



# Changes in Eating Self-Efficacy During Weight Loss Intervention with or Without Nutrition Education

Fatemeh Ghannadiasl,<sup>1,\*</sup> and Reza Mahdavi<sup>2</sup>

<sup>1</sup>Faculty of Agricultural and Natural Resources, University of Mohaghegh Ardabili, Ardabil, Iran

<sup>2</sup>Nutrition Research Center, Department of Biochemistry and Diet Therapy, Faculty of Nutrition, Tabriz University of Medical Sciences, Tabriz, Iran

\*Corresponding author: Fatemeh Ghannadiasl, Daneshgah St, 56199-11367, Ardabil, Iran. Tel: +98-4533248449, Fax: +98-4530515256, E-mail: ghannadiasl@uma.ac.ir

Received 2018 January 01; Revised 2017 August 08; Accepted 2017 August 19.

## Abstract

**Background:** Self-efficacy plays an important role in successful weight loss behaviors and weight loss.

**Objectives:** The aim of the study was to compare the effects of a balanced low-calorie diet with or without nutrition education on eating self-efficacy and weight loss among obese women.

**Methods:** In a randomized clinical trial, a sample of 90 apparently healthy obese women was recruited from the nutrition clinic and randomly assigned to receive a balanced low-calorie diet with or without nutrition education. The anthropometric measures and weight efficacy lifestyle questionnaire were completed at baseline, 3, and 6 months after the intervention.

**Results:** The participants demonstrated a significant weight loss and improvement in total self-efficacy score in both the intervention groups (the time effect:  $F=12.64$ ,  $df=2$ ,  $P<0.001$ ,  $F=22.57$ ,  $df=2$ ,  $P<0.001$ , respectively). No significant difference was observed in the social pressure subscale between the two groups after the intervention (the time  $\times$  intervention effect:  $F=2.80$ ,  $P>0.05$ ). The results showed that nutrition education could be more effective in the increase of self-efficacy, especially in the first 3 months in comparison with the second 3 months ( $1.01 \pm 0.38$  vs.  $0.29 \pm 0.17$ ,  $P=0.005$ ).

**Conclusions:** The findings support the use of nutrition education for improvement of self-efficacy subscales among obese women attending nutrition clinics for weight loss.

**Keywords:** Obese Women, Eating Self-Efficacy, Nutrition Education, Weight Loss

## 1. Background

Obesity is a serious public health problem that has increased to the point of representing a worldwide epidemic such that in 2015, approximately 700 million people were considered obese (1). The use of weight loss dieting has been overemphasized as the first modality to treat obesity (2). A deficit of 500 to 1000 calories/day has been prescribed as an integral part of a weight-loss program aiming at achieving a safe rate of weight loss (3).

Self-efficacy is an integrative framework that has been proven useful in a variety of treatment contexts (4). In terms of weight loss, self-efficacy refers to a person's belief in his/her ability to adhere to dietary recommendations (5). It has been reported that self-efficacy plays an important role in successful weight loss behaviors, weight loss, and maintenance (6-8). The persons with high efficacy expectations will engage in important behaviors related to losing weight and persist in the face of weight loss barriers (9). On the other hand, changes in eating self-efficacy have appeared to be an even stronger predictor during treatment than at baseline (4, 10, 11).

Nutrition education intervention is an instructional method of healthy eating promotion aiming at facilitating the voluntary adoption of nutrition-related behaviors beneficial to health (12). It has been reported that nutrition education is significantly associated with changes in the measures of self-efficacy (13, 14).

## 2. Objectives

The aim of the current study was to compare the effects of a balanced low-calorie diet with or without nutrition education in an individual format on eating self-efficacy and its subscales changes and weight loss in short (3 months) and medium term (6 months).

## 3. Methods

The target sample size of 60 subjects (30 in each group) was calculated for the study by considering type error ( $\alpha = 0.05$ ), type error ( $\beta = 0.1$ ), mean and standard deviation in a previous study (15) and using the formula of

$$\frac{\left(z_{1-\frac{\alpha}{2}} + z_{1-\beta}\right)^2 \times (\delta_1^2 - \delta_2^2)}{(\mu_1 - \mu_2)^2} \quad (1)$$

Finally, given an anticipated dropout rate of 30%, enrollment target was set for 90 subjects. In this randomized clinical trial, ninety volunteer obese women were recruited from the nutrition clinic in Ardabil city. The participants were apparently healthy, non-pregnant, non-lactating, and non-menopausal obese women, aged 18-50 years, and body mass index ranged from 30 to 40 kg/m<sup>2</sup>. They had no participation in weight loss programs in the previous 6 months.

