



Lipid Profile Improvement after Four Group Psychological Interventions in Combination to Nutritional and Physical Activity Instructing Among Overweight and Obese Individuals

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Abstract

Background: Research background approved weight loss would result in improvement of lipid profile. Nowadays, weight management is attained by modifying psychological mediators, as well as dieting and making individuals do more physical activity. Hence, This research was performed to compare effectiveness of different psychological interventions on lipid profile improvement among individuals with overweight and obesity.

Methods: Using quasi- experimental design, 68 participants with mean age 26 years and 9 months (ranged from 20 to 43) were randomly assigned into 4 groups (including LEARN, CBT, CT, and MCT), and eventually 61 participants completed the treatment protocols. BMI was calculated by Omron digital body composition instrument, and blood lipids and glucose concentrations were measured prior to and after all interventions.

Results: Data analysis by using *t*- test for dependent groups analysis revealed lipid profile, FBS, and BMI were significantly modified after applying 4 interventions comparing baseline and post treatment mean differences ($P < 0.05$). Furthermore, repeated measure design analysis showed there were significant mean differences ($P < 0.05$) in HDL cholesterol, TG levels and FBS levels among 4 groups. Scheffe test revealed more detailed significant differences among four groups in HDL cholesterol, and FBS concentration varieties ($P < 0.05$).

Conclusions: Adding psychological interventions to dietary plans and regular physical activities in overweight management would consider as a valuable step in optimizing physiological outcomes and that's because of correcting mind- body interactional pathways among obese and overweight individuals.

Keywords: Lipid profile, Psychological interventions, BMI, Overweight, Obesity

Introduction

Obesity and overweight participate in chronic diseases such as diabetes, cancers, and coronary heart disease, dyslipidemia etc (1, 2); these phenomena seriously threaten general health (1, 3, 4). The prevalence of overweight (BMI ≥ 25) and obesity (BMI ≥ 30) are respectively 66%, and 33% (about 70 million people) among adult population in the United States (5), and obesity rate is 21.5% among Iranian adults (6), these rates are higher

especially among women than men among Iranian adults (6) and WHO predicts there will be entirely 1.5 billion overweight people in 2015 throughout the world (7).

In addition to tragic statistic reported above, excess body weight is related to harmful changes in the blood lipid profile (8). Hence, triglyceride (TG) and cholesterol levels are higher in overweight people than normal weight individuals

(9). Consequently, weight loss tends to improve the blood lipids concentrations (10-12).

Weight loss attained by regular physical activity, and declining fat intake from daily diets would result in increasing HDL concentrations and improving blood fat concentrations (10-13). It straightforwardly associates with dietary habits (14-16), eating beliefs (17), physical activity (18), life style (19) and fat intake (15, 16, 18), which can be influenced by psychological interventions. The objective of these interventions is to change behaviors, maladaptive beliefs (15, 20) and metacognitive beliefs (21) as it is used for palliating or curing chronic conditions (22) such as overweight and obesity (15, 16, 20). These conditions improvements would accelerate the weight loss process (15, 16). Psychological interventions, and mental health programs accompanied by healthy diet plans and exercise programs tends to help people to identify their emotional and environmental aspects for and against exercise behaviors and healthy eating patterns (23-25). This interventions consists of self monitoring practices (15, 16, 20), problem solving skills (15, 20, 26), relapse prevention training (15, 16, 26), paying attention to motivational aspects (15, 27), encouraging to compliant of the program. Confirming and gratifying the achievements (15, 27), and improving eating and exercise self- efficacy (28, 29), etc.

In respect of above points, training obese and overweight individuals to modify their eating behaviors and beliefs in company with restricting daily fat intake from diet would be an essential constituent to improve serum lipid abnormalities. Thus, this research was aimed to investigating the effectiveness of 4 psychological interventions in company with modifying eating diets to improve BMI, FBS, and lipid profile among obese and overweight Iranian females.

