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Effectiveness of Counselling on Diet Quality and Physical Activity with Cognitive Counselling for Overweight and Obese Women-A Randomized Clinical Trial

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Abstract

Various treatments for obesity exist that actually work, however, a great deal of them face the issue of weight regain. Hence, there is this desire to focus on health measures that can be predictors of weight maintenance. This study explores whether four sessions of group-based cognitive counselling can lead to superior results compared to counselling on diet and physical activity only, in terms of eating behavior, calorie intake, diet quality, weight, and physical activity. We conducted a randomized trial for this purpose. Our findings suggest that a short intervention of cognitive counselling can lead to improved emotional eating and uncontrolled eating. Both conditions showed significant improvement in diet quality, cognitive restraint on eating, weight, BMI, calorie intake, and physical activity, while between group differences remained non-significant. Further studies are needed to assess the impact of brief cognitive counselling on measures of weight maintenance in long term.

Keywords: *eating behavior, emotional eating, cognition, obesity, uncontrolled eating*

Rates of obesity range from 2.3% to 12% among adults in developing countries (Poobalan & Aucott, 2016) and studies show higher prevalence among women (Bakhshi, Etemad, Seifi, Mohammad, Biglarian, & Koohpayehzadeh, 2016; Flegal, Kruszon-Moran, Carroll, Fryar, & Ogden, 2016). Obesity has detrimental effects on both physical and psychological health (Hirko, Kantor, Cohen, Blot, Stampfer, & Signorello,2015; Rajan & Menon, 2017). For one thing, patients with eating disorder have higher chances to be obese (Kessler, Berglund, Chiu, Deitz, Hudson, Shahly, et al., 2013).

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The equation for obesity might seem simple: condition of excess fat accumulation in the body is the final product of an imbalance between the intake of energy from foods and the energy expended through physical activity. In one hand, food industry has grown rapidly and consequently, more different types of food products have been introduced to the market. These products, known as convenient foods, contain plenty of calories, salt and sugar. On the other hand, economic developments have negative correlations with physically activity in one nation (WHO, 2018a). Extended availability of fast and convenient foods and lesser degrees of physical activity, both pave the way for the obesity to develop and maintain. Treatment of obesity lies in three main categories, including increasing physical activity, low calorie diet, pharmacotherapy, and in more severe cases, surgical treatments. Attempts for weight loss through low calorie diets and physical activity are showing an increase in popularity (Santos, Sniehotta, Marques, Carraca, & Teixeira, 2017); however, the global level of obesity is increasing, too (WHO, 2018b). Even if interventions could lead to successful weight loss results, data on weight maintenances are not bright (Ulen, Huizinga, Beech, & Elasy, 2008; Wing & Phelan, 2005).

In 2005, a review study suggested that the issue of weight management needs to be dealt with from a psychological viewpoint (Elfhag & Rössner, 2005). From this perspective, unsuccessfulness of the attempts for weight loss and weight maintenance could be attributed to the challenging nature of behavior change (Kinmonth, Wareham, Hardeman, Sutton, Prevost, Fanshawe, et al., 2008). Psychodynamic therapy (Kiesewetter, Köpsel, Köpp, Kallenbach-Dermutz, Pfeiffer, Spranger, et al., 2010), relaxation therapy (Koithan, 2009), and emotion freedom techniques are among other types of psycho-behavioral methods that have been adopted to conquer obesity. A Cochrane review study revealed that cognitive counselling is associated with superior weight loss results than other psychological methods (Shaw, O'Rourke, Del Mar, & Kenardy 2005).

Recent data has suggested that mere focus on weight loss could have a negative impact on well-being, weight loss and eating behavior (Freund & Hennecke, 2011). In fact, there is now a consensus that focusing on weight loss could be a narrow perspective of success for a weight management program (Seagle, Strain, Makris, Reeves, & American Dietetic Association, 2009). On the contrary, improvement in components of eating behavior can inform us of better weight maintenance (Fischer, Meyer, Dremmel, Schlup, & Munsch, 2014). Improved diet quality has also turned out to be a good predictor of weight maintenance in long-term (Aljadani, Patterson, Sibbritt, Hutchesson, Jensen, & Collins, 2013). Therefore, breaking the cycle of unhealthy habits can lead to improved ongoing weight loss maintenance.

A growing number of interventions with cognitive components have been conducted for overweight and obese population. However, these interventions are generally longitudinal (Sawamoto, Nozaki, Nishihara, Furukawa, Hata, Komaki, et al., 2017) and focused on weight loss (Dalle Grave, Calugi, Centis, Ghoch, & Marchesini, 2020) or specific psychological conditions like eating disorders (Grilo,

Masheb, Wilson, Gueorguieva, & White, 2011). Data regards effects of interventions with shorter and briefer designs are few or have limitations. Pimenta, Leal, Maroco, and Ramos (2012) examined the effects of eight sessions of individual cognitive counselling. Subjects were randomly assigned to receive trainings on goal setting, cognitive restructuring, self-monitoring, and positive reinforcement or be placed on a waiting list. After four months, significant increase in cognitive restraint on eating as well as reduction in weight and uncontrolled eating was only observed in the condition receiving cognitive counselling. While the study had a controlled design, small sample size and limited exclusion criteria restricted its findings.