Written information, including the purpose of the study and confidentiality of personal information, was given to each participant. The written informed consent form was obtained from the subjects. The protocol of the study was approved by the ethics committee of Tabriz University of Medical Sciences and registered in the registration center for clinical trials in Iran with the registration code IRCT201110181197N12.

Participants' weight, height, and waist circumference were measured using a balanced scale. The body mass index was calculated as weight (kg) divided by squared height (m<sup>2</sup>) of each participant. The anthropometric measurement was done at baseline, 3, and 6 months after the intervention.

Weight efficacy lifestyle questionnaire (WEL) (4) was employed to measure individuals' perceptions of their ability to control their weight by resisting eating in various situations such as availability of food, negative emotions, physical discomfort, positive activities related to eating, and social pressure to eat. The participants were asked to rate their confidence to resist the desire to eat using a 10-point scale ranging from 0 (not confident) to 9 (very confident). Participants' scores on each subscale were calculated by averaging scores within each subscale. The score of WEL was also computed as an overall index of self-efficacy. In this study, the validated Persian version of the questionnaire by Babai et al. was used (16). The WEL questionnaire was completed at baseline, 3, and 6 months after the intervention.

The participants were randomly assigned to receive a balanced low-calorie diet with or without education. Balanced low-calorie diet was an individualized diet with an energy deficit of 500 calories of daily average energy intake that was calculated from 3-day food records (2 weekdays and 1 weekend day) for every person. The macronutrient content of both groups was based on the percent of ingested calories comprising approximately 55% carbohydrate, 15% protein, and 30% fat. Diet was established by a registered dietitian based on food exchange systems in both the groups. In the group with nutrition educa-

tion, six one-hour sessions were conducted over the initial 3 months. These led to an individual format about the food guide pyramid, goal setting for weight loss, self-monitoring, and stimulus control. Study flowchart is presented in Figure 1.

All statistical analyses were performed using SPSS version 13.0 (SPSS Inc., Chicago, IL, 2005). Data were checked for normality with Kolmogorov-Smirnov test. All variables had a normal distribution. Independent T-Test was used to compare between-group differences. General linear model repeated measures analysis of variance was employed to assess the trend of changes over 6 months for the time effect and the interaction between time and group effect. Paired t-test was used to compare the variable changes before and after the intervention in both groups. The significance level was set at  $P < 0.05$ .

