Int J High Risk Behav Addict. 2017 December; 6(4):e63196. doi: 10.5812/ijhrba.63196.

Published online 2017 November 6. **Research Article**

Impact of Subliminal Activation of Abandonment Schema on the Eating Behavior of Obese and Normal Weight Women: An Experimental Study

Parvaneh Mohammadkhani,[1,*] Reza Moloodi,[2] and Safoora Fatemi[3]

[1]Department of Clinical Psychology, University of Social Welfare and Rehabilitation Sciences, Tehran, IR Iran
[2]Substance Abuse and Dependence Research Center, University of Social Welfare and Rehabilitation Sciences, Tehran, IR Iran
[3]Obesity Clinic, Sina Hospital, Tehran University of Medical Sciences, Tehran, IR Iran

[*]*Corresponding author*: Parvaneh Mohammadkhani, Department of Clinical Psychology, University of Social Welfare and Rehabilitation Sciences, Tehran, IR Iran. Tel: +98-2122180045, E-mail: parmohamir@yahoo.com

Received 2015 September 01; **Revised** 2016 May 10; **Accepted** 2017 January 30.

Abstract

Background: Schema focused cognitive- behavioral model proposed that patients with eating disorders (EDs) used bulimic behaviors in order to avoid or suppress negative affects that are triggered by early maladaptive schemas.
Objectives: The aim of the present study was to compare normal weight and obese women in terms of the effect of the activation of abandonment schema.
Patients and Methods: This was a 2-stage approach experimental study. In the first, 81 women (41 normal weight and 40 obese) completed the eating disorder examination questionnaire (EDE-Q) and eating attitude test-26 (EAT-26). In the second, 1 week later, all participants were randomly exposed to subliminal abandonment stimuli (experimental group) or subliminal neutral stimuli (control group). The subliminal abandonment stimuli was the word loneliness and the neutral stimuli was the word gallery. Each word was presented on a visual screen for 2 milliseconds (ms). Then, the participants were instructed that they were able to eat pistachios provided by the experimenter. The weight of consumed food was recorded as the dependent variable.
Results: Both obese and normal weight women exposed to abandonment themes (loneliness) consumed significantly more food than their counterparts exposed to neutral stimuli. The univariate analysis of covariance indicated that normal weight women in the control group did not differ from obese women in the control group on the amount of consumed pistachios after controlling EDE-Q, EAT-26, and body mass index (BMI). Moreover, the univariate analysis of covariance showed that the amount of food consumed by normal weight women in the experimental condition and obese women in the experimental group did not differ when BMI, EDE-Q, and EAT-26 were controlled.
Conclusions: These results provide indirect support for schemata based theory of eating disorders. In other words, abandonment themes activate eating behaviors that presumably serve to avoid negative emotions.

Keywords: Cognitive Therapy, Avoidance, Feeding Behaviors, Obesity

1. Background

Many studies have indicated that eating disorders (ED) and eating disordered behaviors are rather common phenomena among young and middle aged women in western (1) and eastern (2-4) communities. A large portion of health care resources are directly or indirectly devoted to patients with eating disorders. For example, ED patients experience a 36-day hospitalization on average for their eating problems (5). In addition, about 80% of ED patients have other mental disorders (such as, anxiety, mood, personality disorders) and/or physical comorbidity (such as cardiovascular, endocrine, and musculoskeletal disorders) (6). Thus, eating disorders impose a huge burden on health care. Therefore, development of theories that can explain the incidence and maintenance of ED and provision of effective treatments are considered a clinical and research necessity. The schema focused cognitive- behavioral model for eating disorders (7) is one recent valuable theory in the field of ED.

It proposes that all types of patients with eating disorders score higher on maladaptive schemas such as abandonment, emotional deprivation, and defectiveness/shame (8-20). However, the theory postulated that patterns of schema processes (overcompensation or avoidance strategy) explain the differences between restrictive

and bulimic behaviors. Restrictive behaviors (such as restraint dieting or dietary restriction) refer to primary avoidance of negative affect via the process of schema counterattack. In this process, a compensatory schema (such as unrelenting standards) and the related behavior (e.g. perfectionism) are activated to avoid experiencing the unpleasant emotion in the first place (7, 21). On the other hand, bulimic behaviors are related to the secondary avoidance of the negative affect. In other words, the bulimic behavior is a means of reducing or suppressing the negative emotion after it was experienced through a process of schema avoidance. For example, someone with bulimia who engages in a romantic relationship or challenging task may experience the activation of abandonment, defectiveness/shame, or failure schemas. As a result, the individual tries binge eating in order to regulate negative emotions. In other words, these individuals try not to experience their emotions; they binge in order to escape from the negative emotional arousal (22-25).