Materials and Methods

Study design

This study was conducted in 2011. According to quasi- experimental design, sixty eight volunteer women with body mass index (BMI, weight in kg/ height in m²) over than 25 were randomly as-

signed to LEARN, cognitive behavior therapy (CBT), cognitive therapy (CT), or metacognitive therapy (MCT) groups. Those in LEARN and CBT groups received treatment over 24 weeks, whereas CT and MCT groups took 12 weeks treatment. Two later groups (i.e. CT and MCT groups) did not receive further treatment until the end of the two other group interventions except to stay in their diet plan and physical activity (i.e. LEARN and CBT groups).

The present study was approved by the Ethical Committee of the Behavioral Science Center of Shahid Beheshti University of Medical Sciences in Iran.

Subjects

Announcing to different faculties of Payame Noor University, and Health Centers of Tehran Municipality; 400 participants contacted us directly and were offered an assessment interview, and those were eligible to take part in research if they met the following criteria: 1) female, 2) aged between 20 and 45 years (i.e. prior to menopause), 3) BMI > 25, 4) available for the period of treatment, 5) negative for C- reactive protein CRP), 6) willing to participate in the study, 7) non- smokers. The exclusion criteria were: 1) major medical or psychiatric illness (including diabetes, auto immune disease, cancer, cardiovascular problems, obsessive compulsive disorder, bipolar disorder, and etc), 2) current psychiatric or psychological treatment, 3) weight loss of 10% or more within the previous six months prior to treatment, 4) disorders or treatments known to affect eating, weight or metabolic rate, 5) disorders in which calorie or fat restriction are contraindicated, 6) binge eating is diagnosed by psychiatrist or health psychologist, 7) taking obesity pharmacotherapeutic agents and/ or herbal preparations for any trial weight change. Eventually, according to sample size in previous studies (e.g. 30), and sample size determination guidelines by Length (31) for repeated measure design analysis, 68 participants met the criteria- they were allocated randomly into 4 groups including LEARN, Cognitive behavior therapy (CBT), Cognitive therapy (CT), and Metacognitive therapy (MCT). Written consents had

been informed out because of the exact nature of the study, including the purpose, the course, and the potential risk of the study. Eventually, 4 participants of LEARN group, and 3 participants from MCT group dropped out during the first and second sessions of treatment (4 of them got pregnant, and 3 does not willing to initiate the structure). So, 61 participants completed treatment protocols.

Anthropometrical measurement

Height was measured in centimeters without shoes to the closest 0.5 cm. using a height rod on a standard spring scale. Body weight (kg), BMI (kg/m^2), and metabolism rate (RM; kcal) were measured using a digital body composition monitor (Omron BF-500, accuracy rate was 100 g) in street clothes without shoes.

Glucose and lipid measurements

Blood samples were collected after 12 hours of fasting (overweight), and were centrifuged within 2 hours of sampling. The levels of serum total cholesterol, triglyceride (TG), and High-density lipoprotein cholesterol (HDL) were assessed by the enzymatic method using Pars Azmoon Kits (Tehran, Iran). Low-density lipoprotein cholesterol (LDL) and fast blood sugar (FBS) were assessed by method using Pars Azmoon Kits (Tehran, Iran). Dietary assessments Participants were instructed to record their food intake over a week in a day diary record form (including ingredients and calories) at baseline for estimating total calories intake from carbohydrates, fats, and proteins, and their routine diet plans. They stayed in recording food intake to the end-up of this trial.

Diets and nutritional education

The participants instructed to follow Low calorie diets (LCD) were designed to create an energy deficit of 500–1,000 calories a day (i.e. less than total energy expenditure[•] (kcal) per day)) which

[•] For females with age equal or more than 19 years old and $\text{BMI} \geq 25$ (e.g. overweight/obese), estimated energy requirement calculations formula is $448 - (7.95 \times \text{age (y)}) + \text{PA}^* \times (11.4 \times \text{weight (kg)} + 619 \times \text{height$

induce weight loss of 0.5–1 kg per week (32). The LCD should be higher in carbohydrates (55% or more of total calories), with generous portions of protein (15% of total calories). Fat content should not exceed 30% of total calories with no more than 8–10% of total calories coming from saturated fats (33). A registered dietitian arranged the weekly food plans respecting to LCD, BMI, RM, age, gender, physical activity rate, total energy expenditure, and the food interests applying FAVA professional nutrition software up to the end of the treatments.