#### 4. Results

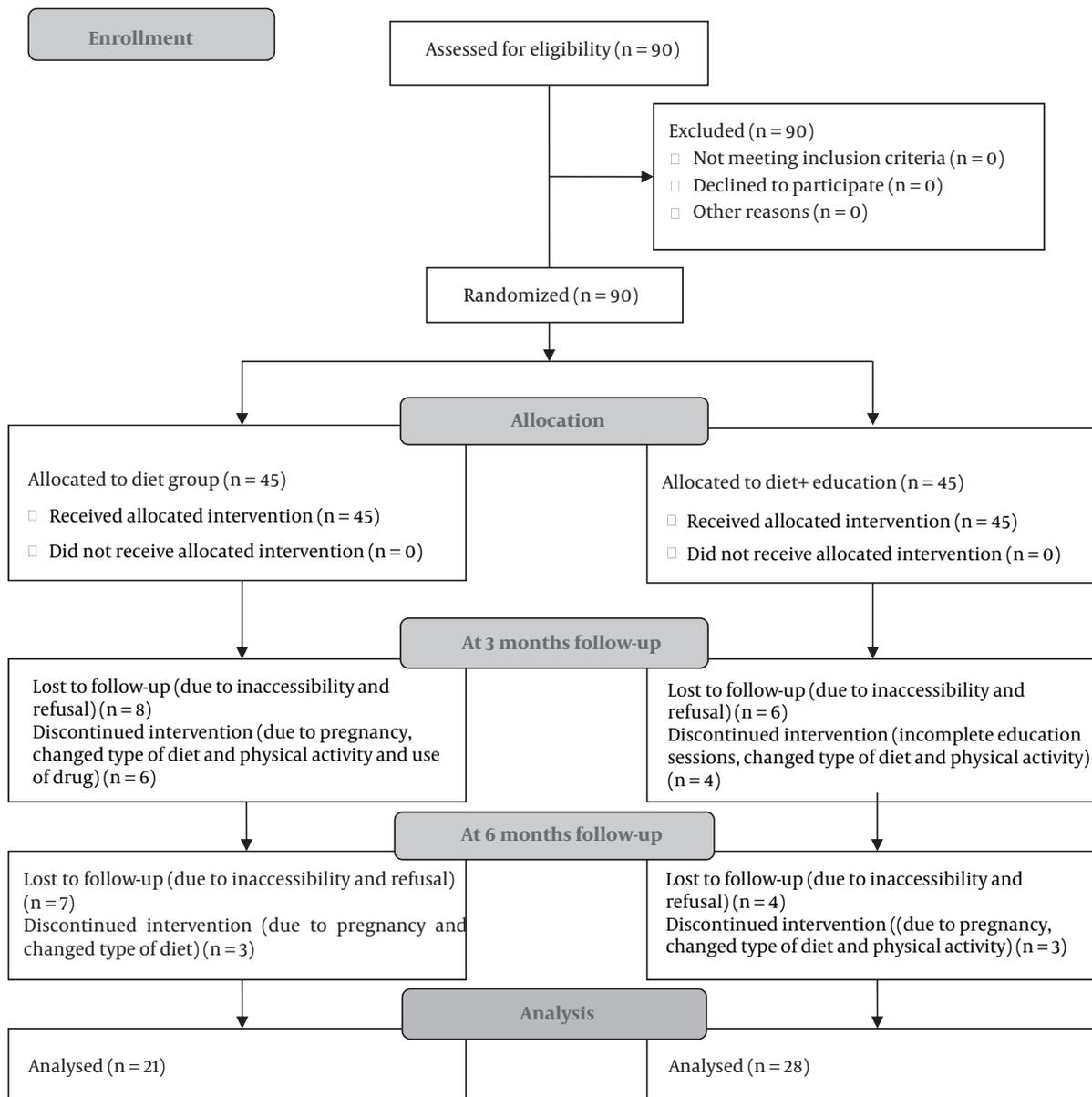
Descriptive characteristics of the study participants are presented in Table 1. Drop out was 26.5% at the 3-month period (31.1% in the diet group vs. 22.2% in the diet + education group) and 45.5% at the 6-month period (53.3% in the diet group vs. 37.7% in the diet + education group).

A significant decrease in weight and an increase in the total score of WEL and all the subscales were observed in the entire study population at the end of the intervention (Table 2: the time effect). Significant differences were found in the trend of changes in weight, the total WEL score, availability of food, negative emotions, physical discomfort, and positive activities subscales between the groups (Table 2: the time  $\times$  group effect), which suggests that the effect of intervention on the self-efficacy scores and weight was not the same for the two groups.

The mean difference in weight loss and total self-efficacy score as well as in positive activities, physical discomfort, availability of food, and negative emotions subscales was higher in the diet + education group than in the diet group over 6 months (Table 3). The improvement in the total score of WEL and its subscales was greater in the first 3 months in comparison with the second 3 months after the intervention in the diet + education group (Table 4).

#### 5. Discussion

This study provided important information about self-efficacy and its changes during weight loss intervention. Based on the results, nutrition education was associated with a greater weight loss and higher total self-efficacy and its subscales scores. This information can be useful to help with person's inner desire to want to lose weight.



**Figure 1.** Study Flowchart for Enrollment, Randomization, Allocation, and Follow-Up

The previous study supports the assessment of self-efficacy in obese persons seeking weight loss treatment (17). In this study, self-efficacy among obese women attending the nutrition clinic was less than that reported in other studies (4, 8, 11, 18). Two of these studies (8, 11) included men and eating self-efficacy may vary by gender. In previous research, men reported higher self-efficacy than women (19, 20). Histories of frequent dieting could undermine women's confidence in the successful management

of their eating (19).