In line with the theory, some experimental studies on nonclinical women have demonstrated higher levels of eating in response to subliminal abandonment cues. The subliminal activation of abandonment schema was achieved through the presentation of a visual cue (e.g. the word loneliness), which is too fast (e.g., 4 ms) to be identified at a conscious level (26). For example, Meyer and Waller (27) examined the impact of presentation of abandonment and food/shape cues on the activation of abandonment or food related schemata on 82 non-clinical women. They found that subliminal presentation of abandonment cues resulted in the activation of food and shape related schema. In another study, Waller and Mijatovich (28) investigated the effect of self-esteem threat and physical threat stimuli on the eating behavior among nonclinical women with different levels of healthy eating attitudes (N = 60). They reported that women with healthy eating attitudes ate a bit more after exposure to the self-esteem threat ("Mom hates me"), however, not after the physical threat ("Mom hurts me"). The group with unhealthy eating attitudes consumed more food after exposure to both forms of threats, especially after the self-esteem threat. The authors concluded that women with higher levels of unhealthy eating attitudes used a more avoidance behavior (e.g. eating) after preconscious activation of threat-related schema. Finally, Waller and Barter (29) tried to answer the question of whether the effect of the activation of abandonment schema on the eating behavior can be neutralized by counter schematic information (e.g. unification cues). Therefore, they exposed 96 non-clinical women to the abandonment stimuli (loneliness), which either preceded or followed by neutral (gallery) or unification (friendship) cues. The dependent variable was the amount of food eaten after the task. Authors found that women who were exposed to neutral- abandonment or abandonment- neutral stimuli ate significantly more than women who saw the unification cue before or after the subliminal activation of abandonment schema. Therefore, they argued that the activation of abandonment schema resulted in greater food consumption as a way of avoidance from negative emotions. In addition, the results implied that the unification cues could diminish the negative effects of abandonment schema. However, these studies did not investigate the impact of the activation of abandonment schema on the eating behaviors of obese women.

2. Objectives

The aim of the present study was to compare normal weight and obese women in terms of the effect of the activation of abandonment schemas. Five hypotheses of the current study were 1) obese women who were exposed to abandonment stimuli (obese women in the experimental group) eat significantly more than obese women who saw neutral cue (obese women in the control group); 2) normal weight women who were exposed to abandonment stimuli (normal weight women in the experimental group) eat significantly more than normal weight participants who saw neutral stimuli (normal weight women in the control group); 3) do normal weight women who were exposed to abandonment stimuli eat more food than obese women who were exposed to the neutral stimuli?; 4) do the amount of food eaten differ between normal weight and obese women who were exposed to the neutral cue?, and 5) do the amount of food consumed differ between the normal weight and the obese women who saw the abandonment stimuli?

3. Patients and Methods

Participants included 40 obese women (BMI > 30) who were referred to the obesity clinic at the Sina hospital of Tehran Medical University as well as 41 normal weight women (20 < BMI < 25) who were recruited among the hospital employees and compeers of the obese women. Among the obese women in control group, 3 participants refused to complete the procedure and were excluded from the analysis. The group of normal weight women in the experimental condition included 21 women. They would have been excluded from the study if they had been pregnant or suffered from bipolar mood disorder, psychotic disorder or substance use disorder, and nut allergies. Both obese and normal weight women were randomly assigned to the experimental (abandonment stimuli) or control (neutral stimuli) groups.