One of the main strategies of cognitive counseling is to target a dysfunctional self-evaluating system which makes weight, shape and controlling them to be the basis of the judgment a person makes about his self-worth (Fairburn, Cooper, & Shafran, 2003). It's hypothesized that this over-concern could lead to cognitive restraint on eating, a phenomenon which concerns setting strict rules on dietary intakes. While cognitive restraint on eating can be a predictor of binge eating disorder (White, Masheb, & Grilo, 2009), data on the effect of cognitive restraint on BMI is mixed (Richardson, Arsenault, Cates, & Muth, 2015; Singh, Bains, & Kaur, 2017). Based on the findings of a Meta-analysis, cognitive counselling is expected to reduce worries about appearance and cognitive restraint on eating (Linardon, 2018). Studies have assessed the effects of cognitive counselling on emotional eating and uncontrolled eating. Although their findings are limited due to the above mentioned limitations, they mostly have reported promising results. The effect of cognitive counselling on diet quality, one possible predictor of weight maintenance, has not been assessed in the form of a measurable scale.

This study compares the efficacy of cognitive counselling plus counselling on diet and physical activity, with that of counselling on diet and physical activity alone.

Objectives

The goal of the present study was to evaluate the effects of a short group-based cognitive counselling intervention on eating behavior (uncontrolled eating, emotional eating, cognitive restraint on eating), and diet quality and secondarily, on weight, BMI, calorie intake, and physical activity level among overweight and obese women over a 3-month period.

METHOD

Study Design and Setting

The study was a randomized, parallel-group three-month trial, conducted in Urmia (Iran) between January to March 2019. The measurements were implemented at

baseline and week 12. Sample size was calculated based on a similar study (Mirkarimi, Kabir, Honarvar, Ozouni-Davaji, & Eri, 2017), where mean and standard deviation of participants' BMI were reported as *M* = 26.53, *SD* = 2.17 and *M* = 26.68, *SD* = 2.53 in motivational interviewing and control group, respectively, after three months of intervention. In this study, the required sample size was determined by solving the following equation, considering 95% confidence interval and a power of at least 90%:

$$n = \frac{(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta})^2 \times (S_1^2 + S_2^2)}{(\bar{X}_1 - \bar{X}_2)^2}$$

$$n = \frac{(1.96 + 1.28)^2 \times (2.53^2 + 2.17^2)}{(28.68 - 26.53)^2} = 27$$

Assuming a risk of 10% attrition of the participants during the study, we aimed to include 30 participants in each intervention group.

Sixty-one eligible participants were randomly assigned to receive counselling on diet quality and physical activity (n=31) or cognitive counselling in addition to counselling on diet quality and physical activity (n=30).

In order to reduce the burden on participants and speed the recruitment process, an overall check on inclusion and exclusion criteria was performed through telephone or social media, as participants contacted the program for the first time. After completion of recruitment, all of the participants were asked to report if they started to take any type of medication during the study (to assess whether they could remain in the program or not). Participants were also asked to inform the program if they decided to join any other weight loss intervention so that their data could be removed from the study.

Eligible participants were randomized into two intervention groups using random allocation rule, to receive intervention on diet and physical activity, or in addition to the same treatment, to receive cognitive counselling. An independent researcher did the process of randomization of the participants to the intervention groups following simple randomization procedure and based on a computer generated randomization list, created by Microsoft Excel.

Ethical Consideration

This study was confirmed by the ethics committee of the Urmia University of Medical Sciences and was registered in the Iranian Registry of Clinical Trials (www.irct.ir) (the registration code: IRCT20160824029508N7). Participants signed their written informed consent before taking part in the study and were informed that they could leave the program at any point that they desired.

Participants

Participants were volunteer women, recruited by flyers, and advertisements on three social media platforms (Instagram, Telegram and WhatsApp), popular between Iranians. We also sought to attract volunteers by visiting beauty salons, gyms and any other facilities with female participants and asking owners of these facilities to inform interested individuals about our program.

Eligibility criteria included being adult (18 ≤age <65 years) and being overweight or obese (25kg/m^2 ≤BMI <40 kg/m^2). Exclusion criteria included pregnancy, lactation, planning pregnancy in the next four months, taking any Nonsteroidal Anti-Inflammatory Drugs (NSAIDs), antidepressant tricyclic medications or any other medication with an effect on weight, cancer, insulin dependent diabetes, and serious medical or psychiatric conditions.