The minimum confidence to resist eating was observed in the availability of food subscale at baseline. This result was consistent with the results of previous studies among obese women (8, 10, 18). The individuals' confidence to resist eating due to external circumstances is an important cognitive dimension of weight loss (9). This subscale has been reported as the strongest and the most consistent predictor of weight loss (21). The strengthening of strate-

**Table 1.** Descriptive Characteristics of Studied Obese Women by Intervention Groups, N = 45<sup>a,b</sup>

Variable	Diet Group	Diet+ Education Group	P Value
Age, y	28.40 ± 7.98	27.02 ± 6.37	0.37
Weight, kg	85.37 ± 11.44	84.72 ± 12.11	0.79
BMI, kg/m <sup>2</sup>	32.28 ± 2.90	33.22 ± 3.16	0.92
Waist circumference, cm	103.91 ± 9.56	107.40 ± 11.45	0.12
Energy intake at baseline, kcal	2715.13 ± 1097.88	2806.98 ± 763.89	0.68
Recommended energy, kcal	2247.8 ± 219.02	2262.22 ± 235.28	0.67

<sup>a</sup>Values are expressed as mean ± SD.

<sup>b</sup>P value: independent T-Tests.

**Table 2.** Changes in Weight, Total WEL Score and Its Subscales Over 6 Months<sup>a</sup>

Variable	Baseline	3 Months	6 Months	Time Effect, F (df), P Value <sup>b</sup>	Time × Intervention Effect, F (df), P Value <sup>c</sup>
<b>Weight, kg</b>					
Diet group	85.37 ± 11.44	79.57 ± 11.17	75.50 ± 7.77	12.64 (2)	5.69 (2)
Diet+ education group	84.72 ± 12.11	78.34 ± 11.62	72.90 ± 13.16	< 0.001	0.011
<b>Positive activities</b>					
Diet group	5.53 ± 2.15	6.09 ± 2.25	6.75 ± 1.99	15.68 (2)	9.41 (2)
Diet + education group	5.17 ± 2.39	6.53 ± 2.12	7.31 ± 1.70	< 0.001	< 0.001
<b>Physical discomfort</b>					
Diet group	5.74 ± 2.12	6.23 ± 2.23	6.78 ± 2.08	10.09 (2)	8.28 (2)
Diet + education group	5.23 ± 2.14	6.53 ± 2.24	7.08 ± 1.89	< 0.001	< 0.001
<b>Social pressure</b>					
Diet group	5.50 ± 2.09	6.31 ± 1.89	6.93 ± 1.67	12.27 (2)	2.80 (2)
Diet + education group	5.19 ± 2.47	6.19 ± 2.56	6.77 ± 2.53	< 0.001	NS
<b>Availability of food</b>					
Diet group	4.85 ± 1.30	5.62 ± 2.23	6.40 ± 2.04	18.39 (2)	6.52 (2)
Diet + education group	4.13 ± 2.37	5.67 ± 2.66	6.31 ± 2.49	< 0.001	0.002
<b>Negative emotions</b>					
Diet group	5.27 ± 2.53	5.91 ± 2.48	6.67 ± 2.25	12.24 (2)	7.23 (2)
Diet + education group	4.69 ± 2.62	6.05 ± 2.48	6.90 ± 2.19	< 0.001	0.001
<b>Total WEL score</b>					
Diet group	5.38 ± 1.20	6.03 ± 2.01	6.73 ± 1.75	22.57 (2)	11.30 (2)
Diet + education group	4.89 ± 2.02	6.23 ± 2.28	6.95 ± 2.05	< 0.001	< 0.001

<sup>a</sup>Values are expressed as mean ± SD.

<sup>b</sup>The time effect represents the results of the GLM repeated measures analysis of the difference between the baseline, 3 and 6 months of each variable in the entire study population.

<sup>c</sup>The time × intervention effect represents the results of the GLM repeated measures analysis assessing whether the trend of change in each variable differed between the two groups.

gies targeting this subscale must be considered in interventions.

