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Assessment of Stages and Processes of Change, Eating Self-Efficacy and Decisional Balance for Weight Loss in Obese Women Attending Nutrition Clinics

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Abstract

Background: The transtheoretical model is an effective theory in health promotion. In order to maximize success, this theory has been introduced into different weight loss interventions.
Objectives: The purpose of this study was to assess the stages and processes of change, self-efficacy, and decisional balance for weight loss among obese women attending nutrition clinics as an attempt to direct nutrition interventions.
Methods: In this descriptive study, ninety volunteered apparently healthy obese women aged 18 - 50 years with body mass index of 30 - 40 kg/m^2 attending a nutrition clinic in Ardabil city were recruited. The subjects completed the translated and validated versions of University of Rhode Island Change Assessment, processes of change, weight efficacy lifestyle, and Decisional Balance scales as the transtheoretical model components before any intervention. The score on each subscale was calculated by averaging the scores obtained by all participants within each subscale. T-test was used to compare the mean total score of each scale with the mean score of its subscales.
Results: The results showed that 46.7% of participants were in the advanced stages of weight loss. The mean score of behavioral processes was significantly lower than that of cognitive processes (2.33 ± 0.51 vs. 3.02 ± 0.45, $P < 0.001$). The minimum and maximum scores of confidence to resist the desire to eat were observed in availability and physical discomfort subscales (3.62 ± 1.83 and 4.54 ± 1.71, respectively). Nearly half of the subjects had lower scores than the mean total score in decisional balance.
Conclusions: It seems that the assessment of stages and tailoring of interventions based on readiness to change are essential among obese women attending nutrition clinics. The strengthening behavioral processes, eating self-efficacy, and decisional balance for weight loss must also be considered.

Keywords: Stages of Change, Processes of Change, Eating Self-Efficacy, Decisional Balance, Weight Loss

1. Background

Although dieting has been a norm among women in past decades (1), success in weight loss and its maintenance are considered as major problems in obese individuals (2). Today, in order to maximize success, a number of theories of behavior change have been introduced into different weight loss interventions (3). The most commonly used individual-level theories for behavior change is the transtheoretical Model (TTM) (4).

It has been reported that the TTM is one of the most effective theories in the promotion of healthy behaviors (5, 6). This model consists of two constructs; the first is the stages of change and the other is composed of a series of other constructs including processes of change, decisional balance, and self-efficacy (7) that provide how, why, and when behavior changes (8).

The construct of stages of change is the core of the model (7) and is the only construct that has the dimension of time (9). The five sequential sub-stages in this construct have been described by Horwath (10), including precontemplation, contemplation, preparation, action, and maintenance. In the precontemplation stage, the person does not want to get involved in activities in the next 6 months and has no knowledge about behavior change. In the contemplation stage, the individual thinks about behavior change and wants to be engaged in the next 6 months. In the preparation stage, the person is ready to change, but does not begin to change behavior. In the action stage, the individual has been involved in behavior change since one day to 6 months ago. A person regularly performs a desired behavior for more than 6 months in the maintenance stage (10).

The construct of processes of change is composed of two components of cognitive and behavioral processes and includes hidden and obvious activities that people use to move through the stages of change. The cognitive processes focus on the individual feeling and experiences, while the behavioral processes focus on the behavior and its reinforcement (11). Decisional balance measures a persons' weighing of the pros (advantages) and the cons (disadvantages) of behavior change. This construct helps explain why behavior changes (12). Self-efficacy refers to individuals' beliefs regarding their ability to make required behavioral changes to achieve the desired goals (13, 14). Self-efficacy is more important during the beginning phase of behavior change (15). Unlike decisional balance, which is sensitive to the earlier stages, self-efficacy is more sensitive to the advanced stages (12).

The transtheoretical model has been applied to reduce dietary fat and increase fruits, vegetables, dairy products, and grain consumption (16). Applying this model to weight management programs among obese individuals has been growing interest recently (17, 18).

