

# Efficacy of Dialectical Behavior Therapy on Decreasing Weight in Obese Women with Emotional and Behavioral Disorders: A Quasi Experimental Study

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## Abstract

**Objective:** The growing worldwide prevalence of overweight and obesity, despite treatment strategies remain the health problem. Over the past decade, increasing attention has been paid to psychological factors and a potentially comprehensive, multimodal skills-based treatment. The purpose of this study was to evaluate the efficacy of dialectical behavior therapy (DBT) on weight loss in obese women with emotional and behavioral disorders.

**Materials and Methods:** In this quasi-experimental study, statistical population from convenience sampling consisted of 42 obese women with body mass index (BMI) more than 29.9 kg/m<sup>2</sup> divided in 3 groups, behavioral, emotional and control. Descriptive and analytic statistics were computed according to demographic information, emotional eating scale and Dutch eating behavior questionnaire. Intervention included 13 sessions of 1.5hr group therapy, DBT-skills training from April to September 2019. Mixed-effect modeling ANOVA with repeated measurements was performed by statistical analyses, IBM SPSS version 24 to study changes in variables over time.

**Results:** The results demonstrated that the emotional such as anger, anxiety and depression, significantly decrease during the study period. (*P*-value<0.001) As well as behavioral eating demonstrated significant improvement in restrained eating and decrease in emotional and external eating behaviors right after the end of intervention while trial group experienced significant weight loss.

**Conclusion:** The present study provides some evidence that DBT-skills training can be effective in decreasing problematic eating behaviors, emotion dysregulations, decreasing BMI.

**Keywords:** Dialectical behavior therapy, Obesity, BMI, Behavior eating, Emotional eating

## Introduction

Obesity as a pandemic is defined as excess body weight (1), results from a physiological imbalance in which energy intake chronically exceeds energy expenditure (2) and anticipates poorer physical and mental health as well as lower well-being

(3), such as diabetes, heart disease and cancers.

Consensus is growing that obesity is a chronic multifactorial disease, arises from a complex interaction between several factors, such as genetics (4), epigenetic, metabolic (5), environmental (6,7) behavioral (3), sedentary behavior such as increases use of transport (e.g. cars, contextual or neighborhoods food environment and school environment), biological (8), emotional (9), socioeconomic, cultural, etc, Which are not yet fully understood the exact complex interaction between them.

Obesity is usually diagnosed by anthropometric measurements of body mass index which is calculated as weight in kilograms divided by the square of height in meters ( $\text{kg}/\text{m}^2$ ).

Investigating, the complex factors of behavioral and emotional factors in obesity can lead to design of interventions to discontinue mechanisms responsible for this relationship.

Based on research by Järvelä-Reijonen et al. (2018) about behavioral eating, eating according to no bodily hunger and satiety cues, (10) dichotomous thinking (e.g. Black or white, all or nothing) (11), intuitive eating, food craving and inability to cut down food intake (12) are examples of maladaptive psychological related to behavioral eating in striatum networks and Hypothalamus (13) leads to weight gain.

Plentiful food, portion size (3), smell, taste and appearance (14) are examples of important type of maladaptive eating behavior called external eating which may be culprit because it can lead to mindless eating or eating based on social and situational cues in addition to hunger cues (15).

On the other hand, Van Strien (2018) study about causes of emotional eating and matched treatment of obesity. Due to childhood experiences of food being used as comfort (16) eating in response to negative emotions as a trigger for food consumptions (17) are used by some individuals. Not only negative emotions

such as depression (18,19), anxiety (20), anger (21), loneliness (22) and stress (23) but also experiences of positive emotions (24) are the factors that make people vulnerable to engage in overeating. Consequently, individuals who suffer from lack of adaptive emotion regulation strategies and skills (25) or have not learned to express their emotions (26) or experience high impulsivity (27) use binge eating, purging or other eating disorders as attempts to cope with negative affect by providing short term comfort or distraction. (28)

As mentioned Van Strien (2018) study was to found out matched treatment of obesity. A broad range of clinical conditions, including eating problems (29) also reduction emotional eating (30) binge eating and improve mood were treated by a stand-alone treatment, DBT, which could be used as an adjunctive treatment as well. To have any considerable impact on the obesity epidemic, efficient interventions not only effectiveness but also cost-effectiveness must be delivered.

