

Fat and sugar rich dietary pattern is associated with negative metaphorical statement in metabolically healthy overweight and obese men and women

Morteza Abdollahi¹, Somayeh Sadat Mckian², Sanaz Jambidi³, Zahra Esmaeilinezhad³, Nazanin Mohammadipoor³, Baran Hashemi³, Seyed Mohammad Mazloomi⁴

¹Nutrition Research Department, National Nutrition and Food Technology Research Institute, School of Nutrition Sciences and Food Technology, Shahid Beheshti University of Medical Sciences, Tehran, Iran; ²Young Researchers and Elite Club, Tehran Medical Sciences Branch, Islamic Azad University, Tehran, Iran; ³School of nutrition and Food sciences, Shiraz University of Medical Sciences - E-mail: baran.hashemi@gmail.com; ⁴Department of Food Hygiene and Quality Control, School of Nutrition and Food Sciences, Shiraz University of Medical Sciences, Shiraz, Iran

Summary. Considering that metaphoric statement indicates individuals' comprehension of health issues, we aimed to assess whether obese individuals' metaphorical expression of either self or their own lives is related to their dietary pattern. Two hundred and ten metabolically healthy adult men and women who attended diet clinics in Shiraz participated in this cross-sectional study. A validated 168 food item FFQ was used for dietary assessment. To assess the individual's metaphorical statement of themselves and their own lives, Osgood semantic differential method was used. Three dietary patterns were extracted using principal component analysis with the orthogonal rotation Varimax with Kaiser Normalization. Mediterranean dietary pattern including leafy vegetables, other non-starchy vegetables, fruits and fruit juices, low fat dairy, olive, and olive oil; inflammatory dietary pattern including refined grains, high fat dairy, hydrogenated oils, sweets, and ice cream; and snacking dietary pattern including snacks, pickles, carbonated drinks, and sweetened juices. Both Mediterranean pattern and inflammatory pattern had a significant association with body mass index ($P=0.03$ and $P=0.01$, respectively). Significant association was also found between inflammatory dietary pattern and waist circumference ($P=0.001$). A negative association were found between inflammatory and snacking dietary patterns and metaphor of self ($P=0.003$ and $P=0.003$, respectively) and life ($P=0.03$ and $P=0.01$, respectively) questionnaire scores. Diet high in starch and sugar as well as hydrogenated fats is associated with negative narration of individuals' embodied experience about themselves and their own lives.

Key words: metaphor, dietary pattern, obesity

Introduction

Obesity is an increasingly prevalent condition with drastic threats to public health. The prevalence of obesity in Iran was estimated to be 21.5% (13.7% and 27.3% in men and women respectively) in 2008 (1). Genetic, environmental, sociocultural and psychological disturbances are elements that play roles in creating overweight and obesity. Obesity and overweight are main culprits of life devastating comorbidities, men-

tal disorders (2), low quality of life, sociopsychological problems, (3) and considerable economic burden (4). Besides, obese people are highly stigmatized and confront discrimination and social rejection which leads to disadvantages in society including educational and employment settings as well as other interpersonal relationship aspects (5). The growing number of interventions aimed at weight management such as nutrition and lifestyle modification, behavioral therapy (6, 7), pharmacotherapy, and surgery are either failing at

posing considerable effects in long term weight maintenance (4) or causing unwanted secondary effects (8). Furthermore, act of dieting in restrained eaters cause anger, depression, and anxiety to occur very often (9).

Metaphors enable individuals to comprehend concrete issues by resembling them to the superficially dissimilar concepts (10). Lakoff and Johnson presented conceptual metaphor rather than simply linguistic approach (11). They stated that thoughts and internal images originated from external stimuli generate metaphorical expression. Metaphors are used mostly unconsciously to depict our personal (e.g. life's game) or societal (e.g. war on poverty, cultural climate or consumers of education) life. Metaphors reveal and shape people's thoughts and attitudes towards important issues such as health problems and cause them choose solutions best fitting to their understanding of embodied problems. Keefer and colleagues demonstrated that framing depression as bodily state, motivate study participants toward metaphorically fit depression treatment and increased antidepressant treatment effect (12). In a study by Barry, the metaphors used by the people to understand rising obesity rates, although with various influence, were strong predictors of public policy support (13).