3.1. Research Tools

All participants completed the eating attitude test-26 (EAT-26) (30) as well as the eating disorder examination questionnaire (EDE-Q 6.0) (31). EAT-26 is one of the most widely used self-report measures for evaluating eating attitudes and behaviors. Several studies demonstrated acceptable factor structure, concurrent validity, and reliability of various versions of the EAT-26 among Western cultures (32, 33). Nobakht and Dezhkam (34) reported satisfactory internal consistency and test-retest reliability among adolescent Iranian girls. Moreover, Ahmadi, Moloodi, Ghaderi, and Zarbakhsh (35), after rigorous translation and back translation, explored the structural, concurrent and discriminant validity, as well as the reliability of Persian version of EAT-26 among young adult women. They found that a 5-factor solution provided the best model fit for the EAT-26. These factors indicated good concurrent and discriminant validity as well as test-retest and internal consistency. EDE-Q (31) was designed to assess the cognitive and behavioral features of eating disorders focusing on the last 28 days. In addition to the behavioral data, the EDE-Q provides a global score as well as 4 subscales including restraint, shape concern, weight concern, and eating concern. Frequencies of the pathological eating behaviors (such as binge eating, laxative misuse) are evaluated through 7 items. These items focus on the number of times the behaviors occurred during the past 28 days. Psychometric properties of the EDE-Q have been demonstrated by several studies (36-40). Mahmoodi, Moloodi, Ghaderi et al., (41) investigated the data norm and validity and reliability of among Iranian female students. The results indicated satisfactory concurrent and discriminant validity as well as internal consistency. One week after the completion of the questionnaires, every participant was exposed to 1 subliminal visual stimulus. Each cue was a single word that appeared in the center of the screen for 2 ms for 10 times with a 5 second interval. In line with previous researches (27, 29), the word "gallery" was used as the neutral stimuli and the word "loneliness" was used as the abandonment stimuli. Finally, the 3rd author measured objectively the height and the weight of the participants and calculated the BMI for each woman.

3.2. Procedure

In order to reduce the impact of expectancy effects, participants were unaware of the purpose of the research until debriefing at the end of the investigation. A 2-stage approach was used. In the 1st stage, participants answered EAT-26 (30) and EDE-Q (37). One week later, in the 2nd stage, each woman was randomly assigned to experimental or control condition (blind to EAT-26 and EDE-Q scores), and exposed to the relevant stimuli. After that, each participant was given an opportunity to eat. In the subliminal task, women were told that the purpose of the task was to evaluate the effect of mild hunger on visual sensitivity. Therefore, women must abstain from eating for at least 2 hours before the task. They were told that a word would appear so quickly that it would be difficult to see it. The word was presented in the center of a laptop screen, 10 times, for 2 ms, with a 5 second interval (Sony, Model: VGN-cr590). In order to diminish the risk of conscious awareness of the stimuli, an exposure time shorter than the previous studies (27-29) was used.

After the presentation of the subliminal stimuli, the participants were told that they have a break. Women were told that they had passed the part of the study that they could not eat. Therefore, a dish of raw Pistachios was provided and women were told that they could eat. The experimenter left participants alone with a dish of raw Pistachios. The experimenter got back exactly 5 minutes later and informed that the experiment was complete. The dependent variable was the weight (Gram) of raw Pistachios eaten within 5 minutes. Finally, the experimenter explained the purpose of the study to the participants. The study procedure was approved by the Ethical Committee of the University of Social Welfare and Rehabilitation Sciences. All participants signed a written consent to take part in the research.

After collecting the data, statistical analysis was conducted using SPSS19. Statistical significance was defined as $P < 0.05$ level. The demographic data of the groups were compared via the Chi-square test and univariate analysis of variance (ANOVA). The Kolmogorov- Smirnov test indicated that the dependent variable (the gram of the food eaten) has normal distribution among the 4 groups (z = ranged from 0.81 to 1.29, P = ranged from 0.07 to 0.51). Levene's test was used to test the assumption of the homogeneity of variance. Univariate analysis of variance (ANOVA), univariate analysis of covariance (ANCOVA), and Mann Whitney U test was used to determine the differences in the weight of food consumed in the 5 minutes after the subliminal exposure to the word. BMI, EDE-Q, and EAT-26 scores were used as covariates to rule out any intergroup differences in these variables.