The purpose of the current study was to determine efficacy of DBT on weight loss in obese women with emotional or behavioral disorders.

## Materials and Methods

This quasi-experimental study was designed psychological approach, Dialectical Behavior Therapy, as intervention in three sub groups (Behavioral, Emotional and Control) in three time stages (pre-test, post-test and follow up). Participants were recruited from Amir Hospital and private clinic in Tehran-Iran with a body mass index in obese level, during April to September 2019.

Inclusion criteria were as follows; female,  $\text{BMI} \geq 29.9 \text{ kg}/\text{m}^2$ , age 18 to 65, no breast-feeding and no pregnancy and having a minimum literacy (grade 9). Other criteria were consent of participating in group therapy and research protocol, no physical disease to use special drugs such as chemotherapy, no use other psychological or pharmaceutical

intervention for obesity and were willing to participate in the study.

Exclusionary criteria were any concurrent treatment for weight, medical conditions such as uncontrolled diabetes, thyroid problems that might influence weight or eating, pregnancy and severe psychiatric conditions.

After informed consent, demographic and self-reported data from questionnaires on EES and DEBQ were collected, weight and height measured by two-member experts in Amir hospital then assessment interviews were conducted to divide behavioral and emotional group from eligible participants' causes of obesity.

Given a large effect size ( $f = 0.8$ ), a power of 80%, and an alpha statistic of .05, approximately 12-15 participants were needed in each group. After the screening interviews were conducted, 14 clients were accepted into the DBT intervention in behavioral and emotional groups as well as 14 clients in control group who had not been provided any intervention.

Questionnaires repeated right after three months later after finishing intervention and follow up during two months later.

The intervention which was adapted from The DBT solution to emotional eating (31) performed simultaneously to trial groups. Intervention included 13 group-sessions, 12 sessions training skills plus 1 session for prevention of relapse, of about one hour and half each, one day per week. (Table.1)

Mixed-effect modeling ANOVA was performed to study changes in variables over

time (pre-test, post-test and follow up).  $P$ -value  $\leq 0.05$  were considered statistically significant. Statistical Package for Social Sciences for Windows version 24.0 (SPSS) was used.

### Dutch eating behavior questionnaire

Emotional, external and restraint eating were assessed using the Dutch Eating Behavior Questionnaire (DEBQ) with uni-dimensional scales. It comprises 33 items responding to a Likert-type scale ranging from 1= never to 5= very often, corresponding to three subscales. A scale score above the mean or higher in emotional and external eating and lower score in restrained means behavior impairment or maladaptive eating. The Cronbach's alpha in current study was 0.869, indicating excellent reliability. There were no missing data for any outcome measures.

### Emotional Eating Scale

The self-report emotional eating scale (EES) has 25 items with three subscales that target feeling in the domains of Anger, Anxiety and Depression. Respondents are asked to rate the urge to eat when experiencing different types of feelings, using a 5-point Likert scale ranging from "1= no desire to eat" to "5 = an overwhelming urge to eat." The item scores are summed to form a total score between 25 and 125, where a higher score indicates greater severity of overall emotional eating.

The Cronbach's alpha for current study was 0.988, indicating excellent reliability.

There were not missing data for any outcome

**Table 1. Protocol of DBT adapted skills training**

Session	
1 <sup>st</sup>	The DBT approach to stopping binge eating (The DBT emotion regulation model)
2 <sup>nd</sup>	Making a commitment to stop binge eating- pros & cons, exploring values
3 <sup>rd</sup>	The program's goal & steps and tools to get it, diary cards, pre mindfulness skills & diaphragmatic breath
4 <sup>th</sup>	Become to be your own DBT coach, behavioral chain analysis
5 <sup>th</sup>	The benefits of DBT thinking and mindfulness, just notice and observation
6 <sup>th</sup>	Becoming a more skillful observer, nonjudgmental stance, stop being right or perfect
7 <sup>th</sup>	Staying on track, review
8 <sup>th</sup>	Mindful eating and urge surfing
9 <sup>th</sup>	Being mindful of current emotions and radically acceptance emotions
10 <sup>th</sup>	Reducing vulnerability to emotion mind and building mastery
11 <sup>th</sup>	Building positive experiences steps for increasing positive emotions
12 <sup>th</sup>	Distress tolerance & the crisis survival skills
13 <sup>th</sup>	Reviewing planning for the future, prevent relapse

measures. Mixed-effect modeling ANOVA was performed to study changes in variables over time (pre test, post test and follow up). *P*-values ≤ 0.05 were considered statistically significant. Statistical Package for Social Sciences for Windows version 24.0 (SPSS) was used. One-way ANOVA test was used to evaluate the homogeneity of the basic levels of research variables and analysis of covariance was used to determine the difference between the groups and Bonferroni post hoc test was used to determine the location of the difference between the groups. Significance level was considered *P*-value ≤ 0.05.