Considering that metaphoric statement indicates individuals' comprehension of health issues, we aimed to assess if individuals' metaphorical expression of either self or their own lives is related to their dietary pattern.

Subjects

A cross-sectional study was done. The study participants were recruited from individuals who attended diet clinics in Shiraz, Iran, over a period of six months. Ethics approval was obtained from the Ethics Committee of Shiraz University of Medical Sciences. Adults (18-65 years) without history of mental problems, and diseases or disorders considering special nutrition management as well as individuals who had not undergone weight loss surgery within 6 months prior to enrolment were included in the study. Individuals with BMI less than 18.5 were excluded.

Materials and methods

Anthropometric and covariate measurements: weight was measured in kilograms using a digital weight scale with 2 consecutive measurements. Standing height was measured using a stadiometer with a fixed vertical backboard and an adjustable headboard in centimeter (Seca 703, Perth, WA). Calibration was scheduled at the start of daily measurements for digital weight scale and weekly for stadiometer. Waist circumference was measured on mid-way between the iliac crest and the lower rib in centimeter (14) using Seca 201CM Ergonomic Circumference Measuring Tape. Socio-demographic characteristics included age, sex, occupation, and marital status and medical history were asked by a self-administered questionnaire.

Dietary intake: A validated 168 food item FFQ was used for dietary assessment (15). The questionnaire was administered by trained nutritionists. The study subjects were asked about how often they consumed each food item during the preceding year as predefined serving per day (e.g. bread, rice), per week (e.g. egg, fish) or per month (e.g. sweets). Average intake in g/day was calculated for each participants using household measures (16).

Metaphor assessment

To assess the individual's metaphorical expression of themselves and their own lives, Osgood semantic differential method (17) was used. This method suggests strength, value and activity as three major dimensions that people use to give meaning to words and phrases. In this technique, there are 20 pairs of adjectives at the opposite ends of a 7-point scale. The value subtheme consists of 8 adjective pairs: 1- good/bad 2- clean/dirty 3- kind/mean 4- happy/sad 5- smooth/rough 6- beautiful/ugly 7- hot/cold 8- brave/coward. The activity subtheme includes 6 adjective pairs: 1- honest/dishonest 2- relaxed/tense 3- deep/shallow 4- active/passive 5- sharp/dull 6- slow/fast. The strength subtheme comprises 6 adjective pairs: 1-peaceful/aggressive 2- wealthy/poor 3- strong/weak 4- hard/soft 5- delicate/coarse 6- thin/obese. The items are rated

from 1 to 7 starting from negative adjectives to the positive ones, respectively. Hence, higher scores reflect better emotional state (18). Regarding this rating scheme, each person would obtain a score varying from 20-140, which results in an average score of 80. Scores higher than 80 would indicate a positive attitude toward life and the self and scores lower than 80 would suggest the opposite. First, a trained interviewer explained the metaphor concept to each participant. Then, the respondents were asked to answer the questions according to their first impression.

Statistical analysis

Data are shown as mean and standard deviation as well as frequency and percentage as appropriate. The Kolmogorov-Smirnov test was used for normality assessment. Dietary patterns extraction method was principal component analysis with the orthogonal rotation Varimax with Kaiser Normalization. With this method linear combination of food items explaining greatest amount of variance creates fewer components (dietary patterns). To assess the strength of the relationships and suggest factorability of the variables, Bartlett's test of Sphericity and Kaiser-Meyer-Olkin (KMO) Test of Sampling Adequacy were used. Bartlett's test of Sphericity was significant (P value <0.001) and KMO was 0.73, which has middling degree of common variance (19). One-way ANOVA test was

used to test the participant's characteristics differences over BMI categories. Kruskal Wallis test was used to assess dietary pattern differences over BMI, age, waist circumference, and self and life metaphor scores. The association of the participants' dietary patterns with categorical variables (sex, marital status, education, occupation categories) was tested using Chi-square test. All statistical analyses were done in IBM SPSS software version 22. The significance level was set at P value <0.05.