2. Objectives

A minority of studies have employed the entire TTM constructs for weight loss (7); there was not enough knowledge available about current stage and processes of change, self-efficacy, and decisional balance for weight loss by employing diet alone in obese women attending nutrition clinics. Therefore, the present study was carried out to assess the entire transtheoretical model constructs in these women simultaneously as an attempt to direct nutrition interventions.

3. Methods

In the current study, data were originally collected as part of a randomized clinical trial conducted at Tabriz University of Medical Sciences, investigating the effectiveness of transtheoretical model in combination with balanced low calorie diet for weight loss in obese women. 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) before any intervention for every person. In this study, 90 volunteered obese women (age: 18 to 50 years and the body mass index: 30 to 40 kg/m^2) were recruited from a nutrition clinic in Ardabil city, northwest of Iran, from September to November 2012 in their first visit. They were apparently healthy, non-pregnant, non-lactate and non-menopause from urban areas. Participants had high school education or above. The subjects had not participated in any program of weight loss in the previous 6 months. The ethics committee of Tabriz University of Medical Sciences approved the study. This approval was presented to the participants. Before the participation to the study, an informed consent form was obtained from each subject.

Subjects' weight and height were measured using a balanced scale (Seca, model 224, Hamburg, Germany) in light clothing and without shoes. All data were collected before any intervention.

Assessing the stages of change was performed by the University of Rhode Island Change Assessment (URICA) Scale. This questionnaire contains 32 items. There are eight items measuring each of the stage subscales: precontemplation, contemplation, action, and maintenance. Each item is rated on a five-point Likert scale (1 = strong disagreement to 5 = strong agreement). Both factor analysis and cluster analysis have supported the validity of URICA (19). No gold standard exists for the categorization (20). Therefore, the participant was classified primarily into one of the four stages of change based on the highest score of her four z-transformed scale scores.

The questionnaire of processes of change (21) contains 48 items. There are four items assessing each of 12 subscales. The responses are rated on a five-point Likert scale (1 = never to 5 = always). Exploratory and confirmatory factor analysis supported the processes of change with two correlated second-order factors representing cognitive and behavioral processes, respectively (22).

The decisional balance questionnaire (23) contains 20 items. There are 10 items assessing perceived benefits and barriers. Individuals rated how important each item was in their decision to participate in weight loss. Items were rated on a 5-point Likert scale, ranging from 1 = not at all important to 5 = extremely important. A total decisional balance score is calculated by subtracting the cons score from the pros score. The internal consistency for pros and cons has been reported as 0.91 and 0.84, respectively (23).

The weight efficacy lifestyle (WEL) questionnaire (24) was used to assess self-efficacy. This questionnaire contains 20 items. The participants rated their confidence to resist eating under various situations. The questionnaire consists of five categories: availability, negative emotions, physical discomfort, positive activities, and social pressure. Four items measure each of the self-efficacy subscales. Responses are scored using a 10-point Likert scale from 0 = not confident to 9 = very confident.

3.1. Questionnaire's Reliability and Validity

The URICA questionnaire's reliability and content validity in Persian language have been reported previously

by Ghannadiasl et al. (25). This study used the Processes of change, Decisional balance, and weight efficacy lifestyle questionnaires for the first time in Persian language. Therefore, test - retest method was used to evaluate the reliability of the translated and modified questionnaires. In our study, the original processes of change, decisional balance, and weight efficacy lifestyle questionnaires were translated from English into Persian initially. Then, the content validity of translated questionnaires was evaluated by bilingual experts (a registered dietitian and a clinical psychologist) who read and spoke in both Persian and English languages. The sentences assessed as unclear or weakly worded were rewritten by the researchers. In order to obtain a culturally equivalent instrument, the back translation technique was used. The equivalence of Persian and English versions was ensured during the process of back translation. The necessary modifications were performed to ensure the understandability of the questionnaire. Later, a pilot study was carried out to evaluate test-retest reliability and intraclass correlation coefficient (ICC) of the translated modified questionnaires. In this pilot study, 10 participants with the same inclusion criteria completed questionnaires twice, once at baseline and again approximately 10 days later.

The test-retest reliability of the subscales included in transtheoretical model constructs is presented in Table 1. The questionnaires showed acceptable reliability and internal consistency in most cases (internal consistency > 0.7 and ICC > 0.6).

