

# Efficacy of Cognitive-Behavioral Interventions in Weight Loss of People with Body Mass Index of 30 or Above (Obesity)

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## ABSTRACT

**Objective:** Obesity is a major health problem. Nowadays approximately one-third of the world population suffer from obesity which is frequently accompanied with serious medical and emotional problems. Three main evidence-based options exist for the treatment of obese individuals: lifestyle modification, pharmacotherapy, and bariatric surgery. The purpose of this study was to determine the effectiveness of cognitive-behavioral treatment in treating of patients with obesity.

**Methods:** Three women with body mass index of 30 kg/m<sup>2</sup> or more were selected by purposive sampling method to take a part in an A-B single subject design with follow up. Patients responded to the multidimensional body-self relations questionnaire-appearance scales (MBSRQ-AS), Binge eating scale (BES) and Rosenberg self-esteem scale (RSES) at 3 stages of baseline (pre-treatment), treatment (2<sup>nd</sup>, 4<sup>th</sup>, 6<sup>th</sup>, 8<sup>th</sup>, 10<sup>th</sup>, and 12<sup>th</sup> sessions), and follow up. In addition, weighing of patients was carried out at beginning of each session. Data were analyzed by graphs and improvement rates.

**Results:** Results showed that therapy was effective in weight loss, reduction of binge eating, and maintaining of weight loss. It also increased body image satisfaction but failed in self-esteem improvement.

**Conclusion:** The cognitive-behavioral treatment was effective in treating of obese patients. This treatment outcome data are consistent with cognitive-behavioral treatment of obesity proposed by other scientists.

## 1. Introduction

Obesity is one of the most important health problems (Cooper and Fairburn, 2001). Almost a third of the world population suffer from obesity and overweight (Amini et al., 2007). Also, obesity is associated with many severe medical and emotional problems (Cooper et al., 2010). Overweight and obesity are not defined as independent entities and the definition of obesity is based on cohort studies and their outputs. In terms of physiology, obesity is defined as accumulation of fat in the body. Obesity can be measured by vari-

ous methods, but the most widely and readily available method is the body mass index (BMI) (Browenell et al., 2005).

The increased prevalence of obesity and its related problems have prompted researchers to study the etiology of obesity and develop a wide range of prevention and treatment programs. In the UK, between 1980 and 1995, the prevalence of obesity increased in men from 6% to 15% and in women from 8% to 16%. Concerns about the increasing prevalence of obesity rise due to the evidence indicating that excess weight has adverse effects on health and longevity. Obesity-related diseases

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include hypertension, type 2 diabetes, stroke, bone-joint arthritis, respiratory disease, and certain types of cancer. Obesity also leads to the reduction of quality of life (World Health Organization, 2000). Three evidence-based approaches have been presented for the treatment of obesity: behavioral therapy, pharmacotherapy, and surgery (Cooper and Fairburn, 2001).

### Behavioral therapy

Behavioral therapy is one of the effective methods for reducing the risk of clinical events (Chobanian et al., 2003). In 2009, one study assessed the short- and long-term results of behavioral therapy on obesity. According to the results, change in life style results in about 10% weight loss in 16 to 26 weeks. But after a year of treatment, about 30% to 35% of the weight loss returns. About 50% of people return to initial weight after 5 years (Sarwer et al., 2009). The problem is not just weight loss in a short period of time, but keeping the weight loss in the long-term.

### Pharmacotherapy

The other treatment type of obesity is medication. Wittert et al. (2007) and Halford et al. (2006) studied the effectiveness of drug therapy. Drug therapy fails to be a complete treatment because of 3 main reasons: (1) long-term use of the drug may be associated with adverse effects, (2) many patients do not like to be treated with medication, and (3) in situations such as pregnancy medication cannot be used (Cooper and Fairburn, 2001).