The improvement of self-efficacy may help participants lose more weight during treatment (17). The higher self-

efficacy at the end of the treatment has been associated with more weight loss at follow-up (20, 22). In accordance with previous research (4, 9, 12), we found a significant improvement in the total WEL score and all five subscales dur-

**Table 3.** Mean Difference in Weight Loss, Total WEL Score and Its Subscales Between the Two Groups Over 6 Months

Variable	Between Baseline and 3 Months		Between 3 and 6 Months		Between Baseline and 6 Months	
	Mean	P Value <sup>a</sup>	Mean	P Value <sup>a</sup>	Mean	P Value <sup>a</sup>
Weight loss, kg	0.58	0.21	1.37	0.04	1.95	0.03
Positive activities	1.28	0.008	0.44	0.03	2.13	0.001
Physical discomfort	0.58	0.006	0.22	0.38	1.89	0.003
Social pressure	1.24	0.23	0.17	0.38	1.13	0.07
Availability of food	1.02	0.02	0.21	0.39	1.69	0.006
Negative emotions	1.72	0.008	0.36	0.20	2.02	0.002
Total WEL score	1.01	0.006	0.29	0.10	1.84	0.001

<sup>a</sup>Independent T-Tests to compare the mean differences between the two groups (Diet + Education group- Diet group).

**Table 4.** Comparison of Mean Scores of Self-Efficacy and Its Subscales After the Intervention<sup>a</sup>

Variables	Interval		P Value <sup>b</sup>
	Baseline to 3 Months	3 to 6 Months	
<b>Positive activities</b>			
Diet group	0.34	-0.09	0.180
Diet + education group	2.03	0.35	0.005
<b>Physical discomfort</b>			
Diet group	0.11	-0.02	0.721
Diet + education group	1.78	0.20	0.005
<b>Social pressure</b>			
Diet group	0.57	0.01	0.137
Diet + education group	1.53	0.18	0.018
<b>Availability of food</b>			
Diet group	0.56	-0.02	0.046
Diet + education group	2.05	0.19	0.001
<b>Negative emotions</b>			
Diet group	0.21	0.11	0.776
Diet + education group	1.87	0.47	0.023
<b>Total WEL score</b>			
Diet group	0.36	-0.005	0.157
Diet + education group	1.91	0.29	<0.001

<sup>a</sup>Interval baseline to 3 months = 3 months- baseline, Interval 3 to 6 months = 6 months - 3 months.

<sup>b</sup>Paired T-Tests to compare the mean difference of self-efficacy and its subscales between the first and the second 3 months' intervention.

ing both of the interventions.

Participation in a treatment along with nutrition education has been reported with changes in measures of self-efficacy (14) and perceived barriers reduction (23). This study showed that individualized nutrition education could be more effective in increasing self-efficacy and more weight loss over 6 months. A greater difference was ob-

served in self-efficacy and its subscales in the first 3 months rather than in the second 3 months in the diet + education group. Previous research has found that early weight loss consistently is related to longer-term outcomes (24). It seems that interventions should consider approaches that directly strengthen self-efficacy and promote more weight loss.

The greatest difference between the groups was observed in the negative emotions subscale at 3 months after the intervention. The obese experience more negative emotions, lose control of their food intake, and revert to overconsumption (25) and difficulty in coping with negative emotions has been associated with reduced dietary compliance (26). Berman's study indicated that low confidence in the ability to control eating while experiencing negative emotions was associated with greater bulimic behaviors (27). The emotional eating is associated with poorly maintained weight loss in long-term (28). Hence, greater self-efficacy in this subscale in the diet + education group can be more effective in weight loss success.

6 months after the intervention, the greatest difference between the groups was observed in the positive activities subscale. In Richman's study, women who completed the behavior modification intervention had higher scores in this subscale (18). Distractions can increase food consumption. Past research indicates that obese persons have a greater tendency to be distracted than non-obese people (29). It is certain that more confidence to resist eating in such circumstances can be important in weight loss and maintenance.

No significant difference was found in the social pressure subscale between the groups. Social pressure to eating has been reported higher in females (30). Social eating (Taarof) can be considered a norm among Iranian people (31) because refusing to join others in eating may be considered a rude behavior. This is not an issue exclusive to the Iranian culture (32). Therefore, using culturally tailored weight loss education will be most useful.

