Efficacy of short-term cognitive group treatment to reduce obesity among overweight Indian women: a randomized control trial

F. Muskan*, S. Jain and K. Bains

Department of Food and Nutrition, Punjab Agricultural University, Ludhiana 141 004, India

This present study aims to assess the impact of a 10-week cognitive group treatment on dietary intake, physical activity, anthropometry and body composition parameters among a group of 66 volunteer Indian working women. The need to combat the rising prevalence of obesity and its associated health risks among working women by exploring the potential benefits. The results revealed a significant reduction in body weight, fat mass, waist circumference, hip circumference, body mass index, waist–hip ratio, waist–height ratio and conicity index among participants of the cognitive group treatment. Overall, the cognitive group treatment showed promising results in helping Indian working women cope with eating disorders, and improve their anthropometry and body composition parameters. These findings emphasize the potential of cognitive group interventions in promoting healthier lifestyles among this population.

Keywords: Anthropometry, body composition, diet, obesity, women.

WITH the evolving times and changes in food habits, lifestyle diseases are increasingly becoming more prevalent in the Indian population. Among these conditions, obesity emerges as a significant health challenge, spreading at an alarming rate. Globally, obesity is a growing concern, with Asian populations, including Indians, being particularly susceptible to obesity-related issues[1]. The number of obese individuals has seen a dramatic rise, reaching 39% by 2014, a doubling since 1980 (ref. 2). Recent statistics indicate that approximately 30.7% of adults are overweight, with men (34.1%) being more affected than women (27.5%). Additionally, a staggering 42.4% of adults suffer from obesity, with 9.2% experiencing severe obesity. Notably, the percentage of women with severe obesity (11.5) exceeds that of men (6.9)[3].

Across all WHO regions, women are reported to be more prone to obesity than men. While the situation in Indian society may be comparatively less critical than in the Western populations, it remains a cause for concern. The National Health Family Surveys reveal an increasing percentage of overweight individuals among both males and females. For example, in Punjab, India, 24% of males were reported to be overweight, with 8.3% being obese, while 26.6% of females were overweight, with 14.2% being obese[4]. Psychological factors play a significant role in this trend, impacting metabolic activity and various hormones in the body, ultimately contributing to weight gain. An extensive review of psychological interventions for obesity and overweight reveals that behavioural and cognitive–behavioural therapies can significantly contribute to successful weight management especially when combined with physical activity and a balanced diet[5].

Food choice is a method of choice-making, including the tactile (non-sensory and taste) features of nourishment itself, attributes of the environment (culture) and a consumer's eating behviour, i.e. state of mind in which the choice is made[6]. Prolonged exposure to enormous portion sizes increases energy intake and, hence, weight gain over time among moderately aged people[7]. Behavioural therapy is a multidisciplinary approach that consists of self-monitoring, stimulus control, social support, goal-setting, nutrition, increase in physical activity and problem-solving[8]. Cognitive behavioural therapy is a psychological evidence-based approach practised by a diverse range of professionals for treating mental health and other personal attributes, and it is considered the first-line remedy for obesity among psychological strategies[9]. This approach is based on a cognitive triangle that interprets the inter-relationships among thoughts, feelings and behaviour, which solely influence each other[10]. Eating behaviour is a marker of emotional system disorders and is a major determinant of obesity. Eating decreases anxiety in the obese population, which gives rise to the inter-relationship of eating with the feelings termed 'emotional eating'; this is more prominent among women. Further, emotional eating has a positive correlation with stress, anxiety, anger and depression[11]. Chronic stress conditions can trigger the intake of energy-dense foods like high-sugar and fatty foods. Although eating provides temporary pleasure from negative emotions, it also increases the level of obesity in the long duration[12]. Cognitive treatment for obesity is one of the appropriate means of weight reduction and long-term plans, which shows more weight loss compared to other dietary strategies

*For correspondence. (e-mail: muskan.lnu@siu.edu)

because behavioural modification builds an individual to better versions of themselves while making healthy eating choices and is a more reliable and durable strategy.