All statistical analyses were performed using SPSS16.0 software for Windows. Normality was checked using the Kolmogorov-Smirnov test. All variables had normal distribution. Descriptive analyses were computed for each of the subscales. Since there was not a control group for comparison, therefore the mean total score of each scale was considered as a norm score for comparison with the mean score of its subscales. Then, T-test was used to test the significance of the difference between the mean total score of each scale and the score of its subscales.

4. Results

Descriptive characteristics of study subjects are presented in Table 2. The majority of participants had a history of one or more dieting (77.8%) and were married (72.2%). More than half of the participants were housekeeper (57.8%) and had one or more children (55.4%).

The stages of change distribution for weight loss showed that 30.0% of subjects were in the precontemplation stage, 23.3% in the contemplation stage, 24.5% in the action stage, and 22.2% in the maintenance stage.

The comparison of the mean total score of each scale as a norm of study with the mean score of its different subscales is presented in Table 3. The results showed that the mean score of precontemplation subscale was significantly lower than the mean total score of stages of change scale ($P < 0.001$) whereas the mean scores of contemplation, action, and maintenance subscales were significantly higher ($P < 0.001$).

In comparison with the mean total score of processes of change scale, the mean scores of counter conditioning, interpersonal control systems, stimulus control, and substance abuse subscales were significantly lower whilst the mean scores of dramatic relief, environmental re-evaluation, reinforcement management, self-liberation, self-re-evaluation, and social liberation subscales were significantly higher than the mean total score of processes of change scale. Also, the mean score of behavioral processes was significantly lower than the mean score of cognitive processes (Table 3).

In the present study, the mean total score of decisional balance scale was 1.73 ± 0.73. Our findings showed that the mean score of availability and negative emotions subscales was significantly lower than the mean total score. While the mean score of positive activities and physical discomfort subscales was significantly higher than the mean total score (Table 3).

5. Discussion

The assessment of readiness to change (26), identification of change resources and barriers, and behaviors associated with weight loss (19) are essential to develop effective interventions. The transtheoretical model focuses on the all important factors of behavior change (27). Therefore, as a recommended technique (19), the entire TTM was used to assess these factors.

In this study, 53.3% of participants were in the early stage of weight loss and 46.7% in the advanced stage. Besides, the mean scores of contemplation, action, and maintenance were significantly higher than the mean total score, while the mean score of precontemplation was significantly lower than the mean total score. According to the reported cluster analysis in different populations, this condition forms the participation cluster. In this cluster, individuals report involvement in changing (28). With this assumption, only 60% of samples were in the participation cluster. Thus, it can be concluded that 40% of participants were not actually ready for weight loss. This may be a reason for dropping out in weight loss interventions. Attrition from treatment is one of the most important barriers to the success of behavioral weight loss interventions

Table 1. Test-Retest Reliability of the Subscales of Transtheoretical Model Constructs