4. Results

The mean BMI of obese and normal weight women as well as their EDE-Q and EAT-26 scores are presented in Table 1. Normal weight women in the experimental group and normal weight women in the control group did not differ significantly on the BMI, EDE-Q, and EAT-26. The same results were found in the experimental and control groups

of obese women. However, obese women scored significantly higher than normal weight women on BMI, EDE-Q, and EAT-26. The 2 groups of normal weight women did not differ on marital status ($x^2 = 1.08$, P = 0.58). The same results were found among the 2 groups of obese women ($x^2 = 1.20$, P = 0.54).

Since the obese women in the experimental group and the obese women in the control group did not differ on covariate variables, we used ANOVA to compare the 2 groups on the amount of food eaten. Levene's test revealed that the assumption of homogeneity of variance was met ($df_1 = 1$, $df_2 = 35$, F= 2.85, P = 0.09). The obese women in the experimental group ate significantly (Mean = 4.37, SD = 4.32) more pistachios than the obese women in the control group (Mean = 1.14, SD = 2.77) (Table 2).

Normal weight women in the experimental group and normal weight women in the control group did not differ significantly on BMI, EDE-Q, and EAT-26. Thus, ANOVA was utilized to determine the differences between the 2 groups on the amount of pistachios eaten. Levene's test showed that the assumption of homogeneity of variance was observed ($df_1 = 1$, $df_2 = 38$, F = 2.09, P = 0.15). As can be seen in Table 3, normal weight women in the experimental group consumed (Mean = 1.50, SD = 1.16) significantly more food than normal weight women in the control group (Mean = 0.64, SD = 0.74).

In light of the significant differences between normal weight women in the experimental group and the obese women in the control group, in regards to BMI, EDE-Q, and EAT-26 scores, we utilized ANCOVA in order to compare these 2 groups on the amount of food eaten. The result of Levene's test verified that the assumption of homogeneity of variance was observed ($df_1 = 1$, $df_2 = 35$, F = 1.83, P = 0.18). Moreover, in order to evaluate homogeneity of regression slope assumption, the interaction between group condition and BMI, EAT-26, and EDE-Q scores were explored. Results implied that there were no significant interaction between group condition and BMI ($F_{2,\ 37} = 0.34$, P = 0.71), group condition and EAT-26 ($F_{2,\ 37} = 2.40$, P = 0.10), as well as group condition and EDE-Q ($F_{2,\ 37} = 1.19$, P = 0.31). The ANCOVA did not indicate a significant main effect of the experimental condition F (1, 37) = 0.014, not significant (NS). In other words, although normal weight women in the experimental group ate more pistachios (Mean = 1.50, SD = 1.16) than the obese women in the control group (1.14 g, SD = 2.77), this difference was not statistically significant.

Since the homogeneity of variance was not observed, the normal weight and obese women in the control groups were compared on the amount of food eaten using the Mann Whitney U test. Normal weight women in the control group did not differ with the obese women in the control group on the amount of consumed pistachios (Mann Whitney U = 169, Z = 0.014, P = 0.98).

Since the assumption of homogeneity of variance was not met, Mann Whitney U test was utilized to compare the normal weight women in the experimental condition and obese women in the experimental group on amount of pistachios eaten (Table 6). The obese women in the experimental condition ate significantly more food than normal weight women in experimental group.

5. Discussion

The aim of this experimental study was to investigate the impact of the subliminal activation of the abandonment schema on the eating behavior of normal weight and obese women. Although the present study was not carried out on clinical women and the amount of food consumed was small, all hypotheses were supported by the findings (except for hypothesis 3). Both obese and normal weight women who were exposed to the abandonment stimuli ate significantly more food than their counterparts who saw neutral stimuli (the 1st and the 2nd hypotheses were supported). However, normal weight women in the experimental group did not eat more food than the obese women in the control group (hypothesis 3 was not supported). The obese and the normal weight women in the control groups (neutral stimuli) did not differ on the amount of food eaten (hypothesis 4 was supported). However, obese women in the experimental group consumed significantly more food than normal weight women in experimental condition (abandonment stimuli) (hypothesis 5 was supported). The results of hypothesis 5 implied that subliminal activation of abandonment schema might have greater effect on eating behaviors of obese women than normal weight women. These results indirectly supported the schema focused cognitive behavioral model for eating disorders (7). The theory argues that binge behaviors serve to avoid or suppress negative arousal due to the activation of the early maladaptive schemas. In other words, behavioral strategies are used to reduce awareness of negative emotions. These findings are implicitly in agreement with the previous literature indicating that women with eating disorders scored higher on early maladaptive schemas than non-clinical women using self report measures (10-14, 16-18). In addition, the present results are in line with previous experimental researches reporting that the subliminal activation of abandonment schema increased the amount of food eaten in non-clinical women (27, 29, 42-44). On the other hand, these findings are in line with the Zhu et al. study (24), which demonstrated the mediating role of early maladaptive schemas between life event stress and binge eating behaviors. Consistency in the results of this type