The prevalence of obesity in India is a well-researched topic, but there is a dearth of comprehensive studies exploring the potential of short-term cognitive group treatment as an effective approach for reducing obesity in the Indian population. The current literature mainly focuses on the increasing prevalence of obesity in the country, attributing it to lifestyle changes, dietary habits and psychological factors. However, a significant research gap exists in studying the efficacy of cognitive group therapy tailored to the specific Indian context and its impact on weight management. As obesity rates continue to rise and psychological factors contribute to weight gain, understanding the effectiveness of cognitive group treatment becomes vital in addressing this mounting public health concern. Hence, the present study seeks to bridge this gap by assessing the effectiveness of short-term cognitive group treatment as an intervention for reducing obesity among individuals in India. The primary objective of the study is to examine the impact of short-term cognitive group treatment on weight reduction among overweight Indian women. Additionally, we aim to assess changes in eating behaviour and emotional eating patterns in participants undergoing cognitive group treatment. Furthermore, we seek to compare the effectiveness of cognitive group treatment (receiving cognitive behavioural therapy–targeting eating behavior (CBT–TEB) interventions) with a control group. Through rigorous analysis and empirical evidence, this study endeavours to shed light on the potential of cognitive group therapy as an effective intervention in the context of obesity management for this specific population.

Materials and methods

Selection of participants

Sixty-six volunteer female university teachers aged 40–55 years with body mass index (BMI) above 25 kg/m^2 participated in this study. The group represented a category of working women engaged in a similar type of job, i.e. teaching work for 6–8 h per day. To initiate the experiment, the participants were involved to participate in the study. The subjects in both the control and intervention groups were volunteers for the study. Random sampling was done to allocate subjects in both groups. Subjects in the experimental group (n = 32) followed cognitive group treatment for 10 weeks, while the matched control group (n = 34) was not given any treatment.

Study design

This study employed a prospective randomized control trial to examine the short-term CBT–TEB intervention on overweight and obese working women. We chose a randomized controlled trial (RCT) as the suitable study design to examine the relationship between the short-term CBT–TEB intervention and its impact on overweight and obese working women. By randomly assigning participants into intervention and control groups, the study effectively reduces potential confounding factors, enabling more reliable attributions of observed differences in the outcomes of the intervention. This robust design offers a solid foundation for evaluating the effectiveness of the CBT–TEB intervention in this population, thereby enhancing the credibility and validity of the research outcomes. The study was conducted for 10 weeks, from 15 June to 21 August 2020. Moreover, we obtained permission from the ethics committee of Punjab Agricultural University, Ludhiana, India, to conduct the study.

Geographical description

Punjab, located in northwestern India, is known for its rich cultural heritage, fertile plains and vibrant lifestyle. It spans an area of approximately 50,362 sq. km and shares borders with Jammu and Kashmir in the north, Himachal Pradesh in the east, Haryana to the south and Rajasthan in the southwest[13].

Food habits in Punjab are predominantly influenced by its agricultural background. The state is famously referred to as the 'granary of India' due to its significant production of wheat and rice. Punjabi cuisine is characterized by its hearty and flavourful dishes[14]. The cuisine is rich in ghee (clarified butter), dairy products and spices, contributing to its distinct taste. However, this food culture has also led to some health challenges. The consumption of high-calorie and high-fat foods has been associated with an increased risk of lifestyle diseases in Punjab[15]. Obesity, diabetes and cardiovascular diseases are prevalent health concerns among the population due to the traditional diet and changing lifestyle patterns, including reduced physical activity.

Cognitive group treatment

The cognitive behaviour therapy[16] was followed with modifications in the dietary programme and exercise schedule that were culturally suitable for Indian women. The treatment included an introductory meeting and 10 group sessions for 10 weeks. Each session per week consisted of theme-based interactive sessions, video sessions, activity plan, compliance form, health-promoting foods and healthy snack recipes. The treatment programme was performed in a group as a learning-based approach. The fundamental goal was to raise awareness and knowledge concerning the triggers of dysfunctional eating and exercise, and to provide tools to address them. The study employed a comprehensive and structured CBT–TEB group treatment for overweight and obese working women. The intervention

spanned several weeks and involved trained therapists conducting the treatment sessions.