Physical activity

Participants recorded the type and duration of daily physical activity in a daily activity diary which were designed by research group at baseline and over the course of treatments. The physical activity goal was 30-60 minutes of moderate intensity at least three times per week or walking 6000 steps per day (15, 16, 27) over through the treatments. So, the participants were trained to walk 30-60 minutes a day and use a pedometer to record their steps per day.

Psychological interventions

Two members of the research team, one a registered dietitian and the other a psychologist were instructed attended weekly group management meetings for all 4 interventions throughout the study. These interventions were instructed under the supervision of the expert clinicians who were the advisors of this research.

(1) Group LEARN program for weight management

LEARN which has an educational structure was designed by Brownell (16) in which the learner

(m)), and PA stands for the “physical activity” value appropriate for the age and physiological state, For above females PA value in different states are estimated by these coefficients: Sedentary=1.00, Low active=1.16, Active=1.27, and Very active=1.44 (adapted from: Institute of Medicine. *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids (Macronutrients)*. Washington, DC: National Academies Press; 2005.).

masters crucial information for everyday life. The words LEARN is an acronym produced from the first letters of the five essential components of the weight management: 1) **L**ifestyle, 2) **E**xercise, 3) **A**ttitudes, 4) **R**elationships, and 5) **N**utrition. This program address some behavioral techniques including analyzing the behavior chains, internal attitude traps, negative self- talks, triggers for eating, ABC approach(antecedent events, behavior, and consequences), self- monitoring, set realistic goals, programmed activity, activity guidelines, flexible goals, habit change, select a support person, distinguish craving from hunger, values of foods, balanced diet, eating patterns, etc. This program comprised 16, 90- min sessions were being held weekly. Full details of this program have been published elsewhere (16).

Group cognitive behavior therapy (CBT)

Cooper, Doll, Hawker, Byrne, Bonner, Eeley, O'Connor, and Fairburn (20) designed a long-term cognitive behavior program to address certain psychological processes that interfere with weight maintenance. This program includes some cognitive and behavioral techniques to attain optimal weight loss, to minimize subsequent weight regain, to distinguish between weight loss and weight regain, to address potential obstacles, to the acceptance of maintenance, to educate problem- solving process, to tackle body image concerns, to acquire and practice the behavioral skills and cognitive responses that are crucial for weight control. This program comprised 24, 90- min sessions were being held weekly. Full details of this program have been published elsewhere (20).

(2) Group cognitive therapy (CT)

Beck (31, 34) has designed this program for making obese and overweight people think like a thin person. Hence, this program is on the basis of cognitive restructuring and addresses motivational issues, sabotaging thinking, introduces behavioral experiments, educates effective responses, introduces a new approach to problem- solving, and etc. This program comprised 12, 90- min sessions

were being held weekly. Full details of this program have been published elsewhere (27, 34, 35).

(3) Group metacognitive therapy (MCT)

The authors have designed this program by adapting from a program was recommended by Cooper, Todd, and Wells (26) for treating bulimia nervosa and binge eating. This treatment by tackling engagement and motivation for weight loss, case formulation and socialization to MCT model, teaching attention and detached mindfulness strategies, addressing negative beliefs about eating: uncontrollability and consequences, and positive beliefs about eating, negative self beliefs; challenges the barriers of weight loss, thinking modes, self- awareness, executive control and intentional flexibility, the cognitive intentional syndrome(CAS), metacognitive beliefs, and object and metacognitive modes in individuals with overweight and obesity. This treatment comprised 12, 90- min sessions were being held weekly. Full details of this program will be published (26, 36).

Statistical methods

Mean differences between categories of lipid profile and BMI into 4 groups were tested by repeated measure design and mean differences between baseline treatment and post- treatment were tested by paired sample *t*- test. *P*-value below 0.05 was considered statistically significant.