### Ethical considerations

The research was approved by the ethical committee of Hormozgan University of Medical Sciences (code: IR\_HUMS.REC.1398.344).

### Results

The trail group of patients who did not differ significantly on any demographic characteristics age and education at baseline, showed in table 2.

Total mean BMI= 38.23 kg/m<sup>2</sup> (SD=12.67), while behavioral group, pre-test mean BMI was 32.08 kg/m<sup>2</sup>, post-test mean BMI=29.49 kg/m<sup>2</sup> and follow up mean BMI=27.91 kg/m<sup>2</sup>. Mean BMI pre-test for emotional group was 31.32 kg/m<sup>2</sup>, post test mean BMI=28.69 kg/m<sup>2</sup> and follow-up mean BMI=27.56 kg/m<sup>2</sup>. While the trend of weight loss and BMI observed in behavioral and emotional groups, the mean BMI in control group is as follows: pre-test=31.8 kg/m<sup>2</sup>, post-test=31.26 kg/m<sup>2</sup> & follow-up=31.5 kg/m<sup>2</sup>.

The means and standard deviations of research variables are presented in table 3.

According to the sphericity test, the results of

**Table 2. demographic characteristics of intervention completers (N=42)**

Mean% (Frequency)	Behavioral	Emotional	Control
<b>age</b>			
<b>28-25</b>	21.4 (3)	14.3 (2)	21.4(3)
<b>25-35</b>	42.9 (5)	28.6 (4)	42.9 (5)
<b>35-45</b>	14.3 (2)	21.4 (3)	21.4 (3)
<b>45-55</b>	21.4 (3)	21.4 (3)	14.3 (2)
<b>55-65</b>	7.1 (1)	14.3 (2)	7.1 (1)
<b>Education</b>			
<b>Under diploma</b>	7.7 (1)	7.7 (1)	15.4 (2)
<b>Diploma</b>	33.1 (3)	30.8 (4)	33.1 (3)
<b>Associated Diploma</b>	33.1 (3)	7.7 (1)	33.1 (3)
<b>Bachelor</b>	30.8 (4)	46.2 (6)	30.8 (4)
<b>Master</b>	30.8 (4)	33.1 (3)	15.4 (2)

**Table 3. Raw data for each outcome / group at pre, post and 2 months follow up**

Measure M±SD	Pre-test			Post-test			Follow up		
	Behavioral	Emotional	Control	Behavioral	Emotional	Control	Behavioral	Emotional	Control
<b>Group</b>									
<b>BMI</b>	32.08 (±1.51)	31.32 (±1.18)	31.80 (±1.25)	29.49 (±1.37)	28.69 (±1.83)	31.26 (±1.17)	27.91± (1.62)	27.56 (±1.750)	31.51 (±1.30)
<b>DEBQ</b>									
<b>Restrained</b>	27.29 (±8.57)	29.57 (±5.51)	26.57 (±3.23)	38.07 (±6.21)	38.57 (±7.82)	28.07 (±4.48)	42.64 (±2.87)	40.71 (±6.41)	29.28 (±6.84)
<b>Emotional</b>	38.93 (±5.92)	48.50 (±3.90)	35.93 (±7.61)	28.79 (±4.56)	34.21 (±4.42)	35.57 (±7.88)	26.21 (±3.81)	30.43 (±3.71)	35.14 (±7.40)
<b>External</b>	39.93 (±4.87)	32.43 (±3.95)	31.14 (±7.31)	27.21 (±4.95)	24.36 (±4.73)	32.07 (±7.52)	25.36 (±5.97)	23.00 (±3.90)	32.86 (±7.73)
<b>EES</b>									
<b>Anger</b>	27.31 (±2.56)	40.15 (±2.56)	34.46 (±2.56)	22.77 (±1.99)	25.92 (±1.99)	31.54 (±1.99)	19.15 (±2.23)	25.38 (±2.23)	31.00 (±2.23)
<b>Anxiety</b>	18.61 (±1.79)	28.85 (±1.79)	25.46 (±1.79)	14.69 (±1.47)	18.85 (±1.47)	23.08 (±1.47)	13.85 (±1.54)	18.92 (±1.54)	23.23 (±1.54)
<b>Depression</b>	12.08 (±1.11)	17.85 (±1.11)	16.46 (±1.11)	9.846 (±0.98)	11.54 (±0.98)	14.23 (±0.98)	8.77 (±1.01)	10.92 (±1.01)	14.92 (±1.01)