Intervention

The intervention for both groups consisted of four weekly sessions of counseling which were held in a clinic in Urmia, Iran. Duration of each session was one hour and a half for the cognitive counselling group and one hour for the counselling on diet and physical activity group. The structure of the cognitive counselling was developed under the supervision of a psychiatrist, based on previous studies and a literature review. Each session was held two times in each week so that 15 participants could take part in each session. Apart from times that participants were allowed to have open-ended interactions monitored by the therapist, the interventions' topics were supplied and participants were assigned with structured activities. Lastly, we also took advantage of social media to share content among participants and the therapist. This included educational information, reminders for in-person sessions, podcasts, assignments, and health related images. Participants of each group were separately added to two different social media platforms and encouraged to have interaction with their group mates and the therapist. When the in-person sessions were finished, each of the participants received weekly phone calls until the end of month 3 (four telephone contacts with each participant). These phone calls were made in order to establish rapport with participants and prevent attrition. The therapist delivering the program was a trained master of nutrition who had learned appropriate techniques of counseling from a recognized psychiatrist and was not blinded to the intervention groups. An overview of the main goals, strategies and session topics are provided in Table 1.

Counselling on Diet

Once the recommended energy intake to maintain body weight was calculated based on Mifflin St. Jeor equation and physical activity factor (Vaz et al., 2005) based on the physical activity level of each participant, 500 calories was subtracted from that and each participant received a personal diet so that a weight reduction around 0.5-1 kg could be observed each week (Seagle et al., 2009). The personal diets contained

30% of calories from fat, 15% from protein and 55% from carbohydrate. All of the participants were instructed about food groups illustrated by United States Department of Agriculture MyPyramid food group servings (USDA, 2012). An elaboration on counselling on diet is presented in Table 1.

Counselling on Physical Activity

All of the participants were encouraged to increase their levels of non-exercise physical activities, e.g. using stairs instead of elevator (CDC, 2020). Participants were also advised to have an everyday moderate-intensity walking plan (Lee & Buchner, 2008). More details on counselling on physical activity is presented in Table 1.

Cognitive Counselling

Participants in cognitive counselling group received counselling based on basic principles of cognitive behavioral therapy (Beck, 2011). Strategies to cope with maladaptive thoughts were integrated throughout the program and education on methods to manage lapses were provided for the participants. Free note books were given out between the participants in order to encourage them to keep diaries of their activities and thoughts. In order to tackle body image dissatisfaction, cognitive strategies (e.g., modifying negative thoughts and inner talks about body appearance) were adopted. Data shows that emotional eating facilitates weight gain in long term (Konttinen, 2020). Therefore, one goal of the cognitive counselling was to train participants on differentiating between hunger desire and cravings. The exercise that we employed was "practice hunger tolerance" to address the awareness of bodily sensations and learn to differentiate between physiologic and emotional hunger. Since reduction of uncontrolled eating is a predictor of weight maintenance in long term (Butryn, Thomas, & Lowe, 2009), we also included some exercises to change "definitions for fullness" in order to break the connection between over fullness and normal fullness. There is an overall look on other main topics and strategies in Table 1.

Table 1.
Intervention Goals, Strategies and Session Topics

Intervention goals	Strategies and/or session topics
Counseling on diet	Target for 0.5-1 kg/week of weight loss
	Weekly weighing
	A diet plan based on HEI-2010 and in compliance with food groups with 55% energy from carbohydrates, 30% from fat, and 15% from protein
	Food groups and food servings
	Introduction on 'good fats' and 'bad fats' and tips on managing consumption
	Introduction on vegetables, fruits and whole grains and tips on managing consumption
	Techniques to reduce salt intake
	Modifying usual recipes
	Trying new, uncommon healthy recipes
	Reading and interpreting food labels
	Eating out or on holidays

Counseling on physical activity	Benefits of exercising Sticking to an exercise plan of at least 150 minutes/week Learning about non-exercise activities Importance of social support: finding a partner for accommodation Finding new motivations for sport rather than weight loss only
Cognitive counseling	Motivation techniques for weight loss Setting realistic behavior-change goals Regular self-monitoring of food intake, physical activity, and thoughts Replacing negative thoughts and behaviors with positive thoughts Motivational techniques to induce behavior change Importance of positive reinforcement in maintaining behavior change End overeating Relapse prevention Body image improvement

Instruments

All of the participants were invited to the nutrition clinic at Imam Khomeini Educational Hospital in Urmia (Iran) for baseline and final measurements (at the end of month-3). Measurements were performed by trained individuals blinded to the study.

Weight with the lightest clothes on was measured to the nearest 0.1 kg by a digital scale. Height was measured without shoes to the nearest 0.5 cm.