Results

The study participants' characteristics are presented in Table 1. Three dietary patterns were extracted based on Eigen value more than 1. Mediterranean dietary pattern including leafy vegetables, other non-starchy vegetables, fruits and fruit juices, low fat dairy, olive, and olive oil; Inflammatory dietary pattern that was positive for refined grains, high fat dairy, hydrogenated oils, sweets, and ice cream; and snacking dietary pattern that included snacks, pickles, carbonated drinks, and sweetened juices. There were no negative value for dietary patterns (Table 2). Table 3 shows the relationship between dietary patterns and socio-demographic, and anthropometric variables. Scores for dietary patterns were categorized by tertiles. Both Mediterranean pattern and inflammatory pattern had a significant association with body mass index (BMI)

Table 1. Participants characteristics

	Normal weight n= 96 mean (S.D)	Overweight n= 66 mean (S.D).	Obese n= 47 mean (S.D)
Age	28.33 (10.16)	35.73 (11.49)	36.98 (12.35)
[†] Sex			
Female	72 (75)	36 (54.5)	34 (72.3)
male	24 (25)	30 (45.5)	13 (27.7)
Height (m)	1.66 (0.08)	1.68 (0.09)	1.64 (0.08)
Weight (kg)	60.19 (8.79)	76.94 (9.15)	89.51 (11.86)
BMI (kg/m ²)	21.79 (1.84)	26.91 (1.31)	33.2 (3.64)
Waist (cm)	78.68 (23.18)	89.21 (27.33)	98.38 (27.81)
Metaphor of life	92.82 (21.84)	87.82 (19.46)	97.91 (14.5)
Metaphor of self	104.43 (15.24)	101.97 (15.85)	88.98 (19.31)

[†]Data are presented as n (%).

Table 2: The dietary patterns

	Factor loading coefficients		
	The Mediterranean pattern	The inflammatory pattern	The snacking pattern
Leafy vegetables	0.73	-	-
Non starchy vegetables	0.7	-	-
Fruits and juices	0.67	-	-
Low fat dairies	0.47	-	-
Olive	0.44	-	-
Refined grain	-	0.63	-
Sweets	-	0.44	-
High fat dairy	-	0.62	-
Solid oil	-	0.64	-
Ice cream	-	0.61	-
sugar-sweetened soft drinks	-	-	0.63
pickles	-	-	0.58
snacks	-	-	0.7

($P=0.03$ and $P=0.01$, respectively). Moreover, a significant association was found between inflammatory dietary pattern and waist circumference ($P=0.001$). Dietary pattern preference seems to be related to occupation categories ($P=0.04$). A slightly higher proportion of subjects in the high social rank jobs was in the highest tertile of inflammatory pattern (48.6%, 18/37). Significant difference in obeying Mediterranean dietary pattern was found between married and single subjects ($P<0.001$). Many more married persons were in the highest tertile of Mediterranean dietary pattern than single participants (49.1% vs. 21.8%). The association between dietary patterns and the questionnaire scores were also tested. There were a negative association between inflammatory dietary pattern and metaphor of self ($P=0.003$) and life ($P=0.03$) questionnaire scores. A negative association was also found between snacking dietary pattern and metaphor of self ($P=0.003$) and life ($P=0.01$) questionnaire scores. No significant differences were found between the sex groups as well as the age and education regarding the dietary patterns.

Discussion

In a sample of healthy obese, overweight, and normal weight adult subjects, three dietary patterns were derived. Inflammatory pattern was negatively as-

sociated with the participants' metaphorical statement about themselves and their own lives. Similar consequences were found for snacking pattern. The participants who were employed in the high social rank jobs and whom had greater waist circumference tended to have inflammatory pattern. Married subjects had more tendencies to follow Mediterranean pattern.

An important message of the present study is that inflammatory and snacking dietary patterns are associated with negative metaphoric narration of self or life. To our knowledge, this study investigated, for the first time, the association between individuals' bodily statement about themselves and their own lives with their food patterns.

Mediterranean dietary pattern in our study is similar to the healthy pattern found in previous study in Iranian population (20). In the study by Rezazadeh and colleagues, healthy and unhealthy patterns derived. Healthy pattern consisted of fruits and vegetables, poultry, legumes, low fat dairy, and olive. Esmaillzadeh and cow-workers, reported somewhat similar pattern in a population of female teachers. Healthy pattern found as high in fruits and vegetables, poultry, legumes, and whole grains (21).