Subscale	Test, Mean ± SD	Re-test, Mean ± SD	ICC (95% CI)	Cronbach's α
Process of change				
Consciousness raising	3.30 ± 1.22	3.64 ± 1.40	0.93 (0.83 - 0.98)	0.93
Counter conditioning	2.37 ± 0.60	2.47 ± 0.59	0.53 (0.29 - 0.85)	0.58
Dramatic relief	3.65 ± 0.83	3.72 ± 1.15	0.86 (0.67 - 0.96)	0.88
Environmental re-evaluation	2.52 ± 0.80	2.58 ± 0.79	0.64 (0.24 - 0.90)	0.72
Helping relationships	3.27 ± 0.94	3.77 ± 0.87	0.78 (0.46 - 0.95)	0.79
Interpersonal control systems	2.53 ± 0.77	3.41 ± 1.06	0.80 (0.52 - 0.95)	0.82
Reinforcement management	3.27 ± 0.87	3.55 ± 0.86	0.63 (0.15 - 0.92)	0.65
Self-liberation	3.87 ± 0.96	4.39 ± 0.74	0.65 (0.14 - 0.91)	0.64
Self-re-evaluation	3.70 ± 1.00	3.75 ± 0.96	0.70 (0.34 - 0.92)	0.75
Social liberation	3.25 ± 0.79	3.43 ± 1.05	0.65 (0.26 - 0.91)	0.77
Stimulus control	1.90 ± 0.78	3.13 ± 1.03	0.71 (0.34 - 0.92)	0.74
Substance abuse	1.60 ± 1.31	1.14 ± 0.33	0.90 (0.77 - 0.97)	0.91
Decisional Balance				
Pros	4.09 ± 0.93	4.12 ± 0.93	0.93 (0.85 - 0.98)	0.95
Cons	2.40 ± 0.75	1.95 ± 0.49	0.74 (0.47 - 0.92)	0.78
Self-efficacy				
Positive activities	4.75 ± 1.44	6.82 ± 1.48	0.56 (0.08 - 0.86)	0.61
Physical discomfort	5.65 ± 2.12	6.72 ± 1.65	0.80 (0.55 - 0.94)	0.81
Social pressure	4.30 ± 2.04	5.05 ± 1.72	0.82 (0.60 - 0.95)	0.85
Availability	3.55 ± 1.27	3.42 ± 1.14	0.53 (0.22 - 0.86)	0.57
Negative emotions	3.67 ± 3.16	5.65 ± 2.36	0.91 (0.79 - 0.97)	0.93

Table 2. Descriptive Characteristics of the Participants (N = 90)

Variable	Mean ± SD
Age, y	27.71 ± 7.21
Height, cm	159.65 ± 6.27
Weight, kg	85.05 ± 11.72
BMI, kg/m^2	33.25 ± 3.02

(29). Attrition rate has been reported between 30% - 60 % in long-term weight loss interventions (30).

The processes of change are independent variables used to move from one stage to another (27). The processes can be potent predictors of behavior change in interventions (7). The mean scores of substance abuse, stimulus control, counter conditioning, and interpersonal control systems subscales were significantly lower than the mean total score. All of the above processes relate to behavior (27). In a previous study carried out by Suris et al. (30), the Mexican American women who were enrolled in a behavioral weight loss program showed similar results. Not participation in any program of weight loss as a criterion for inclusion in this study may result in lower mean score of substance abuse subscale. In addition, more than half of the study subjects were in the precontemplation and contemplation stages. Generally, the use of cognitive processes is higher than the use of behavioral processes in these stages (31). This could be another reason for low scores in behavioral processes subscale. Because of diversity of stages in the obese women, we require using cognitive and behavioral processes in the obese attending nu-

Table 3. The Comparison of the Mean Total Score of Each Construct With the Score of Its Subscales[a]

Construct	Mean (SD)	P Value (In Comparison With Mean Total Score)
Stages of change		
Total score	3.27 (0.30)	
Precontemplation	1.96 (0.54)	< 0.001
Contemplation	3.89 (0.41)	< 0.001
Action	3.65 (0.36)	< 0.001
Maintenance	3.60 (0.50)	< 0.001
Processes of change		
Total score	2.62 (0.44)	
Cognitive processes	3.02 (0.45)	< 0.001
Consciousness raising	2.69 (0.79)	0.43
Dramatic relief	3.49 (0.54)	< 0.001
Environmental re-evaluation	2.70 (0.63)	0.03
Self-re-evaluation	3.21 (0.58)	< 0.001
Social liberation	2.98 (0.62)	< 0.001
Behavioral processes	2.33 (0.51)	< 0.001
Counter conditioning	2.19 (0.63)	< 0.001
Helping relationships	2.47 (0.96)	0.07
Interpersonal control systems	2.31 (0.78)	< 0.001
Reinforcement management	2.91 (0.78)	< 0.001
Self-liberation	2.98 (0.62)	< 0.001
Stimulus control	1.83 (0.78)	< 0.001
Substance abuse	1.27 (0.71)	< 0.001
Decisional balance		
Total score	1.73 (0.73)	
Pros	3.88 (0.54)	< 0.001
Cons	2.14 (0.64)	0.003
Self-efficacy		
Total score	4.16 (1.62)	
Positive activities	4.39 (1.86)	0.03
Physical discomfort	4.54 (1.71)	< 0.001
Social pressure	4.34 (1.86)	0.12
Availability	3.62 (1.83)	< 0.001
Negative emotions	3.91 (2.21)	0.04

[a] Total decisional balance score = Pros score - Cons score.

trition clinics. Emphasized processes of change based on the stages of change are presented by Pochaska and Velicer (32).

