranian populations.[28,29] The Wechsler Memory Scale was designed for clinical use as a rapid and simple memory examination. This version is comprised of seven subtests, namely (1) personal and current information; (2) immediate orientation; (3) mental control; (4) logical memory; (5) memory span; (6) visual reproduction; and (7) associate learning.[30] The TS group first used 2.5 g of powdered capsules every 24 h in the form of a capsule in the 1st week to prevent possible gastrointestinal complications (diarrhea). Then they consumed 2.5 g of powdered capsules every 12 h in the 2nd week. In the next week, the women received 7.5 g of *R. damascene* supplement every 8 h. The placebo group also used starch powder in the form of a capsule.[21]

The aerobic training was performed for 8 weeks, three sessions a week with an intensity of 60%–75% of maximal heart rate (HR). The exercise intensity was controlled by Polar S810 h monitor (Polar Electro, Kempele, Finland). The exercise protocol was performed under the supervision of an exercise physiologist.

In every 2 weeks, the intensity was added by 5%, in other words, from week 2-4, the intensity was 65% and weeks of 4-6 was 70% and finally it was elevated up to 80%. Exercise protocol included 10 min of warming up, 30 min of main program, and 5 min of cooling down.[31]

Ethical considerations

The study protocol was in accordance with the Helsinki declaration and was approved by the Ethical Committee of the

Imam Khomeini International University (Ref. 17628.1395). Written informed consent was obtained from all participants, and they were informed prior to starting the research.

Statistical analysis
Normality distribution of variables was tested using Kolmogorov–Smirnov test. ANCOVA test was performed for analyzing the data by SPSS software for Windows (SPSS Inc., Chicago, IL, USA). Statistically significant difference was set at $P \leq 0.05$. All values were reported as means ± standard deviation.

RESULTS

Table 1 shows the demographic characteristics of the women. WHR and body fat percentage were significantly improved in all the three experimental groups in posttest ($P \leq 0.05$), with a greater improvement in the TS group ($P = 0.001$). The comparison of memory in the groups is found in Figure 1.

Paired *t*-test results are shown in Table 2. As shown in the table, there were significant improvements in posttest of TS ($P = 0.001$), TP ($P = 0.006$), and A groups ($P = 0.01$).

The results of covariance analysis are shown in Table 3. As shown, there was a significant difference between pre- and post-test of the groups. The results of the follow-up test are shown in Table 4.

Table 4 shows the results of Bonferroni *post hoc* test. As shown in the table, TS group had a significant improvement in memory as compared to the A group ($P = 0.027$) and control group ($P = 0.001$).

DISCUSSION

The purpose of this study was to investigate the effect of aerobic training and supplementation of *Rosa damascena* on the memory of obese women. The findings indicated that all the three experimental groups had better memory patterns following exercise and supplementation of *R. damascene*, with greater improvement in the TS group that had both interventions simultaneously.

Evidences suggest that *R. damascene* extract significantly inhibits neuronal growth and inhibits A-β fibrillation and deposition in the brain. Most studies have shown that *R. damascene* is a naturally occurring source of flavonoids such as quercetin, kaempferol, myricetin, gallic acid, and glycoside derivatives, which play a protective role in the brain and nerve function, including neuroxin-protective effects; nerve inflammatory suppression; and promoting memory, learning, and cognitive function.[32] These effects can occur due to flavonoids leading to apoptosis inhibition, neuronal survival, and synaptic flexibility. They can also promote brain blood flow, angiogenesis, neurogenesis, and neuronal morphology.[33] It also contains carboxylic acid, migraine, and Vitamin C.[34] In a research study, a positive effect of *R. damascene* extract on memory deficiency due to high-fat diet was found. It was

assumed that the observed effects of the extract were due to its potent antioxidant properties.[35] Furthermore, in a study, the effect of hydroalcoholic extract of *R. damascene* on memory performance in a model of scopolamine-induced memory impairment in rats was investigated. The results showed that the hydroalcoholic extract of *R. damascene* prevents memory deficiency due to scopolamine.[36]

Table 1: Obesity indices of the participants (mean±standard deviation)

Group	Time	WHR (cm)	BFP (%)
TS	Pretest	0.88±0.04	38.6±2.05
	Posttest	***0.03±0.86	***3.5±36.1
TP	Pretest	0.04±0.87	3.2±38.2
	Posttest	*0.05±0.86	*3.4±37.1
T	Pretest	0.06±0.87	3.3±39.4
	Posttest	*0.04±0.86	*3.1±38.8
C	Pretest	0.07±0.87	3.5±37.2
	Posttest	0.03±0.88	3.4±37.1

*$P \leq 0.05$; ***$P \leq 0.05$. TS: Aerobic training with *Rosa damascene* supplement; TP: Aerobic training group with placebo; T: Aerobic training group; C: Control group; WHR: Waist-to-hip ratio; BFP: Body fat percentage