Our inflammatory pattern is in accordance with empty calorie pattern in Framingham study. Rich in fats, sweets, and deserts, and empty calorie pattern had the highest multivariate adjusted risk for developing overweight in women (22). Snacking pattern, however,

Table 3. Dietary pattern differences over demographic, anthropometrical and psychological variables

	Mediterranean pattern			Inflammatory pattern			Snacking pattern					
	T1 n= 70	T2 n= 70	T3 n= 70	P-value	T1 n= 70	T2 n= 70	T3 n= 70	P-value	T1 n= 70	T2 n= 70	T3 n= 70	P-value
BMI mean (S.D)	25.16 (4.43)	25.44 (4.66)	27.32 (5.65)	0.03	24.58 (4.37)	26.03 (4.66)	27.31 (5.62)	0.01	25.29 (5.52)	25.62 (3.8)	27.02 (5.47)	0.09
Sex n (%)												
Female	43 (62.3)	51 (72.9)	48 (68.6)	0.4	52 (75.4)	47 (66.2)	43 (62.3)	0.24	42 (60.9)	49 (69)	51 (73.9)	0.25
Male	26 (37.3)	19 (27.1)	22 (31.4)		17 (24.6)	24 (33.8)	26 (37.7)		27 (30.9)	22 (31)	18 (26.1)	
Age mean (S.D)	30.49 (9.8)	32.63 (11.77)	34.69 (13.19)	0.3	33.23 (12.16)	32.11 (10.62)	32.51 (12.55)	0.86	34.04 (11.95)	33.25 (11.18)	30.52 (11.99)	0.17
Occupation n (%)				0.88				0.04				0.97
High social rank jobs	10 (14.5)	14 (20)	13 (18.6)		8 (11.6)	11 (15.5)	18 (26.1)		12 (17.4)	13 (18.3)	12 (17.4)	
Low social rank jobs	16 (23.2)	12 (17.1)	13 (18.6)		11 (15.9)	18 (25.4)	12 (17.4)		13 (18.8)	15 (21.1)	13 (18.8)	
University student	18 (26.1)	20 (28.6)	18 (25.7)		24 (34.8)	22 (31)	10 (14.5)		19 (27.5)	16 (22.5)	21 (30.4)	
Housewife	11 (15.9)	15 (21.4)	12 (17.1)		16 (23.2)	10 (14.1)	12 (17.4)		12 (17.4)	16 (22.5)	10 (14.5)	
Unemployed	13 (18.8)	8 (11.4)	13 (18.6)		10 (4.5)	9 (12.7)	15 (21.7)		11 (15.9)	11 (15.5)	12 (17.4)	
Education n (%)				0.6				0.39				0.87
High school diploma	16 (23.2)	19 (27.1)	21 (30)		22 (31.9)	16 (22.5)	18 (26.1)		20 (29)	19 (28.6)	17 (24.6)	
university degree	53 (76.8)	47 (67.1)	48 (68.6)		45 (65.2)	55 (77.5)	48 (69.6)		48 (69.6)	50 (70.4)	50 (72.5)	
Waist circumference	85.4 (27.07)	86.56 (25.4)	87.33 (27.88)	0.4	77.49 (32.81)	88.3 (22.28)	93.46 (21.37)	0.001	84.81 (27.66)	87.46 (21.82)	87 (30.32)	0.75
Marriage status n (%)												
Married	26 (37.7)	42 (60)	49 (70)	<0.001	37 (53.6)	38 (53.5)	42 (60.9)	0.6	37 (53.6)	41 (57.7)	39 (56.5)	0.88
Single	43 (62.3)	28 (40)	21 (30)		32 (46.4)	33 (46.5)	27 (39.1)		32 (46.4)	30 (42.3)	30 (43.5)	
Metaphor of self mean (S.D)	101.07 (16.23)	103.41 (14.38)	102.07 (15.72)	0.47	106.34 (17.07)	100.29 (13.9)	99.87 (14.42)	0.03	105.2 (14.47)	103.99 (17.36)	97.47 (13.12)	0.003
Metaphor of life mean (S.D)	88.43 (21.24)	91.2 (20.26)	91.61 (20.45)	0.78	95.51 (20.86)	88.72 (20.65)	86.87 (19.56)	0.03	95.2 (22.54)	90.5 (21.09)	85.77 (17.15)	0.01

T1: Lowest score tertile, T2: Medium score tertile, T3: Highest score tertile.

was unique regarding food constituents and loading factors thereof, differ from those in previous studies.