Common facilitators and barriers about behavior change and attitudes toward these factors can be assessed by the decisional balance (23). In previous studies, the positive association of decisional balance with stages of change for weight loss (23) and dietary fat decrease and fruit, vegetable, and milk consumption increase (7) has been reported. Nearly half of the subjects had low scores than the mean total score for decisional balance. This indicated that despite the interest in weight loss, some of the participants

had low motivation to change for weight loss. The pros are particularly useful when intervention is performed in the earlier stages of change (33). Previous findings have suggested that obese women would need to perceive higher pros than cons prior to taking intervention (9, 34).

The importance of self-efficacy in weight control behaviors (35) and its change during treatment has been reported previously (14). The self-efficacy is predictive of weight loss (9). A lack of self-control has been identified as a barrier in a sample of obese, treatment-seeking adults (36). The self-efficacy questionnaire can be used as a tool to determine the strengths and weaknesses of participants in weight loss programs (37).

The mean total score of self-efficacy was lower in our study than a similar study conducted on obese women (37). In this study, the majority of women reported a history of one or more dieting for weight loss. Researchers have proposed that dieting and weight cycling will lower eating self- efficacy (38). Hence, increasing self-efficacy can help women better lose their weight.

In this study, the minimum confidence to resist the desire to eat was observed in the availability and negative emotions subscales. These results are consistent with the results of previous studies among the obese women (13, 37, 39). The availability of food subscale from the WEL questionnaire has been reported as the strongest and most consistent predictor of weight loss in overweight and obese postmenopausal women (39). In addition, the obese experience more negative emotions (40, 41) and tend to increase food intake in these situations (42). In general, negative emotions can predict poor treatment outcomes, particularly in obese women (40).

This study had some limitations. A bigger sample size needs to be used to produce more reliable results. Including obese women from different body mass indices or locations would help identify the effect of different values of body mass index and locations on the outcomes. Also, including demographic data would be helpful to see if the findings had any correlation with the demographic data of the participants. In conclusion, it seems that the application of the entire transtheoretical model may be beneficial for the development of effective dietary interventions. Based on the results of the present study, obese women attending nutrition clinics vary in readiness for weight loss. Therefore, the assessment of readiness to change is essential for tailoring of interventions based on assessment results. For effective interventions, strengthening behavioural processes, eating self-efficacy especially in the availability and negative emotions subscales and the pros of weight loss must be considered in counselling. It seems that due to the long length of time for implementation of the entire TTM in clinical settings, further studies are needed to short the model constructs using the highest loading items for each construct.