Note: DEBQ, Dutch Eating Behavior Questionnaire included restrained, emotional and external eating, EES, Emotional Eating Scale included anger, anxiety and depression. SD Standard Deviation, *P*-values<0.05 are statistically significant.

variance analysis of repeated measures showed that during the time from pre-test to post-test and pre-test to follow-up in behavior and emotional groups, there are a significant difference based on  $P$ -values < 0.001.

Results for the decrease of BMI demonstrated statistically significant main effect of trial groups,  $F(3,52) = 7.703$ ,  $P$ -values = 0.000, partial  $\eta^2 = 0.308$ , and did demonstrate a large effect size.

A significant weight loss and improvement in restrained eating and decrease in emotional and external eating in behavioral and emotional groups demonstrated right after the end of intervention according to the trajectories of the outcomes over time while there is not statistically significant in control group ( $P$ -values > 0.05).

The results in BMI seem to be compatible with the hypothesis that the effects of the intervention remain stable or a slight tendency at follow-up.

Also, results at emotional situations such as

anger, anxiety and depression, demonstrated significant decrease during the time in behavioral and emotional groups. As well as behavioral eating according to DEBQ indicate significant improvement.

Contrary to our expectations, the mean differences indicate that with a slight difference, the behavioral group show more weight loss than the emotional group.

Based on self-report measures, in control group, the least small effect sizes were found for mean DEBQ emotional in pretest-posttest ( $d=0.105$ ), pretest-follow up ( $d=0.05$ ) and post test-follow up ( $d=0.06$ ) as well as DEBQ external ( $d=0.1$ ) and EES anxiety ( $d=0.1$ ). While in trial groups (emotional and behavioral causes) demonstrated medium to high effect sizes.

Also great effect size was found in emotional group from pre-test to post-test as well as pre-test to follow-up. While small to medium effect size was demonstrated in post-test to follow up.

**Table 4. Effect size (d) and mean of outcomes**

Outcome	Group	Pre-test post test		Pre-test Follow up		Post-test Follow up	
		MD	Cohen's d	MD	Cohen's d	MD	Cohen's d
Restrained	Behavioral	10.786	1.44	10.286	2.065	1.143	0.398
	Emotional	9.000	1.33	11.143	1.86	2.143	0.3
	Control	1.500	0.38	2.714	0.507	2.373	0.21
Emotional	Behavioral	10.143	1.92	12.714	2.56	2.517	0.612
	Emotional	14.286	3.43	18.071	4.75	3.786	0.93
	Control	0.357	0.05	0.786	0.105	0.428	0.06
External	Behavioral	12.714	2.59	14.571	2.67	1.86	0.34
	Emotional	8.071	1.85	9.429	2.40	1.360	0.32
	Control	-0.929	0.12	-1.714	0.23	-0.79	0.10
Anger	Behavioral	4.539	1.98	8.154	3.39	3.615	1.71
	Emotional	14.231	6.22	14.769	6.15	0.538	0.25
	Control	2.924	1.28	3.462	1.44	0.538	0.25
Anxiety	Behavioral	3.923	2.46	4.769	2.86	0.846	0.56
	Emotional	10	6.1	9.923	5.95	-0.077	0.05
	Control	2.385	1.46	2.231	1.34	-0.154	0.1
Depression	Behavioral	2.231	2.13	3.308	3.13	1.077	1.08v
	Emotional	6.308	6.03	6.923	6.54	0.615	0.62
	Control	2.231	2.13	1.539	1.45	-0.692	1.32

Note: Mean changes and effect sizes presented with positive values indicate of improvement in functioning and negative values indicative of decline in functioning.