Eating behavior was assessed using Three Factor Eating Questionnaire-Revised 18 Items (TFEQ-r18) (Anglé, Engblom, Eriksson, Kautiainen, Saha, Lindfors, Lehtinen, Rimpelä, et al., 2009). This version is the shortened and revised version of the original questionnaire which contains 51 items (Stunkard & Messick, 1985). The questionnaire measures three aspects of eating behavior including emotional eating, cognitive restraint on eating and uncontrolled eating. Three items evaluate emotional eating, which is inability to resist emotional cues of eating, such as anxiousness, sadness, or loneliness. Six items evaluate cognitive restraint of eating, which is conscious control of food intake in order to promote weight loss or control body weight, such as taking small helpings as a means of controlling weight, or to avoid eating certain types of foods. Nine items evaluate uncontrolled eating which is tendency to eat more than usual as well as subjective feeling of hunger, such as eating despite of not being hungry. Each of these subscales has a 4-point Likert scale score calculated through summing the points assigned to given answers, with higher values informing of higher intensity of the component (Brytek-Matera, Rogoza, & Czepczor-Bernat, 2017).

Dietary intakes of the participants were documented each time (at baseline and at the end of the study) using three-day 24-hour recalls (two weekdays and one weekend day). The 24-hour recall is a method that could be administered face-to-face or by telephone to record dietary intake in the previous 24 hours. In this study, all 24-hour recalls (six for each participant) were collected via telephone.

Completed 24-hour recalls were scanned by Nutritionist IV Diet Analysis software (Version 3.5.1; N-Squared computing, 1994) to calculate three subscales of HEI-2010 (fatty acids, sodium, empty calories) and mean calorie intake for each participant.

Energy requirement of each of all of the participants was calculated based on Mifflin St. Jeor equation (Mifflin, St Jeor, Hill, Scott, Daugherty, & Koh, 1990) for females. This equation uses weight (kg), height (cm) and age (years) to provide an estimation of the least amount of energy body needs in resting status. The equation for females is: Women: (10 × weight in kg) + (6.25 × height in cm) - (5 × age in years) – 161. To attain an estimation of the total energy expenditure, the result was then multiplied by the specific activity factors based on four levels of physical activity (sedentary, low, medium, extreme). The product determines the amount of calorie intake needed to maintain body weight. Since we perused weight loss in the present study, 500 was subtracted from this number, so that a 0.5 to 1 kg weight reduction could be observed each week.

Diet quality of each participant was measured using Healthy Eating Index-2010 (Guenther, Casavale, Reedy, Kirkpatrick, Hiza, Kuczynski, Kahle, Krebs-Smith, et al., 2013) with dietary data from baseline and post-treatment. This index measures diet quality consistent with 2010 US Department of Agriculture recommended food patterns (USDA, 2010). As shown in Table 1, HEI-2010 has nine adequacy components (total fruit, whole fruit, total vegetables, greens and beans, whole grains, dairy, total protein foods, seafood and plant proteins, fatty acids) and three moderation components (refined grains, sodium, empty calories). The overall HEI-2010 score is calculated by summing each of the components' score and ranges from 0 to 100 points. Higher overall scores imply healthier diets and are negatively associated with chronic diseases and deaths caused by them (Schwingshackl, Bogensberger, & Hoffmann, 2018).

Physical activity level was identified by using International Physical Activity Questionnaire-Short Form (IPAQ-SF) questionnaire (Lee, Macfarlane, Lam, & Stewart, 2011). This questionnaire has seven items to capture average daily time spent sitting, walking, and engaging in moderate or vigorous physical activity over the last seven days; first by asking how many days were spent doing those activities and then how much time was allocated to doing them. Once the overall time is calculated in minutes, it is multiplied by the Metabolic Equivalence of Task (MET) factor related to each category of activities: 0 for sitting, 3.3 for walking, 4 for moderate intensity activities, and 8 for activities with vigorous intensity. The overall MET minutes/week is obtained by summing the score pertained to each category.

Table 2.
The 12 Components of Healthy Eating Index-2010 Which Was Used to Determine the Diet Quality of the Participants

Component	Maximum points	Standard for maximum score	Standard for minimum score or zero
Total fruit	5	≥0.8 cup equivalent per 1,000 kcal*	No Fruit
Whole fruit	5	≥0.4 cup equivalent per 1,000 kcal	No whole fruits
Total vegetables	5	≥1.1 cup equivalents per 1,000 kcal	No Vegetables
Greens and beans	5	≥0.2 cup equivalent per 1,000 kcal	No Dark Green Vegetables or Beans and Peas
Whole grains	10	≥1.5 oz equivalents per 1,000 kcal	No whole grains
Dairy	10	≥1.3 cup equivalents per 1,000 kcal	No dairy
Total protein foods	5	≥2.5 oz equivalents per 1,000 kcal	No protein foods
Seafood and plant proteins	5	≥0.8 oz equivalent per 1,000 kcal	No Seafood or Plant Proteins
Fatty acids	10	(PUFAs+MUFAs)/SFAs>2.5	(PUFAs+MUFAs)/SFAs ≤1.2
Refined grains	10	≤1.8 oz equivalents per 1,000 kcal	≥4.3 oz equivalents per 1,000 kcal
Sodium	10	≤1.1 g per 1,000 kcal	≥2.0 g per 1,000 kcal
Empty calories	20	≤19% of energy	≥50% of energy

Note. Adapted from "Update of the Healthy Eating Index: HEI-2010", by P. M., Guenther, et al., 2013, *Journal of the Academy of Nutrition and Dietetics, 113*(4), 569–80
* scores between maximum and minimum were calculated proportionately.
** 1 cup=236.6 ml.