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Footnotes

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

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References

1. Kuijer R, de Ridder D, Ouwehand C, Houx B, van den Bos R. Dieting as a case of behavioural decision making. Does self-control matter?. *Appetite.* 2008;**51**(3):506–11. doi: 10.1016/j.appet.2008.03.014. [PubMed: 18479777].
2. Greenway FL. Physiological adaptations to weight loss and factors favouring weight regain. *Int J Obes (Lond).* 2015;**39**(8):1188–96. doi: 10.1038/ijo.2015.59. [PubMed: 25896063].
3. Seals JG. Integrating the transtheoretical model into the management of overweight and obese adults. *J Am Acad Nurse Pract.* 2007;**19**(2):63–71. doi: 10.1111/j.1745-7599.2006.00196.x. [PubMed: 17300531].
4. Spahn JM, Reeves RS, Keim KS, Laquatra I, Kellogg M, Jortberg B, et al. State of the evidence regarding behavior change theories and strategies in nutrition counseling to facilitate health and food behavior change. *J Am Diet Assoc.* 2010;**110**(6):879–91. doi: 10.1016/j.jada.2010.03.021. [PubMed: 20497777].
5. Prochaska JO, Velicer WF, Redding C, Rossi JS, Goldstein M, DePue J, et al. Stage-based expert systems to guide a population of primary care patients to quit smoking, eat healthier, prevent skin cancer, and receive regular mammograms. *Prev Med.* 2005;**41**(2):406–16. doi: 10.1016/j.ypmed.2004.09.050. [PubMed: 15896835].
6. Blue CL, Black DR. Synthesis of intervention research to modify physical activity and dietary behaviors. *Res Theory Nurs Pract.* 2005;**19**(1):25–61. doi: 10.1891/rtnp.19.1.25.66333. [PubMed: 15989166].
7. Spencer L, Wharton C, Moyle S, Adams T. The transtheoretical model as applied to dietary behaviour and outcomes. *Nutr Res Rev.* 2007;**20**(1):46–73. doi: 10.1017/S0954422407747881. [PubMed: 19079860].
8. Palmeira AL, Teixeira PJ, Branco TL, Martins SS, Minderico CS, Barata JT, et al. Predicting short-term weight loss using four leading health behavior change theories. *Int J Behav Nutr Phys Act.* 2007;**4**:14. doi: 10.1186/1479-5868-4-14. [PubMed: 17448248].
9. Krummel DA, Semmens E, Boury J, Gordon PM, Larkin KT. Stages of change for weight management in postpartum women. *J Am Diet Assoc.* 2004;**104**(7):1102–8. doi: 10.1016/j.jada.2004.04.022. [PubMed: 15215768].