Table 1. Univariate Analysis of Variance in the Four Groups on the BMI, EAT-26, and EDE-Q Scores[a,b]

Variables	Normal Weight Women in the Control Group	Normal Weight Women in the Experimental Group	Obese Women in the Control Group	Obese Women in the experimental Group	F	P Value	Tukey
	Group 1	Group 2	Group 3	Group 4			
BMI	22.59 (1.84)	21.58 (1.48)	34.29 (1.73)	35.02 (2.75)	35.35	0.0001	1 = 2 < 3 = 4
EDE-Q	1.53 (1.22)	1.3 (1.31)	2.45 (1.28)	2.51 (1.2)	4.74	0.004	1 = 2 < 3 = 4
EAT-26	12.2 (9.09)	9.9 (10.03)	17.94 (9.42)	16.8 (8.63)	3.16	0.03	1 = 2 < 3 = 4

[a] Values are expressed as mean ± SD.
[b] P < 0.01.

Table 2. Univariate Analysis of Variance Between the Obese Women in the Experimental Group and the Obese Women in the Control Group

Variables	df	Sum of Square	Mean Square	F	P Value
Group	1	95.74	95.74	7.80	0.008
Error	35	424.76	12.1		

Table 3. Univariate Analysis of Variance Between the Normal Weight Women in the Experimental Group and the Normal Weight Women in the Control Group

Variables	df	Sum of Square	Mean Square	F	P Vale
Group	1	7.26	7.26	7.63	0.009
Error	38	36.16	0.95		

Table 4. Univariate Analysis of Covariance Between the Normal Weight Women in the Experimental Group and the Obese Women in the Control Group

Variables	df	Sum of Square	Mean Square	F	P Vale
Group	1	0.037	0.037	0.014	0.90
Error	32	86.83	2.71		
BMI	1	0.003	0.003	0.001	0.97
EAT-26	1	7.51	7.51	2.76	0.10
EDE-Q	1	2.51	2.51	0.92	0.34

Table 5. Mann Whitney U Test Between the Normal Weight Women in the Control Group and the Obese Women in the Control Group

Group	No.	Mean Rank	Mann Whitney U	Z	P Value
Normal weight women in the control group	20	19.02	169	0.014	0.98
Obese women in the control group	17	18.97			

of research among different cultures implies the cross-cultural validity of schema focused cognitive-behavioral theory for eating disorders. It should be noted that when very slight activation of abandonment schema in a virtual and experimental situation can increase the amount of food eaten to 3 to 4 times among non-clinical women, the effect of lifelike activation of the schema in patients with eating disorders must be so strong that a binge eating episode occurs (24).

The results of the study should be interpreted with caution. First, the obese women were recruited from among the clients of the obesity clinic, where the clients received

Table 6. Mann Whitney U Test Between the Normal Weight Women in the Experimental Group and the Obese Women in the Experimental Group

Group	No.	Mean Rank	Mann Whitney U	Z	P Vale
Normal weight women in the control group	20	15.43	98.50	2.70	0.006
Obese women in the control group	20	25.58			

dieting programs to reduce their weight. Although, we selected obese participants from those who were referred for the first time and did not start a formal dieting program, they might already have initiated reducing the calorie intake by themselves. It might explain why the amount eaten was small. This limits the generalization of the findings to obese women who did not intend to reduce their weight. Second, we used maladaptive eating attitudes as controlling variables. Interestingly, after controlling these factors the obese and normal weight women who were exposed to the same stimuli did not differ on the amount of food eaten. At least 1 study showed that maladaptive attitudes regarding eating, shape, and weight mediated the relationship between early maladaptive schemas and pathological eating behaviors (45). Therefore, investigating the relationship between early maladaptive schema, maladaptive eating attitudes, and pathological eating behaviors in Iranian women is a research necessity. If future researches demonstrate maladaptive eating attitudes as a mediator between early maladaptive schemas and disordered eating behaviors, there will be no need to consider the maladaptive eating attitudes as a contaminating factor.