Statistical analysis

SPSS 20 was used to perform statistical analysis at baseline and at the end of month-3. The analyses were performed based on the mean of change in variables over a 3-month period, only for those who completed the study. Descriptive statistics were used to summarize the socio-demographic variables. Significance was set at the 5% level. Mean scores were calculated for all intervention variables. The normality of distribution of continuous variables was tested by one-sample Kolmogorov Smirnov test. Where data was not normally distributed, nonparametric tests were performed. Chi-square test was used to compare the baseline categorical characteristics among two intervention groups.

Total change in weight, BMI, HEI-2010, cognitive restraint on eating, uncontrolled eating between the groups were examined using independent samples t-test. Total change in emotional eating and physical activity between the groups was examined using Mann Whitney U test.

Total change in weight, BMI, cognitive restraint on eating, emotional eating, and physical activity within the groups was examined using Wilcoxon test. Total

change in HEI-2010 overall score, calorie intake and uncontrolled eating within the groups was examined using paired t test.

To examine between-group differences in calorie intake, we used ANCOVA (analysis of covariance), with follow-up calorie intake as the dependent variable, baseline calorie intake as the covariate, and intervention group as the independent variable.

RESULTS

Sixty-one participants were screened at baseline but nine were excluded from our analysis during the study; four from counseling on diet and physical activity group and five from cognitive counselling group (Figure 1). In result, all of the analyses were performed for 26 individuals in each intervention group (per-protocol analysis).

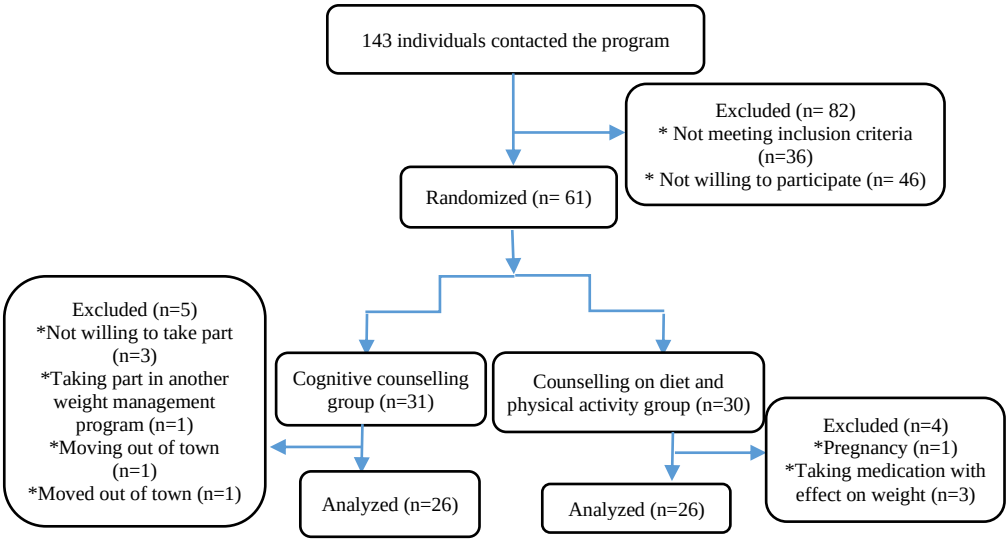

Figure 1. Flow of the participants through the study. Both groups were followed up for three months.

There were no significant differences among groups with regards to age, education, employment status, and marital status (Table 3). Also, no significant differences in initial characteristics were observed between groups except for initial calorie intake which was significantly lower in the cognitive counselling group (M = 1574.62, SD = 403.45 vs. M =1817.42, SD = 446.13, $p < .05$) (data not shown in the tables).

The mean amounts of calorie intake in both groups were significantly lower than baseline levels (difference M = -628.19, SD = 400.18 kcal/day, p = .002 in the cognitive counselling group and M = -722.86, SD = 444.17 kcal/day, p = .004 in the

counselling on diet and physical activity group); however, no significant difference in degree of change between the groups was found ($F(1, 49) = 1.44$, $p = .237$). Similarly, there was no difference by group in the change in total score of HEI-2010 from baseline to month-3 ($t(26) = -4.152$, $M = 9.64$, $SD = 13.99$ and $t(26) = -4.915$, $M = 9.01$, $SD = 14.39$ for cognitive counselling group and counselling on diet and physical activity group, respectively; $p = .92$) (Table 5).