The strengths of the current study were in its prospective design, assessment of energy intake, and moderate reduction in calorie during 6 months. This study had some limitations. In this study, the dropout rate was high. The attrition rate, as a common problem for long-term weight loss interventions (33) may have restricted the ability to find stronger results. It is certainly possible that participants who drop out represent a unique set of individuals with different outcomes. Another limitation is that the information regarding caloric intake was self-reported, and thus subjected to potential biases. Therefore, future investigations should evaluate the relationship between changes in self-efficacy subscales and longer-term outcomes with a larger group of individuals.

## Acknowledgments

We would like to acknowledge the contribution of research participants who were involved in the trial.

## Footnotes

**Authors' Contribution:** Fatemeh Ghannadiasl, study design, proposal writing, data collection, statistical analysis, and manuscript writing; Reza Mahdavi, study design and manuscript writing.

**Competing Interests:** The authors declare that there is no conflict of interests.

## References

1. Nguyen DM, El-Serag HB. The epidemiology of obesity. *Gastroenterol Clin North Am.* 2010;**39**(1):1-7. doi: [10.1016/j.gtc.2009.12.014](https://doi.org/10.1016/j.gtc.2009.12.014). [PubMed: 20202574].
2. Tremblay A, Chaput JP. Obesity: the allostatic load of weight loss dieting. *Physiol Behav.* 2012;**106**(1):16-21. doi: [10.1016/j.physbeh.2011.05.020](https://doi.org/10.1016/j.physbeh.2011.05.020). [PubMed: 21627975].
3. American Dietetic Association . *Back to basics for healthy weight loss.* [cited 22 April]. Available from: <http://www.eatright.org/public/content.aspx?id=6847>.
4. Clark MM, Abrams DB, Niaura RS, Eaton CA, Rossi JS. Self-efficacy in weight management. *J Consult Clin Psychol.* 1991;**59**(5):739-44. doi: [10.1037/0022-006X.59.5.739](https://doi.org/10.1037/0022-006X.59.5.739). [PubMed: 1955608].
5. White MA. *Mediators of weight loss in an internet-based intervention for African-American adolescent girls.* James Madison University; 2003.
6. Stotland S, Zuroff DC. Relations between multiple measures of dieting self-efficacy and weight change in a behavioral weight control program. *Behav Ther.* 1991;**22**(1):47-59. doi: [10.1016/S0005-7894\(05\)80243-6](https://doi.org/10.1016/S0005-7894(05)80243-6).
7. Byrne S, Barry D, Petry NM. Predictors of weight loss success. Exercise vs. dietary self-efficacy and treatment attendance. *Appetite.* 2012;**58**(2):695-8. doi: [10.1016/j.appet.2012.01.005](https://doi.org/10.1016/j.appet.2012.01.005). [PubMed: 22248709].
8. Clark MM, Cargill BR, Medeiros ML, Pera V. Changes in self-efficacy following obesity treatment. *Obes Res.* 1996;**4**(2):179-81. doi: [10.1002/j.1550-8528.1996.tb00531.x](https://doi.org/10.1002/j.1550-8528.1996.tb00531.x). [PubMed: 8681051].
9. Rejeski WJ, Mihalko SL, Ambrosius WT, Bearon LB, McClelland JW. Weight loss and self-regulatory eating efficacy in older adults: the cooperative lifestyle intervention program. *J Gerontol B Psychol Sci Soc Sci.* 2011;**66**(3):279-86. doi: [10.1093/geronb/gbq104](https://doi.org/10.1093/geronb/gbq104). [PubMed: 21292809].
10. Dennis KE, Goldberg AP. Weight control self-efficacy types and transitions affect weight-loss outcomes in obese women. *Addict Behav.* 1996;**21**(1):103-16. doi: [10.1016/0306-4603\(95\)00042-9](https://doi.org/10.1016/0306-4603(95)00042-9). [PubMed: 8729712].
11. Pinto BM, Clark MM, Cruess DG, Szymanski L, Pera V. Changes in self-efficacy and decisional balance for exercise among obese women in a weight management program. *Obes Res.* 1999;**7**(3):288-92. doi: [10.1002/j.1550-8528.1999.tb00408.x](https://doi.org/10.1002/j.1550-8528.1999.tb00408.x). [PubMed: 10348500].
12. Boyle MA. *Community nutrition in action: An entrepreneurial approach.* U.S.A: Wadsworth Pub Co; 2003.
13. Long JD, Stevens KR. Using technology to promote self-efficacy for healthy eating in adolescents. *J Nurs Scholarsh.* 2004;**36**(2):134-9. doi: [10.1111/j.1547-5069.2004.04026.x](https://doi.org/10.1111/j.1547-5069.2004.04026.x). [PubMed: 15227760].
14. Annesi JJ, Whitaker AC. Psychological factors associated with weight loss in obese and severely obese women in a behavioral physical activity intervention. *Health Educ Behav.* 2010;**37**(4):593-606. doi: [10.1177/1090198109331671](https://doi.org/10.1177/1090198109331671). [PubMed: 19225071].
15. Wadden TA, Foster GD, Letizia KA. One-year behavioral treatment of obesity: comparison of moderate and severe caloric restriction and the effects of weight maintenance therapy. *J Consult Clin Psychol.* 1994;**62**(1):165-71. doi: [10.1037/0022-006X.62.1.165](https://doi.org/10.1037/0022-006X.62.1.165). [PubMed: 8034818].