### Surgery

The third type of obesity treatment is surgery. Adverse effects of operation result in the limitation of its use. Some patients have complaints such as heartburn (acid indigestion), shoulder pain, vomiting, bloating, and rectal pain. In

addition, about 7% to 8% of patients suffer from serious complications such as subdiaphragmatic abscess, pneumonia, pulmonary problems, wound splitting, and death (Nicol et al., 2011).

Since obesity is a complex and multifactorial phenomenon, involving biological, psychological, and social factors in its etiology and outcomes, its control and treatment is outside the scope of one specialty. Due to the complications and restrictions of 3 main treatments of obesity mentioned above and also to prevent an increase in weight again and to overcome psychological barriers, cognitive-behavioral approach for the treatment of obesity has been developed. Cognitive behavioral therapy is not only for weight loss, but is designed to minimize the recurrence of obesity and weight gain. In this approach, the treatment is primarily cognitive, and the patient changes the diet and level of activity.

Many studies have confirmed the effectiveness of cognitive-behavioral interventions in reducing body weight (Werrije et al., 2015), (Munsch et al., 2012). Cognitive-behavioral therapy model, Integrative Package for Overeating and Obesity Management (IPOM) is a treatment protocol based on cognitive-behavioral approach which was developed by Dr Hamed Ekhtiari (member of the Board of the Institute of Cognitive Sciences, Tehran) and is explained step by step in his book "I am a happy chubby" (Ekhtiari et al., 2014). Treatment consisted of 24 sessions and the list of health topics are summarized in Table 1.

Some factors distinguish IPoM cognitive-behavioral therapy from other cognitive-behavioral therapies: evaluating hunger and different types of craving such as basic craving, craving induced by signs, and craving induced by emotional states. After knowing the difference between real hunger and different types of craving, various approaches to cope with cravings will arise. Another issue

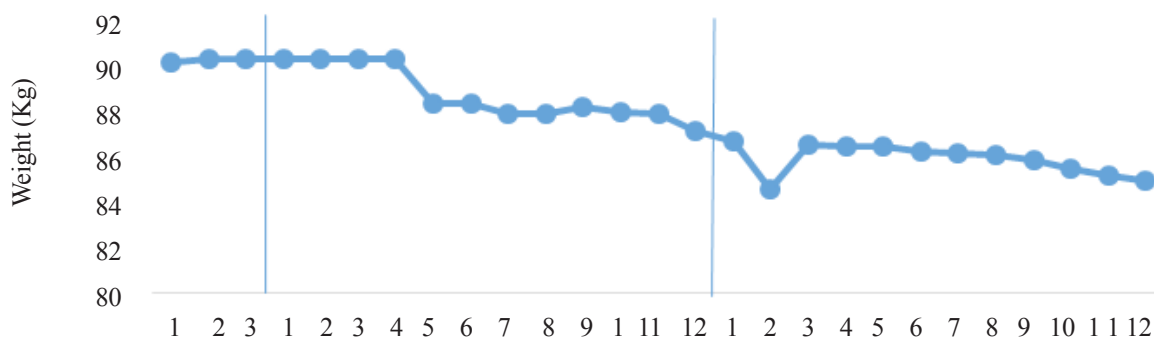


Figure 1. Efficacy of cognitive- behavior therapy techniques in weight reduction and weight maintenance of the first patient.

Table 1. Titles of therapy sessions.

1 <sup>st</sup> session	The purpose and motivation
2 <sup>nd</sup> session	The road to recovery
3 <sup>rd</sup> session	Primers
4 <sup>th</sup> session	Cravings and hunger
5 <sup>th</sup> session	Symptoms of Primers
6 <sup>th</sup> session	Environmental engineering
7 <sup>th</sup> session	Feelings of primer
8 <sup>th</sup> session	Eating to regulate emotions
9 <sup>th</sup> session	Emotion regulation for management overeating
10 <sup>th</sup> session	Entertainment activation
11 <sup>th</sup> session	Social values
12 <sup>th</sup> session	Group pressure
13 <sup>th</sup> session	Prevention is more effective than control
14 <sup>th</sup> session	Craving inhibition
15 <sup>th</sup> session	Craving reinterpretation
16 <sup>th</sup> session	Engineering relations
17 <sup>th</sup> session	Destructive activities and environments
18 <sup>th</sup> session	Enhanced brain inhibition regions
19 <sup>th</sup> session	Eating habits and bad eating habits
20 <sup>th</sup> session	Supportive activities
21 <sup>st</sup> session	Automatic eating
22 <sup>nd</sup> session	Mindfulness eating
23 <sup>rd</sup> session	Slip and relapse
24 <sup>th</sup> session	Mindfulness overeating