Table 2: Memory status of groups in pre- and post-test

Variable	Groups	Test	Mean±SD	t	P
MQ	TS	Pretest	11.41±97	−6.57	0.001
		Posttest	7.88±131.1		
	TP	Pretest	21.99±109.44	−3.70	0.006
		Posttest	13.06±124.2		
	A	Pretest	10.24±103.28	−4.04	0.01
		Posttest	13.31±114.33		
	C	Pretest	18.81±105.5	2.70	0.31
		Posttest	18.06±103		

MQ: Memory quotient; SD: Standard deviation

Table 3: Memory status in groups (ANCOVA test)

Source	SS	df	MS	F	P	η coefficient
Pretest	2719.82	1	2719.82	31.81	0.000	0.541
Groups	3894.21	3	1298.07	15.18	0.000	0.628
Error	2308.40	27	85.50			
Total	460,696	32				

SS: Sum of square, MS: Mean square

Table 4: Pair-wise comparison groups (Bonferroni *post hoc* test)

Group (i)	Group (j)	Mean differences	SD	P
TS	TP	6.20	4.55	0.001
	T	15.20	4.90	0.027*
	C	28.8	4.58	*0.001
TP	T	9.0	4.94	0.479
	C	22.6	4.51	*0.001
T	C	13.6	5.01	0.066

*$P \leq 0.05$. SD: Standard deviation

This finding suggests that sulfur is potentially effective in improving memory due to its antioxidant effects.[37] In a study, it was shown that *Rosa damascena* would alleviate the destructive consequences of Alzheimer and also memory loss in the elderly population.[21,38] These results are consistent with our studies in terms of effectiveness of *R. damascene* on memory status. One of the findings was that the A group (mere aerobic training) did not experience significant improvement in memory, which is consistent with the results of Cuttler *et al.*,[39] whereas the findings contradict that of other researches.[16,18,38-41] Differences in research methods and procedure and also age and gender are among the possible reasons of the divergent results. Given the effectiveness of *R. damascene* and exercise group, it can be concluded that the use of both interventions plays an important role in improving the memory of obese women. One of the most important limitations of this study was the low number of participants, and it is highly recommended to include large number of participants in future studies for obtaining more crucial results.

CONCLUSION

The results showed that the use of *R. damascene* with aerobic exercise had a significant effect on the memory of obese women. Therefore, given the positive effects of *R. damascene* and aerobic exercise, this strategy can be used to improve the memory of obese women.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