Results

After baseline testing regarding to BMI>25, 68 participants were randomly assigned into 4 groups (each group consists of 17 subjects), and 61 completed a special protocol respecting to the group. Mean age was 26 years and 9 months (ranged from 20 to 43). T- test for dependent groups analysis to compare baseline and post treatment mean differences revealed lipid profile, FBS, and BMI were significantly modified after applying 4 interventions ($P<0.05$).

The characteristics of the study subjects are shown in Table 1.

Table1: General characteristics of study population (data are presented as mean \pm SD)

	Baseline				Post treatment				Pvalue
	LEARN (n=13)	CBT (n=17)	CT (n=17)	MCT (n=14)	LEARN (n=13)	CBT (n=17)	CT (n=17)	MCT (n=14)	
BMI (kg/m ²)	31.10 \pm 4.41	29.20 \pm 2.61	30.23 \pm 4.18	31.86 \pm 4.35	27.96 \pm 4.90	26.62 \pm 2.87	27.69 \pm 4.16	29.53 \pm 3.71	<0.05
LDL cho- lesterol (mg/dl)	86.92 \pm 12.85	90.52 \pm 13.03	88.47 \pm 20.26	93.85 \pm 27.66	94.53 \pm 25.95	93.41 \pm 15.57	111 \pm 17.28	117.07 \pm 34.26	<0.05
HDL cho- lesterol (mg/dl)	62.00 \pm 5.77	64.41 \pm 7.61	48.35 \pm 4.59	53.00 \pm 17.32	60.00 \pm 28.23	49.00 \pm 6.42	45.23 \pm 4.14	44.50 \pm 5.86	<0.05
Cholesterol (mg/dl)	172.31 \pm 16.93	179.94 \pm 20.73	184.12 \pm 17.36	195.36 \pm 41.91	169.38 \pm 23.04	162.76 \pm 22.87	159.24 \pm 23.98	170.64 \pm 31.06	<0.05
TG (mg/dl)	115.46 \pm 20.27	120 \pm 32.88	122.76 \pm 26.14	140.64 \pm 43.49	85.46 \pm 19.73	95.52 \pm 26.80	116.29 \pm 32.76	117 \pm 31.34	<0.05
FBS (mg/dl)	74.69 \pm 5.64	77.64 \pm 4.28	75.76 \pm 4.03	79.35 \pm 5.49	80.84 \pm 5.01	78.11 \pm 5.87	85.88 \pm 4.49	87.71 \pm 7.41	<0.05

BMI, Body mass index; LEARN, Lifestyle, Exercise, Attitude, Relationship, and Nutrition; CBT, Cognitive-behavior therapy; CT, Cognitive therapy; MCT, Metacognitive therapy; FBS, Fast blood sugar; LDL, Low dense lipid; HDL, High dense lipid; TG, Triglyceride

Furthermore, repeated measure design analysis showed there were significant mean differences ($P<0.05$) between 4 groups in HDL cholesterol, TG levels and FBS concentrations (Table 2).

Table 2: Comparison of BMI, FBS and lipid profile concentrations among four groups

	F	Df1	Df2	Pvalue
BMI (kg/m ²)	1.361	3	55	0.246
LDL cholesterol (mg/dl)	2.090	3	57	0.112
HDL cholesterol (mg/dl)	7.441	3	57	0.0001
Cholesterol (mg/dl)	0.896	3	57	0.449
TG (mg/dl)	3.227	3	57	0.029
FBS (mg/dl)	8.444	3	57	0.0001

BMI, Body mass index; LEARN, Lifestyle, Exercise, Attitude, Relationship, and Nutrition; CBT, Cognitive-behavior therapy; CT, Cognitive therapy; MCT, Metacognitive therapy; FBS, Fast blood sugar; LDL, Low dense lipid; HDL, High dense lipid; TG, Triglyceride

Conducting multiple comparisons with Scheffe test reflected that the HDL cholesterol concentrations were significantly higher in LEARN group in comparison to two other groups (i.e. CT and MCT, $P<0.05$) (Table 3). Furthermore, HDL cholesterol varieties in CBT group was significantly higher than CT group ($P<0.05$). FBS varieties were significantly higher among MCT group than two other groups (i.e. CBT and LEARN, $P<0.05$), too. These changes are depicted in Fig. 1-2.