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is to avoid greedy body and mind which is very important. And finally is top-down regulation, which is described in treatment protocol in detail (Ekhtiyari et al., 2014).

Although the conceptual framework of cognitive-behavioral effects of cognitive-behavioral therapy is almost acceptable (Esteghamati et al., 2010) (with the exception of a single subject experimental trial of multiple baseline type by Kheyrollah Sadeghi who studied 4 women with a BMI above 30 and used cognitive-behavioral treatment protocol of Cooper et al.), the researcher did not find more findings about the effectiveness of cognitive-behavioral therapy (Sadeghi, 2008). Because of the increased prevalence of obesity in Iran which is reported 19.2% for women and 9.1% for men in 2010 and its ranking in adult obesity in the world (66 in 2010) (Cooper et al., 2010), and

also increased costs, financial losses, and adverse effects that obesity has on the health and longevity, we decided to evaluate the model of cognitive-behavioral therapy (IPOM), developed by the Dr Hamed Ekhtiyari, which has not been assessed in terms of its scientific efficacy. If this model had significant efficacy, we could apply it at the national level. According to what mentioned above, the main purpose of this study was to determine the effectiveness of cognitive behavioral therapy on people with a body mass index of 30 or higher.

The hypotheses of the study were as follows (all of the hypotheses are applied on people with BMI $\geq$ 30): first, cognitive-behavioral interventions reduce the weight of the obese people; second, the effects of cognitive-behavioral interventions in the 3-month follow-up period

**Table 2.** Demographic characteristics of participants.

Patient	Age	Height, cm	Weight, kg	BMI, kg/m <sup>2</sup>	WHR
Patient 1	29	170	90	31.14	1.8
Patient 2	35	156	99.1	40.68	0.85
Patient 3	48	165	97	35.63	0.85

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remain stable; third, cognitive interventions increase the satisfaction of body image in obese people; fourth, cognitive-behavioral interventions increase self-esteem of obese people; and fifth, cognitive-behavioral interventions reduce the rate of overeating.

## 2. Methods

Using the purposive sampling method, participants were selected from women who were obese with BMI ≥ 30 and referred to the Institute of Cognitive Sciences in Tehran to lose weight. This study was conducted to determine the effectiveness of cognitive-behavioral treatment of obesity in a single subject experimental trial with follow-up period with A-B design. Inclusion criteria were as follows: minimum age of 18 years, minimum education of high school level, body mass index equal to or greater than 30 kg/m<sup>2</sup>, and obesity associated with periods of overeating. Exclusion criteria were as follows: being pregnant or planning a pregnancy during treatment; receiving psychotropic drugs or drugs which affect weight; having eating disorders (bulimia nervosa, anorexia nervosa, night eating disorder); having psychotic disorders, addiction to stimulants, opioids, and other substances; and registered for another weight loss program or psychotherapy during the research. The sample size of this study were 3 patients who participated in the research and cognitive-behavioral therapy implemented on them after their agreement.