In comparison to the baseline, significant reduction in the score of uncontrolled eating ($M = .49$, $SD = .21$ vs. $M = .33$, $SD = .21$) and emotional eating ($M = .60$, $SD = .35$ vs. $M = .46$, $SD = .32$) was observed in cognitive counselling group (Table 4). The uncontrolled eating score and emotional eating score remained stable for the counselling on diet and physical activity group throughout the study ($p = .314$ and $p = .456$, respectively). Effect size for uncontrolled eating was large ([Cohen's d] = .82) and medium for emotional eating ([Cohen's d] = .57) (Table 6).

There was a significant increase in cognitive restraint on eating in both groups ($M = .14$, $SD = .18$ and $M = .12$, $SD = .22$ in the cognitive counselling group and counselling on diet and physical activity group, respectively; $p < .05$) but no significant difference between the groups was noted ($p = .64$) (Table 6).

At month-3, the mean weight in the cognitive counselling group was 80.87 ($SD = 11.31$ kg), compared to $M = 83.13$, $SD = 11.09$ kg at baseline; $Z = -4.27$, $p < .001$). The respective quantities were $M = 81.24$, $SD = 8.30$ kg in the counselling on diet and physical activity group (compared to $M = 82.47$, $SD = 7.68$ kg at baseline; $Z = -2.48$, $p = .013$); however, mean weight loss did not differ statistically between groups ($p = .09$).

There was a significant increase in reported physical activity in both groups over time ($M = 883.94$, $SD = 2387.81$; $Z = -1.84$, $p = .04$ in cognitive counselling group and $M = 379.07$, $SD = 1185.62$; $Z = -2.29$, $p = .02$ in counselling on diet and physical activity group) but this difference in the amount of change between the groups turned out to be non-significant ($p = .64$).

Table 3.
Demographic Characteristics of the Participants

Variable	Categories	Cognitive counselling group (n=26)	Counseling on diet and physical activity group (n=26)	*p*	X^2
Age (%)	<40	16(61.54%)	14(53.85)	.78	.31
	≥40	10(38.46)	12(46.15)		
Education (%)	Elementary	3(11.54)	3(11.54)	.99	.09
	High school	8(30.77)	9(34.62)		
	University	15(57.69)	14(53.85)		
Marital status (%)	single	2(7.69)	4(15.38)	.67	.75
	married	24(92.31)	22(84.62)		
Employment status (%)	Employed	9(34.6)	15(57.7)	.16	2.79
	Not-employed	17(64.4)	11(42.3)		

Table 4.
Within Intervention Groups Comparison of Outcomes at Baseline and Month-3

Variables	Cognitive counseling group (n=26)			Counseling on diet and physical activity group (n=26)		
	Baseline	Month-3	*p* *	Baseline	Month-3	*p* *
	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	
Weight (kg)	83.13 (11.31)	80.87 (11.09)	**<.001**†	82.47 (7.68)	81.24 (8.30)	**.013**†
BMI (kg/m^2)	31.92 (3.97)	31.06 (3.98)	**<.001**†	32.33 (2.92)	31.83 (2.95)	**.011**†
Calorie intake (kcal/day)	1,574.62 (403.45)	946.42 (275.64)	**<.001**‡	1,817.42 (446.13)	1,094.56 (287.12)	**<.001**‡
Cognitive restraint	0.69 (.16)	.83 (.17)	**.002**†	0.58 (.22)	0.70 (.22)	**.011**†
Uncontrolled eating	0.49 (.21)	.33 (.21)	**<.001**‡	0.41 (.27)	0.38 (.24)	.31‡
Emotional eating	0.60 (.35)	.46 (.32)	**.002**†	0.51 (.33)	0.48 (.35)	.46 †
Physical activity (MET-minutes/week)	1,568.19 (1795.04)	2452.13 (1926.22)	**.040**†	792.77 (1026.66)	1,171.84 (950.63)	**.02**†

Note. SD: Standard Deviation, BMI: Body Mass Index, MET: Metabolic Equivalence of Task
*Within group analysis (before vs. after)
†Wilcoxon test
‡Paired t test

Table 5.
Within Intervention Groups Comparison of Healthy Eating Index-2010 at Baseline and Month-3