16. Babai S, Khodapanahi MK, Sadeghpour BS. Validating and investigating reliability of the weight efficacy life style questionnaire. *J Behav Sci.* 2008;**2**(1):75-81.
17. Bas M, Donmez S. Self-efficacy and restrained eating in relation to weight loss among overweight men and women in Turkey. *Appetite.* 2009;**52**(1):209-16. doi: [10.1016/j.appet.2008.09.017](https://doi.org/10.1016/j.appet.2008.09.017). [PubMed: [18929608](https://pubmed.ncbi.nlm.nih.gov/18929608/)].
18. Richman RM, Loughnan GT, Droulers AM, Steinbeck KS, Caterson ID. Self-efficacy in relation to eating behaviour among obese and non-obese women. *Int J Obes Relat Metab Disord.* 2001;**25**(6):907-13. doi: [10.1038/sj.ijo.0801606](https://doi.org/10.1038/sj.ijo.0801606). [PubMed: [11439307](https://pubmed.ncbi.nlm.nih.gov/11439307/)].
19. Presnell K, Pells J, Stout A, Musante G. Sex differences in the relation of weight loss self-efficacy, binge eating, and depressive symptoms to weight loss success in a residential obesity treatment program. *Eat Behav.* 2008;**9**(2):170-80. doi: [10.1016/j.eatbeh.2007.07.005](https://doi.org/10.1016/j.eatbeh.2007.07.005). [PubMed: [18329595](https://pubmed.ncbi.nlm.nih.gov/18329595/)].
20. Linde JA, Jeffery RW, Levy RL, Sherwood NE, Utter J, Pronk NP, et al. Binge eating disorder, weight control self-efficacy, and depression in overweight men and women. *Int J Obes Relat Metab Disord.* 2004;**28**(3):418-25. doi: [10.1038/sj.ijo.0802570](https://doi.org/10.1038/sj.ijo.0802570). [PubMed: [14724662](https://pubmed.ncbi.nlm.nih.gov/14724662/)].
21. Shin H, Shin J, Liu PY, Dutton GR, Abood DA, Ilich JZ. Self-efficacy improves weight loss in overweight/obese postmenopausal women during a 6-month weight loss intervention. *Nutr Res.* 2011;**31**(11):822-8. doi: [10.1016/j.nutres.2011.09.022](https://doi.org/10.1016/j.nutres.2011.09.022). [PubMed: [22118752](https://pubmed.ncbi.nlm.nih.gov/22118752/)].
22. Teixeira PJ, Going SB, Houtkooper LB, Cussler EC, Metcalfe LL, Blew RM, et al. Pretreatment predictors of attrition and successful weight management in women. *Int J Obes Relat Metab Disord.* 2004;**28**(9):1124-33. doi: [10.1038/sj.ijo.0802727](https://doi.org/10.1038/sj.ijo.0802727). [PubMed: [15263921](https://pubmed.ncbi.nlm.nih.gov/15263921/)].
23. Quan T, Salomon J, Nitzke S, Reicks M. Behaviors of low-income mothers related to fruit and vegetable consumption. *J Am Diet Assoc.* 2000;**100**(5):567-70. doi: [10.1016/S0002-8223\(00\)00173-5](https://doi.org/10.1016/S0002-8223(00)00173-5). [PubMed: [10812383](https://pubmed.ncbi.nlm.nih.gov/10812383/)].