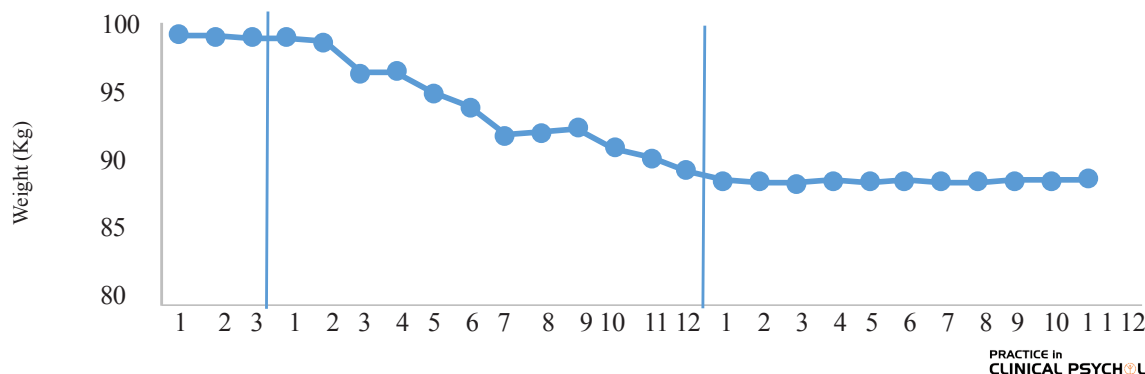
Body mass index (BMI) is calculated by dividing weight (in kilogram) by the square of height (in meter) (Browenell et al., 2005). Portable digital weight scale Arzum with a sensitivity of 100 g was used to measure weight and height was measured by a tape meter with an accuracy of 0.5 cm.

Waist circumference and hip size were measured in meters and then waist to hip ratio (WHR) is calculated by a simple division.

This checklist is available in IPOM therapy package, and useful topics are covered in it. The therapist asks open ended questions with regard to the content of each factor (Ekhtiyari et al., 2014).

Checklist of eating disorders (ED) is a clinical interview to assess eating disorders. The checklist is based on diagnostic and research criteria, DSM-IV-TR (APA, 2000) for diagnosis of bulimia nervosa (BN), anorexia nervosa (AN), night eating disorders (NED), and tracing the symptoms of ED in obese patients. Question subjects of checklist were based on the judgment of supervisors and advisors, which refers to the narrative content of tools (Sadeghi, 2008).

In this research, the short form of the scale was used which contains 34 items in 5 subscales: appearance evaluation, appearance orientation, body areas satisfaction, overweight pre-occupation, and self-classified weight evaluation. The questionnaire scoring is based on 5 degrees Likert-type scale. The



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**Figure 2.** Efficacy of cognitive- behavior therapy techniques in weight reduction and weight maintenance of the second patient.

**Table 3.** Comparison of patients' weight (kg) and percentage reduction.

Therapy sessions	Pre-test			Follow up	Post test		
	Patient 1	Patient 2	Patient 3		Patient 1	Patient 2	Patient 3
A1	90.1	99.1	97.2	F1	86.6	88.8	92
A2	90.2	99	97.2	F2	84.5	88.8	92
A3	90.2	98.9	97	F3	86.5	88.7	91.3
B1	90.2	98.9	96.2	F4	86.4	88.6	91.7
B2	90.2	98.6	96	F5	86.4	88.8	91.5
B3	90.2	98.4	94.4	F6	86.2	88.7	91.3
B4	90.2	96.5	95.6	F7	86.1	88.8	91.1
B5	88.3	95	95.4	F8	86	88.7	91
B6	88.3	94	95.1	F9	85.8	88.7	90.8
B7	87.8	92	94.9	F10	85.4	88.8	90.8
B8	87.8	92.2	94.3	F11	85.1	88.8	90.5
B9	88.1	92.5	94.4	F12	84.9	88.9	90.2
B10	87.9	91.1	93.5	MPR	5.54%	10.3%	7.04%
B11	87.8	90.4	92.7				
B12	87.1	89.5	92.6				
MPR	4.77%	10.4%	6.01%				
Effect size	5.54	34.3	14.65				

\*A=baseline, B=therapy sessions, F=follow up, MPR=means percentage reduction.

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Cronbach  $\alpha$  coefficient of 34 items was 0.79 and the internal scale of 5 subscales was 0.83. As a result, the questionnaire has appropriate reliability and validity (Cash, 1997).