REFERENCES

1. Ford RL. A Minority Perspective on the Public Health Response to the Obesity Epidemic; 2017.
2. Caballero B. The global epidemic of obesity: An overview. Epidemiol Rev 2007;29:1-5.
3. Reza Sharif M, Sayyah M. Assessing physical and demographic conditions of freshman "15" male medical students. Int J Sport Stud Health 2018;1:e67421.
4. Naghavi N, Taheri M, Irandoust K. Psychophysiological responses to cognitive and physical training in obese elderly. Int J Sport Stud Health 2018;1:e83935.
5. Samaras K, Kelly PJ, Chiano MN, Spector TD, Campbell LV. Genetic and environmental influences on total-body and central abdominal fat: The effect of physical activity in female twins. Ann Intern Med 1999;130:873-82.
6. Haslam DW, James WP. Obesity. Lancet 2005;366:1197-209.
7. Grundy SM. Obesity, metabolic syndrome, and cardiovascular disease. J Clin Endocrinol Metab 2004;89:2595-600.
8. Sayyah M, Rahimi S, Bigdeli M, Rajabi M. Comparing the anthropometric characteristics of injured and non-injured girl student athletes participating in the sport Olympiads held by the ministry of health and medical education in the summer of 2009 in the city of Yazd. Biosci Biotechnol Res Asia 2011;8:367-71.
9. 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 Health 2018;1:e67514.
10. Luppino FS, de Wit LM, Bouvy PF, Stijnen T, Cuijpers P, Penninx BW, *et al.* Overweight, obesity, and depression: A systematic review and meta-analysis of longitudinal studies. Arch Gen Psychiatry 2010;67:220-9.
11. Loprinzi PD, Frith E. Obesity and episodic memory function. J Physiol Sci 2018;68:321-31.
12. Funahashi H, Yada T, Suzuki R, Shioda S. Distribution, function, and properties of leptin receptors in the brain. Int Rev Cytol 2003;224:1-27.
13. Jagust W, Harvey D, Mungas D, Haan M. Central obesity and the aging brain. Arch Neurol 2005;62:1545-8.
14. Gunstad J, Paul RH, Cohen RA, Tate DF, Gordon E. Obesity is associated with memory deficits in young and middle-aged adults. Eat Weight Disord 2006;11:e15-9.
15. Coppin G, Nolan-Poupart S, Jones-Gotman M, Small DM. Working memory and reward association learning impairments in obesity. Neuropsychologia 2014;65:146-55.
16. Babaei P, Demirchi A, Alamdari KA. Effect of aerobic training on metabolic risk factors of the syndrome, brain growth factor and brain function of middle-aged men. J Endocrinol Metab Iran 1392;15:132-42.
17. Rashidi M, Rashidipour A, Vaezi GH, Ghorbani R. The effects of aerobic and anaerobic exercises on the memory of healthy people. Koomesh Journal 1395;17:733-8.
18. Erickson KI, Voss MW, Prakash RS, Basak C, Szabo A, Chaddock L, *et al.* Exercise training increases size of hippocampus and improves memory. Proc Natl Acad Sci U S A 2011;108:3017-22.
19. Aliwand F, Karimzadeh F. The effect of exercise on memory enhancement: Review of cellular and molecular mechanisms. Review of cellular and molecular mechanisms 1394;3:123-30.
20. Cotman CW, Berchtold NC, Christie LA. Exercise builds brain health: Key roles of growth factor cascades and inflammation. Trends Neurosci 2007;30:464-72.
21. Esfandiary E, Abdolali Z, Omranifard V, Ghanadian M, Bagherian-Sararoud R, Karimipour M, *et al.* Novel effects of *Rosa damascena* extract on patients with neurocognitive disorder and depression: A clinical trial study. Int J Prev Med 2018;9:57.
22. Dabbaghin FH, Shojaei A, Fard MA, Syed AG. A review of anti-diabetes herbs in Iranian traditional medicine and their effectiveness. Med Plants 1390;11:57-65.
23. Zargari A. Potentiation of pentobarbital hypnosis by *Rosa damascena* in mice. Med Plants 1992;2:97-101.
24. Özkan G, Sagdiç O, Baydar NG, Baydar H. Note: Antioxidant and antibacterial activities of *Rosa damascena* flower extracts. Food Sci Technol Int 2004;10:277-81.
25. Hajhashemi V, Ghannadi A, Hajiloo M. Analgesic and anti-inflammatory effects of *Rosa damascena* hydroalcoholic extract and its essential oil in animal models. Iran J Pharm Res 2010;9:163-8.
26. Mahmood N, Piacente S, Pizza C, Burke A, Khan AI, Hay AJ, *et al.* The anti-HIV activity and mechanisms of action of pure compounds isolated from *Rosa damascena*. Biochem Biophys Res Commun 1996;229:73-9.
27. Irandoust K, Taheri M. Effects of different daytime exercises on the quality of sleep and appetite of obese women. Int Arch Health Sci 2018;5:111.
28. Sarrami GR. Standardization of Kesler's memory test on the population living in Tehran. J Tarbiat 1382;19:20-5.
29. Hassani F, Askari P, Shariat A. Validation of a new version for memory assessment in a group of Farsi speaking. Shiraz Residents Life Sci J 2012;9:42-7.
30. Scale WD, Edition T. The Psychological Corporation. San Antonio, TX; 1997.
31. Mollaee S. Effect of Kakuti on Antioxidant Parameters (MDA, TAC and -SH) during a Physical Exhaustion Session. 2011;14:63-9.
32. Esfandiary E, Karimipour M, Mardani M, Ghanadian M, Alaei HA, Mohammadnejad D, *et al.* Neuroprotective effects of *Rosa damascena* extract on learning and memory in a rat model of amyloid-β-induced Alzheimer's disease. Adv Biomed Res 2015;4:131.
33. Esfandiary E, Karimipour M, Mardani M, Alaei H, Ghannadian M, Kazemi M, *et al.* Novel effects of *Rosa damascena* extract on memory and neurogenesis in a rat model of Alzheimer's disease. J Neurosci Res 2014;92:517-30.
34. Monfared N. Effect of One Session of Increasing Activity and Supplementation of Roses on Inflammatory CK Index of Active Girls. International Conference on Sport Sciences; 1394.

35. Rezvani-Kamran A, Salehi I, Shahidi S, Zarei M, Moradkhani S, Komaki A. Effects of the hydroalcoholic extract of *Rosa damascena* on learning and memory in male rats consuming a high-fat diet. Pharm Biol 2017;55:2065-73.

36. Mohammadpour T, Hosseini M, Naderi A, Karami R, Sadeghnia HR, Soukhtanloo M, *et al*. Protection against brain tissues oxidative damage as a possible mechanism for the beneficial effects of *Rosa damascena* hydroalcoholic extract on scopolamine induced memory impairment in rats. Nutr Neurosci 2015;18:329-36.

37. Cuttler C, Connolly CP, LaFrance EM, Lowry TM. Resist forgetting: Effects of aerobic and resistance exercise on prospective and retrospective memory. Sport Exe Perform Psychol 2018;7:205.

38. Farioli-Vecchioli S, Tirone F. Control of the cell cycle in adult neurogenesis and its relation with physical exercise. Brain Plast 2015;1:41-54.

39. Irandost K, Taheri M, Seghaholeslami A. Comparison of the effect of aerobic exercise on water and yoga on memory and dynamic balance in older men. Motor Sport Learn (Harekat) 1393;4:463-73.

40. Eskandrinejad M, Rezaei F. The effect of aerobic exercise on attention neural networks and work memory. Neurosci Healing Khatam 1397;6:31-40.

41. Yang L, Zhang J, Deng Y, Zhang P. The effects of early exercise on motor, sense, and memory recovery in rats with stroke. Am J Phys Med Rehabil 2017;96:e36-43.