Acknowledgments

This research is supported by the University of Social Welfare and Rehabilitation Sciences (grant number 29690).

Footnotes

Authors' Contribution: Parvaneh Mohammadkhani and Reza Moloodi designed the research protocol and wrote the paper. Safoora Fatemi collected the data. The data analysis was conducted by Reza Moloodi.

Financial Disclosure: All authors declare that they have no financial interests related to the material in the manuscript.

References

1. Kessler RC, Berglund PA, Chiu WT, Deitz AC, Hudson JI, Shahly V, et al. The prevalence and correlates of binge eating disorder in the World Health Organization World Mental Health Surveys. *Biol Psychiatry.* 2013;**73**(9):904–14. doi: 10.1016/j.biopsych.2012.11.020. [PubMed: 23290497].
2. Smink FR, van Hoeken D, Hoek HW. Epidemiology of eating disorders: incidence, prevalence and mortality rates. *Curr Psychiatry Rep.* 2012;**14**(4):406–14. doi: 10.1007/s11920-012-0282-y. [PubMed: 22644309].
3. Pike KM, Dunne PE. The rise of eating disorders in Asia: a review. *J Eat Disord.* 2015;**3**:33. doi: 10.1186/s40337-015-0070-2. [PubMed: 26388993].
4. Qian J, Hu Q, Wan Y, Li T, Wu M, Ren Z, et al. Prevalence of eating disorders in the general population: a systematic review. *Shanghai Arch Psychiatry.* 2013;**25**(4):212–23. doi: 10.3969/j.issn.1002-0829.2013.04.003. [PubMed: 24991159].
5. Thompson A, Shaw M, Harrison G, Ho D, Gunnell D, Verne J. Patterns of hospital admission for adult psychiatric illness in England: analysis of Hospital Episode Statistics data. *Br J Psychiatry.* 2004;**185**:334–41. doi: 10.1192/bjp.185.4.334. [PubMed: 15458994].
6. Hudson JI, Hiripi E, Pope HJ, Kessler RC. The prevalence and correlates of eating disorders in the National Comorbidity Survey Replication. *Biol Psychiatry.* 2007;**61**(3):348–58. doi: 10.1016/j.biopsych.2006.03.040. [PubMed: 16815322].
7. Waller G, Kennerley H, Ohanian V. In: Cognitive Schemas and Core Beliefs in Psychological Problems: A Scientist-Practitioner Guide. Riso LP, du Toit PL, Stein DJ, Young JE, editors. Washington: American Psychological Association; 2007. pp. 139–75.Schema-focused cognitive-behavioral therapy for eating disorders.
8. Cooper M, Hunt J. Core beliefs and underlying assumptions in bulimia nervosa and depression. *Behav Res Ther.* 1998;**36**(9):895–8. doi: 10.1016/S0005-7967(98)00068-0. [PubMed: 9701863].
9. Cooper MJ, Rose KS, Turner H. Core beliefs and the presence or absence of eating disorder symptoms and depressive symptoms in adolescent girls. *Int J Eat Disord.* 2005;**38**(1):60–4. doi: 10.1002/eat.20157. [PubMed: 15971249].
10. Lee D. Maladaptive cognitive schemas as mediators between perfectionism and psychological distress. Florida State University; 2007.
11. Leung N, Price E. Core beliefs in dieters and eating disordered women. *Eat Behav.* 2007;**8**(1):65–72. doi: 10.1016/j.eatbeh.2006.01.001. [PubMed: 17174853].
12. Leung N, Thomas G, Waller G. The relationship between parental bonding and core beliefs in anorexic and bulimic women. *Br J Clin Psychol.* 2000;**39 (Pt 2)**:205–13. doi: 10.1348/014466500163220. [PubMed: 10895363].
13. Leung N, Waller G, Thomas G. Core beliefs in anorexic and bulimic women. *J Nerv Ment Dis.* 1999;**187**(12):736–41. doi: 10.1097/00005053-199912000-00005. [PubMed: 10665468].
14. Waller G. Schema-level cognitions in patients with binge eating disorder: a case control study. *Int J Eat Disord.* 2003;**33**(4):458–64. doi: 10.1002/eat.10161. [PubMed: 12658675].
15. Waller G, Dickson C, Ohanian V. Cognitive content in bulimic disorders: core beliefs and eating attitudes. *Eat Behav.* 2002;**3**(2):171–8. doi: 10.1016/S1471-0153(01)00056-3. [PubMed: 15001014].
16. Waller G, Ohanian V, Meyer C, Osman S. Cognitive content among bulimic women: the role of core beliefs. *Int J Eat Disord.* 2000;**28**(2):235–41. [PubMed: 10897088].