The results of our study regarding the association between inflammatory dietary pattern and BMI and waist circumference are in line with unhealthy or western pattern in other observational investigations (20, 21). Nonetheless, compared with the referent investigations we found positive association between Mediterranean dietary patterns and BMI. However, we studied subjects without any disease or disorder, which necessitated dietary change. For metabolically healthy obese subjects following Mediterranean dietary pattern, weight loss may not be an essential requirement. Moreover, there is not strong evidence that dietary pattern high in fruit and vegetable is related to lower BMI (23).

In view of pattern differences over marriage status, Barker and colleagues investigated sociocultural factor relevance to dietary behaviours in Northern Ireland and showed that married ones tended towards modern concepts of healthy eating behaviour. They pointed to the role of women as food providers at home (24). Also, people try to maintain commensal relationship primarily with family members rather than friends. Sobal and Nelson observed demographical difference in commensal eating pattern. They found that unmarried persons more often ate alone and more times ate with friends (25). Other study reported that single, divorced, and widowed men in Spain tended to follow western pattern rather than Spain-Mediterranean pattern (26).

Considering eating behaviour among occupation and employment status, findings of various investigations are inconsistent. While in Helsinki study occupational status was not contributed to eating habits, Whitehall II Study showed unhealthy food habits among passive workers and those with overtime jobs rather than normal time jobs (27). Dynesen and colleagues assessed whether sociodemographic factors affect dietary habits of Danish people. In their study, occupation had very weak association with consuming any type of food (28). In the study by Lallukka and colleagues, high occupation class revealed significant association with healthy food intake. The authors suggested that the association of healthy eating and occupation class might be mediated by income (29). Due to sociocultural context of our society, we were

not able, however, to ask the participants about their income. Moreover, accumulative and synergistic effect of occupational class and education was determined on food choices (30). Lack of association between healthy dietary pattern and high social rank jobs in our study may be in part owing to the absence of dietary pattern difference by education.

Maintaining a healthy eating pattern and normal weight in long term, requires self-regulatory strength to control motivation power of thoughts and emotions and correct behaviours (31). In our study, high BMI among healthy pattern followers may be due to not considering bodily statement in choosing foods, as we found no association between healthy pattern and the participants' metaphorical statements. According to Petit and colleagues, those trying to manage their weight, usually focus on their health goals rather than their physiological signals of satiety and hunger to give in temptations. This leads them to underestimate the quantity of food they consume (31). For example, they tend to estimate the calorie of foods lower when they incorporate vegetables in their diet (32). Nevertheless, our finding may have another reason. Regardless of the health consequence of diet, non-restrained eaters may choose healthy foods because they like them. Even their self-regulation resources are low (33). Thus, non-restrained eaters choose to eat healthy according to their personal attitudes and standards.

We showed that inflammatory and snacking patterns were associated with negative narration of subjects from themselves and their own lives. Some studies investigated the association between dietary pattern and the risk of depression. Mediterranean dietary pattern is known to decrease depression risk (34, 35). In a cohort by Lucas and cow-workers, it was concluded that inflammatory pattern might mediate depression via inflammation. Refined grains, soft drinks, red meat, and margarine in mentioned inflammatory pattern were significantly associated with more than one inflammatory marker (36). As mentioned, obese people are not capable enough in estimating the calorie amounts of foods because of poor consideration of bodily statement (31). So, proper metaphors could be effective in the empowerment of obese people to explain their embodied experience realistically. According to Goldstone and colleagues, when people are

fasted, brain reward bias attract people towards high calorie rather than low calorie foods. Thus, feeling full make people prefer low rather than high calorie foods (37). Levontin, however, suggested that if metaphor caused individuals recreated the sense of fullness they might choose low calorie foods (31).

We studied for the first time the dietary pattern of metabolically healthy subjects in both sexes for their differences over metaphorical statement. The questionnaires completed by interviewing led to a high response rate. It is a limitation of the present research that we did not examined obesity biomarkers to validate the food intake data. The cross-sectional methodology of investigation does not exactly determine whether inflammatory and snacking patterns are responsible for negative metaphors of self and life or those negative bodily statement cause people to consume more fats and sugar. To prove the results, prospective studies are suggested.