Nonetheless, the data's demonstrated a slight tendency towards returning to post-test values by the two-month follow-up both in trial groups in compare to control group.

All data's changes in groups, Mean and Cohen's d effect from pre-test to post-test and follow up are provided in table 4.

## Discussion

The findings of the study provide preliminary support of an adapted DBT in reducing eating pathology and weight loss often present in obese individuals with emotional and behavioral causes. The results of the present study indicate improvements in patterns of emotional eating, along with decreased problematic eating behaviors, after intervention. These improvements were sustained with slight or none tendency at follow-up.

According to EES (depression, anxiety and anger) demonstrated greater reductions in emotional obese women from pre-test to post-test as well as from post-test to follow up in comparison to control group. The result was consistent to Safer and Jo's, Chen et al. & Kamody et al. (32-34) researches who they all used DBT for their patients.

As well as in line with Fitzpatrick et al. (35), research which specific negative emotions and comorbid depression and PTSD, decrease during DBT intervention.

The results of the analysis were compatible with the hypothesis that DBT benefits in the reduction of negative emotions with weight loss in obese women. Because DBT is an intervention that in addition to developing mindfulness skills, a class of therapies to which DBT belongs to (36), also promotes the acquisition of more effective emotion-regulation strategies. (37)

It is correctly anticipated that participants in the DBT group may be on a better weight loss trajectory than those in the control group.

In addition to reduction in eating pathology, adjunctive psychological support, specially DBT, may be important to address the potential weight loss related to the eating style

(Restricted, external cues and emotional eating). Results demonstrated significant reduction on behavioral style of eating with weight loss in obese individuals in compare with control group.

The results remained stable during the follow-up period, with lowly fluctuations and tiny trends towards returning to baseline values in post-test. DBT skills training partially mediated the improvements in all outcomes.

Our findings in behavior habits were consistent with other studies that investigated the effects of DBT in addictive behaviors among individuals. (38) Dol et al., (39) demonstrated attitude and poor eating habits of obese individuals would be changed by creating incongruence between them in DBT intervention.

Like Roosen et al. (40), we concluded that DBT is an effective intervention in weight loss and pathology of eating, emotional eating and eating-related habits.

The current study relied on a self - report questionnaire for all data's. Even though these instruments are generally able to capture the occurrence and intensity of the behaviors of interest, they still rely on the participant's ability to fully understand and psychological minded what is being asked, as well as their ability to accurately describe his or her own behavior in retrospect, which may be influenced by a myriad of factors, such as emotional state, literacy, and psychological minded concerns.

DBT is an approach has used to fill a gap exist in other interventions, when individuals have the knowledge, but does not influence their (eating) behavior unless they learn with confidence in their ability to adhere to it consistently. (41)

Contrary to our expectations, the mean differences indicate that with a slight difference, the behavioral group show more weight loss than the emotional group.

Our findings in the study offer empirical evidence showing trends for the effectiveness of a brief, adapted DBT for individuals with emotional and behavioral maladaptive eating.

Since the program developed is brief, implementation is likely a cost-effective option for various health care systems.

The present study relied on self-report questionnaire for all data. We know that these questionnaires are able to capture the intensity of the behaviors of interest with high accuracy, actually not 100%, they still rely on the participant's responses and their ability to fully understand what is being asked, as well as their ability to accurately describe their retrospect behavior. Also a high drop-out rate at the beginning of treatment encounter us delay to start the DBT- skill trainings.

To our knowledge, this is the first research in the word to work on causes of obesity and evaluate the efficacy of DBT. Also the research was that body height and weight were obtained through by objective measurements in all participants, not self-report. Hence, there is not any dropped out of the DBT treatment after starting intervention. The last but not the least, treatment has done by the author who translated the book "the DBT solution for

emotional eating" who mastered the content and implementation of the intervention.

## Conclusions

The findings of the present study showed that, DBT were proved to significantly alleviate negative emotion and relief them, could be effective in decreasing problematic eating behaviors and loss weight. Also, as an adjuvant treatment, it is a considerable investment of both time and money for individuals affected by different obesity causes.

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## Conflict of Interest

The authors declare that there are no conflicts of interest.

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