17. Waller G, Shah R, Ohanian V, Elliott P. Core beliefs in bulimia nervosa and depression: The discriminant validity of young's schema questionnaire. *Behav Ther.* 2001;**32**(1):139–53. doi: 10.1016/s0005-7894(01)80049-6.
18. Damiano SR, Reece J, Reid S, Atkins L, Patton G. Maladaptive schemas in adolescent females with anorexia nervosa and implications for treatment. *Eat Behav.* 2015;**16**:64–71. doi: 10.1016/j.eatbeh.2014.10.016. [PubMed: 25464069].
19. Dingemans AE, Spinhoven P, van Furth EF. Maladaptive core beliefs and eating disorder symptoms. *Eat Behav.* 2006;**7**(3):258–65. doi: 10.1016/j.eatbeh.2005.09.007. [PubMed: 16843229].
20. Moloodi R, Dezhkam M, Mootabi F, Omidvar N. Comparison of early maladaptive schema in obese binge eaters and obese non-binge eaters [In Persian]. *J Behav Sci.* 2010;**4**(2):109–14.
21. Lawson R, Waller G, Lockwood R. Cognitive content and process in eating-disordered patients with obsessive-compulsive features. *Eat Behav.* 2007;**8**(3):305–10. doi: 10.1016/j.eatbeh.2006.11.006. [PubMed: 17606228].
22. McManus F, Waller G. A functional analysis of binge-eating. *Clin Psychol Rev.* 1995;**15**(8):845–63. doi: 10.1016/0272-7358(95)00042-9.
23. Haedt-Matt AA, Keel PK. Revisiting the affect regulation model of binge eating: a meta-analysis of studies using ecological momentary assessment. *Psychol Bull.* 2011;**137**(4):660–81. doi: 10.1037/a0023660. [PubMed: 21574678].
24. Zhu H, Luo X, Cai T, He J, Lu Y, Wu S. Life Event Stress and Binge Eating Among Adolescents: The Roles of Early Maladaptive Schemas and Impulsivity. *Stress Health.* 2016;**32**(4):395–401. doi: 10.1002/smi.2634. [PubMed: 25688978].
25. Van Vlierberghe L, Braet C, Goossens L. Dysfunctional schemas and eating pathology in overweight youth: a case-control study. *Int J Eat Disord.* 2009;**42**(5):437–42. doi: 10.1002/eat.20638. [PubMed: 19115366].
26. Weinberger J, Hardaway R. Separating science from myth in subliminal psychodynamic activation. *Clin Psychol Rev.* 1990;**10**(6):727–56. doi: 10.1016/0272-7358(90)90077-n.
27. Meyer C, Waller G. Subliminal activation of abandonment- and eating-related schemata: relationship with eating disordered attitudes in a nonclinical population. *Int J Eat Disord.* 2000;**27**(3):328–34. [PubMed: 10694719].
28. Waller G, Mijatovich S. Preconscious processing of threat cues: impact on eating among women with unhealthy eating attitudes. *Int J Eat Disord.* 1998;**24**(1):83–9. [PubMed: 9589313].
29. Waller G, Barter G. The impact of subliminal abandonment and unification cues on eating behavior. *Int J Eat Disord.* 2005;**37**(2):156–60. doi: 10.1002/eat.20072. [PubMed: 15732066].
30. Garner DM, Garfinkel PE. The Eating Attitudes Test: an index of the symptoms of anorexia nervosa. *Psychol Med.* 1979;**9**(2):273–9. doi: 10.1017/S0033291700030762. [PubMed: 472072].
31. Fairburn CG. Cognitive behavior therapy and eating disorders. New Yourk: Guilford press; 2008.
32. Doninger GL, Enders CK, Burnett KF. Validity evidence for eating attitudes test scores in a sample of female college athletes. *Meas Phys Educ Exerc Sci.* 2005;**9**(1):35–49. doi: 10.1207/s15327841mpee0901_3.