This self-report instrument is designed to detect the presence and severity of cognitive and behavioral characteristics of overeating in the obese. The questionnaire has 16 materials, 8 of them are about the cognitive-emotional characteristics and other 8 materials are about behavioral characteristics of overeating (Ridderstra et al., 2006). Materials are rated from 0 to 3 and the total score ranges from 0 to 46. The Cronbach  $\alpha$  reliability of this scale is 0.85. In Iran, Dezhkam and colleagues examined sensitivity, internal consistency, and discriminate validity of the Persian version of BES (Dezhkam et al., 2009).

This tool is a self-report scale with 10 questions, which assesses the whole self-esteem or cognitive aspects of self-esteem. The results of Pullmann and Allik (2000) have shown that the internal validity of the scale is 84% (Pullmann, 2000). In Iran, Rajabi and colleagues examined sensitivity, internal consistency, and discriminate validity of the Persian version of Rosenberg self-esteem scale (Rajabi et al., 2011).

Following referral to a therapist, the inclusion criteria were firstly reviewed. Cognitive and physical assessment was carried out on the patients who had the desired conditions, and then they offered a short description of cognitive therapy. If they agreed to participate in the research an informed consent was taken from them. All patients completed BES, MBSRQ-AS, RESES questionnaires, 3 times at baseline. In addition, at the baseline, blood tests were taken to assess the risk factors and the presence of obesity-related diseases. Also during the intervention sessions, (in the 2nd, 4th, 6th, 8th, 10th, and 12th session), all the questionnaires were refilled again by the participants. The exception was the patient's weight which was measured before the start of each session. Moreover, during 3 months of follow-up, all questionnaires were refilled again by the samples every 2 weeks.

In addition, they called and reported their weight to the therapist. Standard framework of therapy sessions included measuring participant's weight, reviewing notes and homework, setting the agenda for the session, processing the contents of the agenda, summarizing the

**Table 4.** Comparison of patients' score in MBSRQ-AS, RSES, BES Questionnaire in treatment stage.

Patient	Tools	Baseline			Therapy sessions						MPI (%)
		1	2	3	2	4	6	8	10	12	
1	MBSRQ_AS	63.43	56.43	69.68	72.57	75.57	80.43	82.43	80.68	74.9	94.65
2		45.43	42.43	39.43	43.43	52.18	53.18	44.18	45.18	54.76	42.76
3		51.95	58.95	68.93	79.18	82.9	77.9	74.65	78.15	73.65	82.23
1	RSES	-2	0	4	-4	-2	0	2	2	-2	-1.33
2		0	4	8	8	8	8	6	1	8	-7.06
3		-4	4	0	10	6	4	10	0	8	100
1	BES	22	21	20	23	12	2	6	3	6	69.7
2		21	23	22	23	12	13	14	15	8	13.6
3		23	16	9	7	9	10	5	10	1.1	95.87

\*MPI=means percentage improvement.

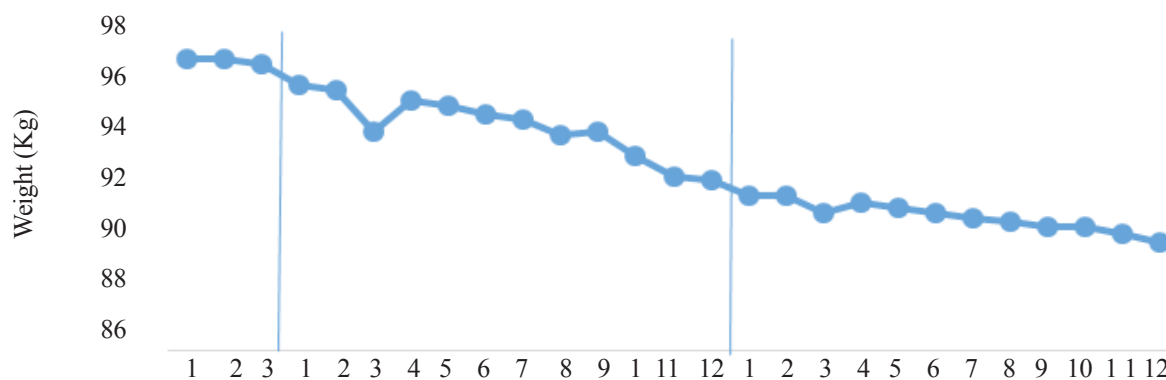
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main points covered in the session, and receiving feedback from patients. Treatment consisted of 24 items and in each session, 2 items were covered. Treatment package was performed in 12 sixty-minute sessions (plus an initial assessment) once a week for 3 months; with the exception of assessment session which took 2 hours.