24. Fabricatore AN, Wadden TA, Moore RH, Butryn ML, Heymsfield SB, Nguyen AM. Predictors of attrition and weight loss success: Results from a randomized controlled trial. *Behav Res Ther.* 2009;**47**(8):685-91. doi: [10.1016/j.brat.2009.05.004](https://doi.org/10.1016/j.brat.2009.05.004). [PubMed: [19497559](https://pubmed.ncbi.nlm.nih.gov/19497559/)].
25. Barthomeuf L, Droit-Volet S, Rousset S. Obesity and emotions: Differentiation in emotions felt towards food between obese, overweight and normal-weight adolescents. *Food Qual Prefer.* 2009;**20**(1):62-8. doi: [10.1016/j.foodqual.2008.07.005](https://doi.org/10.1016/j.foodqual.2008.07.005).
26. Forman EM, Butryn ML, Hoffman KL, Herbert JD. An Open Trial of an Acceptance-Based Behavioral Intervention for Weight Loss. *Cogn Behav Pract.* 2009;**16**(2):223-35. doi: [10.1016/j.cbpra.2008.09.005](https://doi.org/10.1016/j.cbpra.2008.09.005).
27. Berman ES. The relationship between eating self-efficacy and eating disorder symptoms in a non-clinical sample. *Eat Behav.* 2006;**7**(1):79-90. doi: [10.1016/j.eatbeh.2005.07.004](https://doi.org/10.1016/j.eatbeh.2005.07.004). [PubMed: [16360626](https://pubmed.ncbi.nlm.nih.gov/16360626/)].
28. Keranen AM, Strengell K, Savolainen MJ, Laitinen JH. Effect of weight loss intervention on the association between eating behaviour measured by TFEQ-18 and dietary intake in adults. *Appetite.* 2011;**56**(1):156-62. doi: [10.1016/j.appet.2010.10.004](https://doi.org/10.1016/j.appet.2010.10.004). [PubMed: [20955744](https://pubmed.ncbi.nlm.nih.gov/20955744/)].
29. Wansink B. Environmental factors that increase the food intake and consumption volume of unknowing consumers. *Annu Rev Nutr.* 2004;**24**:455-79. doi: [10.1146/annurev.nutr.24.012003.132140](https://doi.org/10.1146/annurev.nutr.24.012003.132140). [PubMed: [15189128](https://pubmed.ncbi.nlm.nih.gov/15189128/)].
30. Grogan SC, Bell R, Conner M. Eating sweet snacks: gender differences in attitudes and behaviour. *Appetite.* 1997;**28**(1):19-31. doi: [10.1006/appe.1996.0067](https://doi.org/10.1006/appe.1996.0067). [PubMed: [9134092](https://pubmed.ncbi.nlm.nih.gov/9134092/)].
31. Shakibazadeh E, Larijani B, Shojaezadeh D, Rashidian A, Forouzanfar M, Bartholomew L. Patients' Perspectives on Factors that Influence Diabetes Self-Care. *Iran J Public Health.* 2011;**40**(4):146-58. [PubMed: [23113114](https://pubmed.ncbi.nlm.nih.gov/23113114/)].
32. Chang CT. Applicability of the stages of change and Weight Efficacy Lifestyle Questionnaire with natives of Sarawak, Malaysia. *Rural Remote Health.* 2007;**7**(4):864. [PubMed: [18076311](https://pubmed.ncbi.nlm.nih.gov/18076311/)].
33. Greenberg I, Stampfer MJ, Schwarzfuchs D, Shai I, Direct Group . Adherence and success in long-term weight loss diets: the dietary intervention randomized controlled trial (DIRECT). *J Am Coll Nutr.* 2009;**28**(2):159-68. [PubMed: [19828901](https://pubmed.ncbi.nlm.nih.gov/19828901/)].