	Cognitive counselling group (n=26)			Counselling on diet and physical activity (n=26)		
	Baseline	Month-3	*p**	Baseline	Month-3	***p****
	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	
Total fruit	4.00(1.82)	4.79(0.64)	**.03**‡	3.55(1.72)	4.69(1.04)	**.002**‡
Whole fruit	3.08(1.80)	4.10(1.25)	**.04**†	2.40(1.55)	3.60(1.50)	**.002**†
Total vegetables	2.17(1.63)	4.15(1.43)	**<.001**‡	2.17(1.26)	3.96(1.46)	**<.001**‡
Greens and beans	1.15(2.15)	4.23(1.84)	**<.001**†	2.17(2.38)	3.85(2.15)	**.009**†
Whole grains	6.96(4.01)	8.65(2.82)	.12†	6.50(4.07)	9.06(2.74)	**.02**‡
Dairy	2.04(1.68)	3.63(2.99)	**.02**‡	1.77(1.69)	3.15(3.06)	**.05**‡
Total protein foods	3.32(1.54)	4.17(1.39)	**.01**†	3.87(1.43)	4.12(1.18)	.67†
Seafood and plant proteins	2.29(2.12)	2.58(2.44)	.58†	2.19(2.13)	2.90(2.31)	.25†
Fatty acids	7.20(2.80)	5.73(3.89)	**.01**†	7.29(3.01)	5.75(3.65)	.11†

	Cognitive counselling group (n=26)			Counselling on diet and physical activity (n=26)		
	Baseline	Month-3	*p**	Baseline	Month-3	***p****
	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	
Refined grains	4.17(4.33)	4.25(4.66)	.95†	3.17(4.26)	3.48(4.31)	.78†
Sodium	3.12(.08)	3.00(.00)	.32†	3.13(.08)	3.12(.08)	1.00†
Empty calories	19.85(.06)	19.96(.02)	.41†	19.73(.04)	19.27(.03)	1.00†
Healthy Eating Index-2010	66.61(10.41)	76.25(11.17)	**<.002**‡	64.62(10.04)	73.63(10.75)	**<.004**‡

Note. SD: Standard Deviation
*Within group analysis (before vs. after)
†Wilcoxon test
‡Paired t test

Table 6.
Between Intervention Groups Comparison of Outcomes

Variable	Cognitive counseling group (n=26)	Counseling on diet and physical activity group (n=26)	*p**	Confidence interval	Eta squared (η2) /Cohen's d
	Change Mean (SD)	Change Mean (SD)			
Weight (kg)	-2.27 (1.72)	-1.23 (2.44)	0.088†	-0.14,2.21	0.06/0.50
BMI (kg/m^2)	-0.86 (0.65)	-0.50 (0.97)	0.123†	-0.11,0.82	0.04/0.44
Calorie intake (kcal/day)	-628.19 (400.18)	-722.86 (444.17)	0.237‡	-63.36,250.23	0.01/0.22
Healthy Eating Index-2010	9.64(13.99)	9.01(14.39)	0.920†	-6.75,7.46	0.00/0.03
Cognitive restraint	0.14 (0.18)	0.12 (0.22)	0.640†	-0.08,0.14	0.00/0.13
Uncontrolled eating	-0.16 (0.18)	-0.03 (0.15)	**0.005**†	0.04,0.22	0.15/0.82
Emotional eating	-0.14 (0.20)	-0.03 (0.19)	**0.023**§	NA	0.10/0.57
Physical activity (MET-minutes/week)	883.94 (2387.81)	379.07 (1185.62)	**0.641**§	NA	0.02/0.28

Note. SD: Standard Deviation, BMI: Body Mass Index, MET: Metabolic Equivalent of Task, NA: Not Applicable
*comparing mean change between the groups
†Independent T-Test
‡ ANCOVA adjusted by baseline values
§ Mann Whitney U Test

DISCUSSION

Significant differences were found between the groups in uncontrolled eating and emotional eating with cognitive counselling group showing significant reduction and lower scores than their comparative group, in both of the items. Cognitive counselling had no added effect on any of the other health measures.

Cognitive counselling was successful in reducing uncontrolled eating and emotional eating. Uncontrolled eating is believed to be a critical predictor of binge eating disorder (Lydecker, Ivezaj, &S Grilo 2020). While there is no evidence that the improvement in uncontrolled eating or emotional eating has contributed to weight loss or would have done so in the upcoming months, Fischer et al. (2014) suggested that improvement in eating behavior has the potential to predict success of weight loss interventions in long-term. Furthermore, though the observed improvement in uncontrolled and emotional eating failed to lead to higher weight loss, uncontrolled eating is associated with lower life quality (De Zwaan, Mitchell, Howell, Monson, Swan-Kremeier, Roerig, et al., 2002) and the observed improvement should not be underestimated. Moreover,previous studies yielded similar improvements in longer durations (Palavras, Hay, Filho, & Claudino, 2017; Torres, Sales, Guerra, Simões, Pinto, & Vieira 2020). From this point of view, current study tells us that significant improvement in eating behavior could be expected from shorter interventions, with probably costing less time and money.