33. Alvarez-Rayon G, Mancilla-Diaz JM, Vazquez-Arevalo R, Unikel-Santoncini C, Caballero-Romo A, Mercado-Corona D. Validity of the Eating Attitudes Test: a study of Mexican eating disorders patients. *Eat Weight Disord.* 2004;**9**(4):243–8. doi: 10.1007/BF03325077. [PubMed: 15844395].
34. Nobakht M, Dezhkam M. An epidemiological study of eating disorders in Iran. *Int J Eat Disord.* 2000;**28**(3):265–71. doi: 10.1002/1098-108X(200011)28:3<265::AID-EAT3>3.0.CO;2-L. [PubMed: 10942912].
35. Ahmadi S, Moloodi R, Zarbaksh MR, Ghaderi A. Psychometric properties of the Eating Attitude Test-26 for female Iranian students. *Eat Weight Disord.* 2014;**19**(2):183–9. doi: 10.1007/s40519-014-0106-7. [PubMed: 24563207].
36. Black CM, Wilson GT. Assessment of eating disorders: interview versus questionnaire. *Int J Eat Disord.* 1996;**20**(1):43–50. doi: 10.1002/(SICI)1098-108X(199607)20:1<43::AID-EAT5>3.0.CO;2-4. [PubMed: 8807351].
37. Fairburn CG, Beglin SJ. Assessment of eating disorders: interview or self-report questionnaire? *Int J Eat Disord.* 1994;**16**(4):363–70. [PubMed: 7866415].
38. Mond JM, Hay PJ, Rodgers B, Owen C, Beumont PJ. Validity of the Eating Disorder Examination Questionnaire (EDE-Q) in screening for eating disorders in community samples. *Behav Res Ther.* 2004;**42**(5):551–67. doi: 10.1016/S0005-7967(03)00161-X. [PubMed: 15033501].
39. Peterson CB, Crosby RD, Wonderlich SA, Joiner T, Crow SJ, Mitchell JE, et al. Psychometric properties of the eating disorder examination-questionnaire: factor structure and internal consistency. *Int J Eat Disord.* 2007;**40**(4):386–9. doi: 10.1002/eat.20373. [PubMed: 17304585].
40. Wade TD, Byrne S, Bryant-Waugh R. The eating disorder examination: norms and construct validity with young and middle adolescent girls. *Int J Eat Disord.* 2008;**41**(6):551–8. doi: 10.1002/eat.20526. [PubMed: 18433026].
41. Mahmoodi M, Moloodi R, Ghaderi A, Babai Z, Saleh Z, Alasti H, et al. The Persian Version of Eating Disorder Examination Questionnaire and Clinical Impairment Assessment: Norms and Psychometric Properties for Undergraduate Women. *Iran J Psychiatry.* 2016;**11**(2):67–74. [PubMed: 27437002].
42. Agras WS, Telch CF. The effects of caloric deprivation and negative affect on binge eating in obese binge-eating disordered women. *Behav Ther.* 1998;**29**(3):491–503. doi: 10.1016/s0005-7894(98)80045-2.
43. Dingemans AE, Martijn C, Jansen AT, van Furth EF. The effect of suppressing negative emotions on eating behavior in binge eating disorder. *Appetite.* 2009;**52**(1):51–7. doi: 10.1016/j.appet.2008.08.004. [PubMed: 18778742].
44. Waller G, Barnes J. Preconscious processing of body image cues. Impact on body percept and concept. *J Psychosom Res.* 2002;**53**(5):1037–41. doi: 10.1016/S0022-3999(02)00492-0. [PubMed: 12445593].
45. Boone L, Braet C, Vandereycken W, Claes L. Are maladaptive schema domains and perfectionism related to body image concerns in eating disorder patients? *Eur Eat Disord Rev.* 2013;**21**(1):45–51. doi: 10.1002/erv.2175. [PubMed: 22556040].