Table 3: Multiple comparisons of HDL and FBS concentrations among four groups

Scheffe Test for Multiple Comparisons					
	Group(I)	Group(J)	MD (I-J)	SE	P value
HDL levels (dl/mg)	LEARN	CT	14.2059*	3.46380	0.002
	LEARN	MCT	12.2500*	3.62105	0.015
	CBT	CT	9.9118*	3.22463	0.032
FBS levels (dl/mg)	MCT	LEARN	5.7665*	1.38477	0.002
	MCT	CBT	5.6534*	1.29754	0.001

LEARN, Lifestyle, Exercise, Attitude, Relationship, and Nutrition; CBT, Cognitive-behavior therapy; CT, Cognitive therapy; MCT, Metacognitive therapy; FBS, Fast blood sugar; HDL, High dense lipid

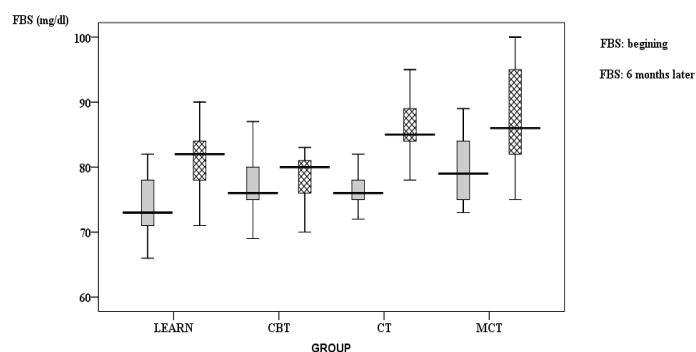


Fig.1: FBS concentration varieties had significant differences in MCT group in comparison to the other groups ($P<0.05$)

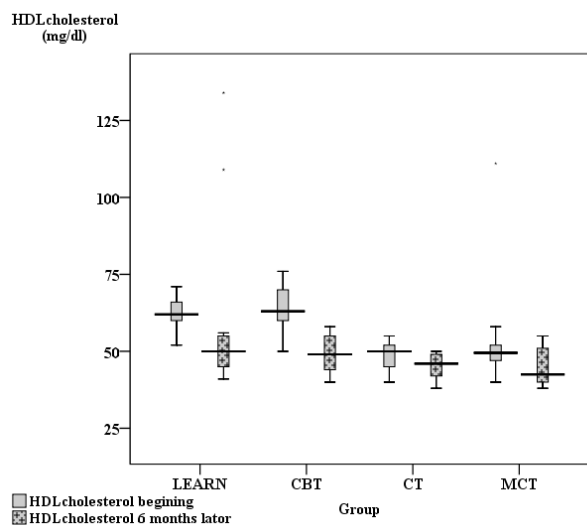


Fig.2: HDL cholesterol concentration varieties are significantly differed among LEARN and CBT in comparison to the other groups ($P<0.05$)

Discussion

Nowadays applying multidisciplinary approaches in overweight and obesity management are popular. These approaches encompass every aspect of body weight and health, including nutrition, physical activity, behavior, cognitions and other factors that may influence them. They focus on controlling environmental resources, social situations, and daily lifestyle that deteriorate weight management attempts by obese and/ or overweight individuals (e.g., unhealthy eating, sedentary activities, sabotaging thinking patterns, dysfunctional behaviors, and etc.). Hence, it is expecting that combination of psychological interventions, nutritional considerations, and physical activity guidelines would be effective on modifying excess weight, and adverse effects of overweight such as bad blood lipids concentrations. Therefore, the objective of this research was to determine the effectiveness of adding different psychological interventions to dietary plans on improving BMI and the blood lipids concentrations.