It should be noted that the assessment session was free for the participants but therapy sessions was half-priced. Graphic or visual analysis, mean percentage improvement, mean percentage reduction, and effect size (Cohen's coefficient) were used to analyze the data. Data from questionnaires were analyzed by SPSS19. Effect sizes based on Cohen's d is defined as the difference between the two means divided by the standard deviation data.

### 3. Results

Demographic characteristics of participants are shown in table 2. Table 3 shows the weight of each patient before the intervention (baseline), for the time of treatment, and during follow-up period. At the level of treatment, weight percentage reduction was 4.77%, 10.4%, and 6.01% in first, second, and third patient, respectively which is statistically significant. The coefficient of Cohen's effect size was 4.25%, 34.3%, and 14.65% in the first, second, and third patient, respectively. In the follow up period, weight percentage reduction was 5.54% for the first patient, 10.3% for the second patient, and 7.04% for the third patient. Figures 1 to 3 show the efficacy of cognitive-behavioral therapy for obesity during the treatment level and also the follow-up period.



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**Figure 3.** Efficacy of cognitive- behavior therapy techniques in weight reduction and weight maintenance of the third patient.



In general, quantitative data and charts have confirmed the first and second study hypotheses. Scores of patients in multi-dimensional relationships of body questionnaire, self-esteem questionnaire, and BES during the treatment are provided in Table 4. Also, the scores of the mentioned questionnaires during follow-up period are given in Table 5. The scores of multi-dimensional relationship of body and BES questionnaire in Tables 4 and 5 show that treatment was effective in increasing body image satisfaction and reducing overeating.

During the treatment, improvement in percentage of patient's body image satisfaction in the first, second, and third patient were 94.65%, 42.76%, and 82.23%, respectively. The percentage of overeating reduction in the first case was 69.7%, in the second case was 13.6% and in the third case was 95.87%. According to the quantitative data and Tables 4 and 5, the third and fifth hypotheses were also confirmed. However, the high fluctuations in the scores given in Tables 4 and 5, show that the treatment was not effective in increasing the patients' self-esteem.

#### 4. Discussion

Analysis of the first hypothesis in the light of the results of this study showed that cognitive behavioral therapy was clinically significant in weight loss of first, second, and third patients. This finding is consistent with the standard by the USA Institute of Medicine (IOM) to assess the specific weight control programs which considers a successful treatment as "5% to 10% weight loss."

In general, according to the second hypothesis, it seems that medical intervention and patient guidance

throughout the treatment process has been effective in maintaining the decreased weight (Cooper et al, 2010). As shown in Table 3, the weight of the first, second, and third subjects has increased in the fifth or ninth session and again decreased in a week. What could be the reason for the fluctuations of weight in a short time? According to the studies, factors such as decrease and increase of the interstitial water, gravity in different environments, different circumstances in measuring weight such as the measurement time (morning, afternoon, or evening), and the amount of daily calorie intake, directly affect weight. Studies have also shown that a few days before menstruation weight increases due to fluid retention until a few days after it (Cooper, 2001). Altogether, these factors are possible reasons for those fluctuations. It should be pointed out that the rate of weight loss is different; some people have gradual and sustained weight loss, such as the first and third subjects and some people, like the second subject lost weight in a short time.