In conclusion our investigation determined that diet high in starch and sugar as well as hydrogenated fats is associated with negative narration of individuals' embodied experience about themselves and their own lives. Therapeutic metaphor is suggested to be examined in future investigations to find its role in weight reduction and weight maintenance.

Acknowledgments

This study (Code: 93-01-87-8176) was funded by Research Center of School of Nutrition and Food Sciences, Shiraz University of Medical Sciences. We sincerely thanks Hosseini M, for his assistance with data entry.

References

- Mirzazadeh A, Sadeghirad B, Haghdoost A, Bahreini F, Kermani MR. The prevalence of obesity in Iran in recent decade; a systematic review and meta-analysis study. *Iranian Journal of Public Health*. 2009;38(3):1-11.
- Scott KM, Bruffaerts R, Simon GE, et al. Obesity and mental disorders in the general population: results from the world mental health surveys. *International journal of obesity*. 2008;32(1):192-200.
- Lin H-Y, Huang C-K, Tai C-M, et al. Psychiatric disorders of patients seeking obesity treatment. *BMC psychiatry*. 2013;13(1):1.
- Tapper K, Shaw C, Ilsley J, Hill AJ, Bond FW, Moore L. Exploratory randomised controlled trial of a mindfulness-based weight loss intervention for women. *Appetite*. 2009;52(2):396-404.
- Puhl RM, Heuer CA. The stigma of obesity: a review and update. *Obesity*. 2009;17(5):941-64.
- Dombrowski SU, Knittle K, Avenell A, Araujo-Soares V, Sniehotta FF. Long term maintenance of weight loss with non-surgical interventions in obese adults: systematic review and meta-analyses of randomised controlled trials. *Bmj*. 2014;348:g2646.
- Wadden TA, Berkowitz RI, Womble LG, et al. Randomized trial of lifestyle modification and pharmacotherapy for obesity. *New England Journal of Medicine*. 2005;353(20):2111-20.
- Kim GW, Lin JE, Blomain ES, Waldman SA. Antiobesity pharmacotherapy: new drugs and emerging targets. *Clinical Pharmacology & Therapeutics*. 2014;95(1):53-66.
- Adams CH, Chadbourne J. Therapeutic Metaphor: An Approach to Weight Control. *Personnel & Guidance Journal*. 1982;60(8).
- Landau MJ, Meier BP, Keefer LA. A metaphor-enriched social cognition. *Psychological bulletin*. 2010;136(6):1045.
- Jensen A. Coping with Metaphor: A Cognitive Approach to Translating Metaphor. *Hermes, Journal of Linguistics*. 2005;35:183-209.
- Keefer LA, Landau MJ, Sullivan D, Rothschild ZK. Embodied metaphor and abstract problem solving: Testing a metaphoric fit hypothesis in the health domain. *Journal of Experimental Social Psychology*. 2014;55:12-20.
- Barry CL, Brescoll VL, Brownell KD, Schlesinger M. Obesity metaphors: how beliefs about the causes of obesity affect support for public policy. *Milbank Quarterly*. 2009;87(1):7-47.
- Expert W. Committee on Physical Status: the use and interpretation of anthropometry: report of a WHO Expert Committee. Geneva, Switzerland: World Health Organization; 1995.
- Malekshah A, Kimiagar M, Saadatian-Elahi M, et al. Validity and reliability of a new food frequency questionnaire compared to 24 h recalls and biochemical measurements: pilot phase of Golestan cohort study of esophageal cancer. *European journal of clinical nutrition*. 2006;60(8):971-7.
- Ghaffarpour M, Houshiar-Rad A, Kianfar H. The manual for household measures, cooking yields factors and edible portion of foods. Tehran: Nashre Olume Keshavarzy. 1999;7:213.
- Osgood CE, Luria Z. A blind analysis of a case of multiple personality using the semantic differential. *Journal of Abnormal and Social Psychology*. 1954;49(57):591.
- Song C, Ikei H, Kobayashi M, et al. Effects of viewing forest landscape on middle-aged hypertensive men. *Urban Forestry & Urban Greening*. 2017;21:247-52.
- Beavers AS, Lounsbury JW, Richards JK, Huck SW, Skolits GJ, Esquivel SL. Practical considerations for using exploratory factor analysis in educational research. *Practical assessment, research & evaluation*. 2013;18.