Results revealed that all 4 interventions altered the target variables in post treatment state in comparison to baseline. So that, BMI, HDL cholesterol, total cholesterol and TG concentrations were reduced, but LDL cholesterol, and FBS levels were increased in post treatment state. Williams (18) believed that lack of healthy eating and exercise habits together with ineffective ways of managing stress increases blood lipid concentrations. So,

Weight loss programs that address all three above lifestyle factors may be an effective path to improving serum lipid profiles. Therefore, it tends psychological interventions target healthy lifestyle would improve adherence to control and monitor food intake and physical activity in overweight individuals, and so result in BMI reduction, and blood lipids concentrations improvement. Additionally, Taylor (22) proposed that there is a relationship between emotions, beliefs, behavior, and health outcomes (mind- body linkage), beliefs can affect health outcomes through which affecting decision- making about health- related behaviors and its options. In consistent with this study, some researchers found that HDL concentrations significantly decrease during the weight reduction period of interventions but significantly increased when subjects were at a stabilized, reduced weight (e.g. 11-13). Different studies have shown favorable improvements in blood lipid concentrations (i.e., reduced TG, and total cholesterol) with weight loss as a result of decreased dietary fat intake and increased physical activity (12, 13, 38). These findings are consistent with what were found among research using aerobics alone or plus restricting food intake (10-13, 18, 37, 38). Additionally, these findings could be explained by unconscious pathway of mind-body linkage that considering emotional and physiological influence would affect the health outcomes, too. So, psychological interventions such as CBT would improve the adaption with chronic conditions by mediating behaviors and cognitions as the fundamental core of treatment; Beck (39, 40) emphasizes the way in which systematic errors in thinking and unrealistic cognitive appraisal of events can lead to negative emotions and maladaptive behaviors. So, changing the mindset about dieting and struggling to sabotage thoughts that dieters have would improve weight loss and consequently through body- mind pathway would alter positively the serum lipid concentrations. Furthermore, Fisher and wells (21) proposed that challenging between metacognitive beliefs which are in the domains of thought- action fusion or thought-object fusion, and beliefs about the need to react to thoughts in special ways are important to

soothing the mental problems which could influence the physiological varieties by above pathway, too.

In consistent with the results of some other studies (e.g. 41-44) another finding of this study was that FBS concentrations were increased in all groups especially among MCT group (because of using detached mindfulness techniques to relax mind and body) in comparison to the other two groups (e.g. LEARN, and CBT). Although FBS varieties in pre- and post- test states are in normal ranges (e.g. 70-115 mg/dl) it would be because of body homeostasis reaction to reducing fat intake and increasing complex carbohydrates intakes due to low fat diets ingredients. In addition to this, Keeping FBS concentrations in higher levels of normal range could delay physiological hunger, and so prevent binge eating.

The other finding was that CT and MCT had higher effects on reducing plasma HDL cholesterol in comparison to LEARN program. This finding reveals that CT and MCT can more readily addresses the practical problem and unique challenges (22) that clients with weight conditions face (15, 27), and facilitate compliant with diet plans or activity exercise(15, 27) during weight loss phase. Moreover Werrij, Jansen, Mulken, Elgersma, Ament, and Hospers (41) have suggested that cognitive therapy has more enduring effects than pure behavioral treatments (such as LEARN). MCT which is one of CBT techniques aims to change the way individuals experience and control thinking and the beliefs hold about cognition. So this intervention tends to have more enduring effects than pure behavioral treatments, too.

There are some potential limitations to the current study. First was the subjectivity of the self-report measures that were used to assess physical activity and dietary patterns. Another limitation was as the sample was recruited of the general community and females, results may not generalize to individuals seeking treatment in medical or community treatment settings or to overweight or obese males. Despite these limitations the current study will provide much needed information about benefits of applying multidisciplinary approaches in overweight and obesity management.

Conclusion

Adding cognitive and metacognitive therapy to the regular treatment of overweight and obesity would be a valuable step in facilitating and optimizing treatments and attaining more beneficial outcomes in the weight management area.

Ethical considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc) have been completely observed by the authors.

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