10. Horwath CC. Applying the transtheoretical model to eating behaviour change: challenges and opportunities. *Nutr Res Rev.* 1999;**12**(2):281–317. doi: 10.1079/095442299108728965. [PubMed: 19087455].
11. Velicer WF, Prochaska JO, Fava J, Rossi JS, Redding CA, Laforge RG. Using the Transtheoretical Model for Population-based Approaches to Health Promotion and Disease Prevention. *Homeostasis in Health and Dis.* 2000;**40**:174–95.
12. Greene GW, Rossi SR, Rossi JS, Velicer WF, Fava JL, Prochaska JO. Dietary applications of the stages of change model. *J Am Diet Assoc.* 1999;**99**(6):673–8. doi: 10.1016/S0002-8223(99)00164-9. [PubMed: 10361528].
13. 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. [PubMed: 18329595].
14. 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. [PubMed: 22248709].
15. Linde JA, Rothman AJ, Baldwin AS, Jeffery RW. The impact of self-efficacy on behavior change and weight change among overweight participants in a weight loss trial. *Health Psychol.* 2006;**25**(3):282–91. doi: 10.1037/0278-6133.25.3.282. [PubMed: 16719599].
16. Di Noia J, Prochaska JO. Mediating variables in a transtheoretical model dietary intervention program. *Health Educ Behav.* 2010;**37**(5):753–62. doi: 10.1177/1090198109334897. [PubMed: 19494057].
17. Andres A, Gomez J, Salda-a C. The transtheoretical model and obesity: A bibliometric study. *Scientometrics.* 2007;**73**:289–301. doi: 10.1007/s11192-007-1692-1.
18. Johnson SS, Paiva AL, Cummins CO, Johnson JL, Dyment SJ, Wright JA, et al. Transtheoretical model-based multiple behavior intervention for weight management: effectiveness on a population basis. *Prev Med.* 2008;**46**(3):238–46. doi: 10.1016/j.ypmed.2007.09.010. [PubMed: 18055007].
19. Dozois DJA, Westra HA, Collins KA, Fung TS, Garry JKF. Stages of change in anxiety: psychometric properties of the University of Rhode Island Change Assessment (URICA) scale. *Behav Res Ther.* 2004;**42**:711–29. doi: 10.1016/S0005-7967(03)00193-1.
20. Sbrocco T, Osborn R, Clark RD, Hsiao CW, Carter MM. Assessing the Stages of Change Among African American Women in a Weight Management Program. *J Black Psychol.* 2011;**38**(1):81–103. doi: 10.1177/0095798411403618. [PubMed: 24683280].
21. Prochaska JO, DiClemente CC. Common processes of self-change in smoking, weight control and psychological distress. New York, NY: Academic Press; 1985. pp. 345–63.
22. O'Connor EA, Carbonari JP, DiClemente CC. Gender and smoking cessation: a factor structure comparison of processes of change. *J Consult Clin Psychol.* 1996;**64**(1):130–8. doi: 10.1037/0022-006X.64.1.130. [PubMed: 8907092].
23. O'Connell D, Velicer WF. A decisional balance measure and the stages of change model for weight loss. *Int J Addict.* 1988;**23**(7):729–50. doi: 10.3109/10826088809058836. [PubMed: 3192340].
24. 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. [PubMed: 1955608].
25. Ghannadiasl F, Mahdavi R, AsghariJafarabadi M. Assessing Readiness to Lose Weight among Obese Women Attending the Nutrition Clinic. *Health Promot Perspect.* 2014;**4**(1):27–34. doi: 10.5681/hpp.2014.004. [PubMed: 25097834].
26. Sutton K, Logue E, Jarjoura D, Baughman K, Smucker W, Capers C. Assessing dietary and exercise stage of change to optimize weight loss interventions. *Obes Res.* 2003;**11**(5):641–52. doi: 10.1038/oby.2003.92. [PubMed: 12740454].
27. Wilson GT, Schlam TR. The transtheoretical model and motivational interviewing in the treatment of eating and weight disorders. *Clin Psychol Rev.* 2004;**24**(3):361–78. doi: 10.1016/j.cpr.2004.03.003. [PubMed: 15245836].
28. McConnaughy BA, DiClemente CC, Prochaska JO, Velicer WF. Stages of change in psychotherapy: A follow-up report. *Psychotherapy: Theory, Research and Practice.* 1989;**4**:494–503. doi: 10.1037/h0085468.
29. 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].
30. Suris AM, Trapp MC, DiClemente CC, Cousins J. Application of the transtheoretical model of behavior change for obesity in Mexican American women. *Addict Behav.* 1998;**23**(5):655–68. [PubMed: 9768301].
31. Palmeira AL, Markland DA, Silva MN, Branco TL, Martins SC, Minderico CS. Reciprocal effects among changes in weight, body image, and other psychological factors during behavioral obesity treatment: a mediation analysis. *Int J Behav Nutr Phys Act.* 2009;**6**:9. doi: 10.1186/1479-5868-6-9.
32. Prochaska JO, Velicer WF. The transtheoretical model of health behavior change. *Am J Health Promot.* 1997;**12**(1):38–48. [PubMed: 10170434].
33. Fried TR, Redding CA, Robbins ML, Paiva A, O'Leary JR, Iannone L. Promoting advance care planning as health behavior change: development of scales to assess Decisional Balance, Medical and Religious Beliefs, and Processes of Change. *Patient Educ Couns.* 2012;**86**(1):25–32. doi: 10.1016/j.pec.2011.04.035. [PubMed: 21741194].
34. Redding CA, Rossi JS, Rossi SR, Velicer WF, Prochaska JO. Health behavior models. *Int Electron J Health Educ.* 2000;**3**:180–93.
35. 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. [PubMed: 18929608].
36. Welsh EM, Jeffery RW, Levy RL, Langer SL, Flood AP, Jaeb MA, et al. Measuring perceived barriers to healthful eating in obese, treatment-seeking adults. *J Nutr Educ Behav.* 2012;**44**(6):507–12. doi: 10.1016/j.jneb.2010.06.005. [PubMed: 21665549].
37. 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. [PubMed: 11439307].
38. Clark MM, King TK. Eating self-efficacy and weight cycling: a prospective clinical study. *Eat Behav.* 2000;**1**(1):47–52. [PubMed: 15001066].
39. 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. [PubMed: 22118752].
40. 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. [PubMed: 14724662].
41. Macht M. How emotions affect eating: a five-way model. *Appetite.* 2008;**50**(1):1–11. doi: 10.1016/j.appet.2007.07.002. [PubMed: 17707947].
42. 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.* 2008 doi: 10.1016/j.foodqual.2008.07.005.