20. Rezazadeh A, Rashidkhani B. The association of general and central obesity with major dietary patterns of adult women living in Tehran, Iran. *Journal of nutritional science and vitaminology*. 2010;56(2):132-8.
21. Esmailzadeh A, Azadbakht L. Major dietary patterns in relation to general obesity and central adiposity among Iranian women. *The Journal of nutrition*. 2008;138(2):358-63.
22. Quatromani PA, Copenhafer DL, D'AGOSTINO RB, Millen BE. Dietary patterns predict the development of overweight in women: The Framingham Nutrition Studies. *Journal of the American Dietetic Association*. 2002;102(9):1239-46.
23. Newby PK, Muller D, Hallfrisch J, Qiao N, Andres R, Tucker KL. Dietary patterns and changes in body mass index and waist circumference in adults. *The American journal of clinical nutrition*. 2003;77(6):1417-25.
24. Barker M, McClean S, Thompson K, Reid N. Dietary behaviours and sociocultural demographics in Northern Ireland. *Br J Nutr*. 1990;64(2):319-29.
25. Sobal J, Nelson MK. Commensal eating patterns: a community study. *Appetite*. 2003;41(2):181-90.
26. Sánchez-Villegas A, Delgado-Rodríguez M, Martínez-González MA, De Irala-Estevez J. Gender, age, socio-demographic and lifestyle factors associated with major dietary patterns in the Spanish Project SUN (Seguimiento Universidad de Navarra). *European journal of clinical nutrition*. 2003;57(2):285-92.
27. Lallukka T, Lahelma E, Rahkonen O, et al. Associations of job strain and working overtime with adverse health behaviors and obesity: evidence from the Whitehall II Study, Helsinki Health Study, and the Japanese Civil Servants Study. *Social science & medicine*. 2008;66(8):1681-98.
28. Dynesen AW, Haraldsdóttir J, Holm L, Astrup A. Sociodemographic differences in dietary habits described by food frequency questions—results from Denmark. *European Journal of Clinical Nutrition*. 2003;57(12):1586-97.
29. Lallukka T, Laaksonen M, Rahkonen O, Roos E, Lahelma E. Multiple socio-economic circumstances and healthy food habits. *European journal of clinical nutrition*. 2007;61(6):701-10.
30. Galobardes B, Morabia A, Bernstein MS. Diet and socioeconomic position: does the use of different indicators matter? *International Journal of Epidemiology*. 2001;30(2):334-40.
31. Petit O, Basso F, Merunka D, Spence C, Cheok AD, Oullier O. Pleasure and the Control of Food Intake: An Embodied Cognition Approach to Consumer Self-Regulation. *Psychology & Marketing*. 2016;33(8):608-19.
32. Chernev A, Gal D. Categorization effects in value judgments: Averaging bias in evaluating combinations of vices and virtues. *Journal of Marketing Research*. 2010;47(4):738-47.
33. Hofmann W, Rauch W, Gawronski B. And deplete us not into temptation: Automatic attitudes, dietary restraint, and self-regulatory resources as determinants of eating behavior. *Journal of Experimental Social Psychology*. 2007;43(3):497-504.
34. Sanchez-Villegas A, Henriquez P, Bes-Rastrollo M, Dorreste J. Mediterranean diet and depression. *Public health nutrition*. 2006;9(8A):1104-9.
35. Psaltopoulou T, Sergentanis TN, Panagiotakos DB, Sergentanis IN, Kosti R, Scarmeas N. Mediterranean diet, stroke, cognitive impairment, and depression: a meta-analysis. *Annals of neurology*. 2013;74(4):580-91.
36. Lucas M, Chocano-Bedoya P, Shulze MB, et al. Inflammatory dietary pattern and risk of depression among women. *Brain, behavior, and immunity*. 2014;36:46-53.
37. Goldstone AP, Prechtel de Hernandez CG, Beaver JD, et al. Fasting biases brain reward systems towards high-calorie foods. *European Journal of Neuroscience*. 2009;30(8):1625-35.

Correspondence:

Baran Hashemi

School of nutrition and Food sciences,
Shiraz University of Medical Sciences
School of Nutrition and Food Sciences,
Razi St., Shiraz, Iran.

P.O. Box: 71645-111.

E-mail: baran.hashemi@gmail.com