Cognitive restraint on eating increased significantly in both groups with no between group differences. Cognitive restraint on eating increases as a person follows a restricted calorie diet (Morin, Bégin, Maltais-Giguère, Bédard, Tchernof, & Lemieux, 2018) or increases his physical activity level (Martins, Robertson, & Morgan 2008). While the results of a meta-analysis show that cognitive counselling is effective in reducing restraint on eating (Linardon, 2018), both groups received a weight loss diet and recommendations on increasing their physical activity level. Maybe the weight loss diet and increase in physical activity have reduced the effect of cognitive counselling on dietary restraint. But at this point the reason of this between group indifference remains unclear. Cognitive restraint on eating is one of the challenging subjects of psychology: while traditional weight loss methods rely on its increment in order to achieve considerable weight loss, there are mixed findings about its association with stress (Rutters, Nieuwenhuizen, Lemmens, Born, & Westerterp-Plantenga, 2009; Morin et al., 2018) or diet quality (Giudici, Baudry, Méjean, Lairon, Bénard, Hercberg, et al. 2019; de Lauzon, Romon, Deschamps, Lafay, Borys, Karlsson, et al. 2004). Also, there are studies suggesting that it is negatively associated with body satisfaction (Markey & Markey, 2005; Megalakaki, Mouveaux, Hubin-Gayte, & Wypych, 2013). On the contrary, a recent study could not find any significant effect of this component on stress levels, appetite or other components of eating behavior (Morin et al., 2018). Findings of the current and previous studies could mean that more data is needed to judge about the desired direction of change in cognitive restraint on eating.

The addition of cognitive counselling did not significantly improve weight loss over and above counselling on diet and physical activity alone. Trials that studied cognitive counselling among overweight population unusually conclude that cognitive counselling leads to more weight loss against no treatment group. For example, a recent randomized controlled trial showed cognitive counselling efficacy in weight loss in comparison to a control group over 6 months (Madjd, Taylor, Delavari, Malekzadeh, Macdonald, & Farshchi, 2020). Pimenta et al. (2012) reported similar findings to that of Madjd et al over four months. Our findings in terms of weight loss might result from uncontrolled design of the study or shorter duration compared to the other studies. In our study, we sought to assess the short-term effects of cognitive counselling. Either way, our findings (and similar studies with even shorter durations) need to be furtherly investigated to assess the effect of brief types of counselling on weight and other health measures.

Both of the interventions were effective in reducing calorie intake of the participants and improvement in their HEI-2010 total score with no between groups differences. Few studies have evaluated the effect of cognitive counselling on diet quality. Previously, Aller and van Baak (2016) and Tsiros, Parletta, Brennan, Coates, Walkley, Petkov, et al. (2008) reported promising results in regards with effects of cognitive counselling on diet quality. However, none pointed to the exact components of cognitive counselling that might have had contributed to their findings. Acharya, Elci, Sereika, Styn, and Burke (2011) suggested that self-monitoring can improve diet quality. While self-monitoring was only emphasized in the cognitive counselling group, there were many other factors that were common between the groups which could have contributed to the results; including education on diet quality and calorie-restricted diet. Hence, more studies are needed to investigate the effect of cognitive counselling on diet and consequently for us to judge our findings.

The mean level of increase in physical activity was more in cognitive counselling group than the diet and physical activity group but their statistical difference turned out to be non-significant. It's been suggested that cognitive counselling could help to increase adherence to physical activity through several techniques (Dalle Grave et al., 2011; Michie, Abraham, Whittington, Mcateer, & Gupta, 2009). On the other hand, Laird, Fawkner, Kelly, McNamee, and Niven (2016) examined the role of social support in physical activity level through a systematic review meta-analysis study. According to their findings, there is a small yet significant association between total number of social support and physical activity level. In the present study, both groups received counselling and education in form of group based sessions. Moreover, we put emphasis on having company to follow exercise plans. This is a factor that might have mediated the effect of cognitive counselling on physical activity to some extent.

Limitations

This study did not have its intended power (91%) as it was initially designed to include 60 participants up to the end. This issue was due to higher rate of attrition than expected. Future studies are advised to plan for higher recruitment of participants and predict higher attrition rates in calculating their sample size.

Due to the comparative design of this study, assessment of the effect of each intervention component was not possible. For this reason, we cannot fully attribute the observed differences between the groups to cognitive counselling which represented the only different component between the interventions. While the ethical issues associated with controlled trials (Resnik, 2008) in addition to shortage of monetary resources prevented us from considering a control group, future studies could address this shortcoming by practical solutions, like considering a placebo intervention group.

The counselling in both intervention groups of this study was provided by one soul individual. This was done in order to prevent the confounding therapist effect on the results. However, although the cognitive counselling protocol was followed, the therapist may have become committed to the benefits of cognitive counselling and drifted somewhat from the strict counselling on diet and physical activity plan.

Conclusion. Counselling on diet and physical activity combined with cognitive counselling had no added effect to counselling on diet quality and physical activity alone in regards with weight, calorie intake, HEI-2010, cognitive restraint on eating, and physical activity outcomes over three months. However, only cognitive counselling was effective in improving uncontrolled and emotional eating.

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CONFLICTS OF INTEREST

None.

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