The goal of cognitive behavioral therapy is compatible with the first mode because its effect is more stable and weight is regained with a delay. The reason for fast weight loss in the early stages lies with less eating. During this period, muscles' and liver's glycogen stores are consumed to provide the energy needed for activities. Glycogen is bound to water, and when the body uses glycogen, water is separated from glycogen and excreted from the body. So, in fact, the weight loss is due to water loss and not due to losing extra fat of the body. For this reason, we should not look for rapid weight loss in the early stages because after a while, weight loss will

**Table 5.** Comparison of patients' score in MBSRQ-AS, RSES, BES Questionnaire in follow up stage.

Patients	Tools	Follow up						MPI (%)
		2	4	6	8	10	12	
1	MBSRQ_AS	78.43	77.43	78.43	73.43	75.43	70.32	61.35
2		41.43	43.9	39.43	40.43	38.18	45.18	13.93
3		76.65	84.15	76.65	75.65	73.65	75.65	18.92
1	RSES	-2	-2	-2	-4	6	-2	0.66
2		-2	2	-2	4	4	8	0.24
3		10	10	10	10	10	10	100
1	BES	5	6	9	7	3	1	83.3
2		19	19	19	17	19	20	15.4
3		0	2	0	2	2	0	91.68

\*MPI=Means percentage improvement.

become slow which can be frustrating (Cooper et al., 2010).

The findings of this research confirmed the third hypothesis stating that cognitive-behavioral therapy increases the satisfaction of body image. Body image is a psychological phenomenon and do not necessarily reflect the others' view. One of the most interesting findings of Cash (Cash, 1990) is that women's body image does not have any relation to reality. Concerns about the appearance of women is so common which mentioned as "normative discontent" (Cooper et al., 2003). Weight loss is probably the most famous treatment for body image but it should be noted that weight loss just partly improve the body image in the obese people. Weight loss, especially moderate loss does not relieve all problems related to body image by itself (Cooper, 2001). Cooper and his colleagues suggest that body image therapy should be based on long-term weight loss to maintain it. They argue that traditional weight loss plans do not consider cognitive processes and expectations of patients about improvements in body image and for this reason these plans frequently fail (Cooper, 2001). So, one of the major achievements of this study is that body image of people with a little weight loss is greatly increased.

Fourth hypothesis evaluation which states that the treatment has effects on increasing self-esteem showed that this method has not been effective in improving self-esteem. And if the percentage of improvement was much like the second patient, is due to other factors that were not examined in this study. In general, studies on the relationship between self-esteem and obesity have yielded contradictory results. Miller attributed it to self-reporting of fat people that can overcome prejudices against them in society and response like normal weight people (World Health Organization, 2000). In general, all women, especially those who are overweight have low self-esteem (Bennett, 1986).

To prove that self-esteem does not relate just to weight loss, some points about the first subject must be mentioned. First, the fluctuations in the self-esteem scale scores of the subjects were very high. Second, before starting treatment and without any intervention, self-esteem of the subject had increased. This can prove that self-esteem is also related to other factors.

The investigation of fifth hypothesis which states the effect of treatment on reducing overeating showed that the method was effective. It seems that overeating gradually leads to weight gain and the idea that obesity leads to overeating get less support. One of the evidence that

supports the causal relationship between obesity and eating disorders is a longitudinal study by Fairburn and colleagues in 2000 (Mokdad et al., 1998). Hasler and his colleagues in a prospective 20-year study evaluated the relationship between overeating, obesity, and weight gain. The results showed that overeating has a significant positive correlation with the weight gain over time (Hasler et al., 2004). Clinical trials conducted in terms of the treatment of patients with Binge eating disorder have shown that holding eating episodes are associated with weight maintenance, but weight of the people who continue overeating increased (Amini et al., 2007). This finding is almost the same as shown in this study.

In summary, our results showed that therapy was effective in weight loss, reduction of binge eating and maintaining of lost weight. It also increased body image satisfaction but it was not effective in self-esteem improvement.

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