The primary focus of the CBT–TEB group treatment was to help the participants identify and modify dysfunctional thought patterns and behaviours associated with their eating habits. Using various cognitive techniques, individuals were taught to recognize triggers for emotional eating and develop healthier coping strategies. The intervention included cognitive restructuring to challenge negative thoughts and beliefs about food and body image. Additionally, behavioural techniques like self-monitoring, setting realistic goals and implementing a reward system were integrated to reinforce positive changes. The group treatment fostered a supportive environment, encouraging participants to share experiences, offer encouragement and learn from each other's successes and challenges. This group dynamics played a significant role in motivating and cultivating a sense of community among the participants.

Throughout the intervention, therapists regularly assessed individual progress and customized the treatment to meet specific needs. The effectiveness of the CBT–TEB group treatment was evaluated through various outcome measures, including changes in body composition and psychological well-being.

Collection of baseline and post-treatment data

The basic anthropometric parameters, i.e. height (cm) and weight (kg), were measured using an anthropometric rod, a body composition monitor (TANITA, BC420MA). Waist circumference (WC; cm) and hip circumference (HC; cm) were measured at the height of the umbilicus and at the largest area of the hip respectively[17]. Height, weight, HC and WC were calculated at a precision of 0.1 kg or cm in compliance with the standard protocol[18]. BMI was calculated as weight (kg) divided by height squared (sq. m). Waist-hip ratio (WHR) was calculated from these measurements as WC divided by HC. A cut-off value of 23 kg/m^2 for BMI and 0.80 for WHR ratio was considered the reference value[19]. The waist and height ratio (WHtR) was estimated as WC divided by height. A cut-off value of 0.5 for both waist and height was considered the reference value[20]. Conicity index (CI) was determined using WC, weight and height. Body composition parameters, i.e. fat mass (FM), muscle mass (MM), fat-free mass (FFM), total body water (TBW) and bone mass (BM), were analysed by bioelectrical impedance analysis (BIA) using the body composition monitor. Dietary intake was assessed by '24 hour recall method' for two working days and one holiday at 0- and 10-week periods in control and experimental groups. The daily intake of energy, carbohydrates, proteins, fats, iron and calcium was assessed using the software 'diet cal'[21]. The frequency and duration of physical exercises, i.e. walking, aerobic exercise and resistance exercise, were also recorded at the baseline and on completion of the treatment programme.

Statistical analysis

The data were analysed using Statistical Package for the Social Sciences, IBM SPSS version 22.0 and MS Excel 2018. Mean and standard deviation for various parameters were computed. Paired *t*-test was used to compare data at the baseline and after completion of the treatment in both control and experimental groups using analysis of variance. Correlation coefficients (r) were computed to determine the relationship of anthropometric and body composition with daily nutrient intake and physical exercise. In the statistical analysis of the CBT–TEB intervention, a sample size of more than 30 participants was included in each group (intervention and control). This meets the requirement for a level of significance of 0.05, indicating that the study aims for a 95% confidence level in its results. By having both intervention and control groups with more than 30 participants, the study seeks to ensure sufficient statistical power to detect potential differences between the groups and draw meaningful conclusions about the effectiveness of the CBT–TEB intervention.

Results and discussion

Compliance with diet plan and physical exercise of cognitive group treatment

Compliance with meals and snack time of the diet plan and the exercise schedule was recorded for the experimental group on a daily basis for 10 weeks. Table 1 depicts the per cent compliance with the diet plan, which ranged from 50.06 to 81.86. The maximum percentage of compliance was for breakfast (81.86), followed by lunch (74.96) and dinner (72.01). The snacking time showed lesser compliance than the three major meals, i.e. 67.41% for mid-morning and 70.42% for evening snacking (70.42%), but evening snacks had higher compliance. The results revealed that a greater percentage of subjects were able to follow healthy snacking prescribed to them during the treatment. Compliance with different forms of exercise, i.e. walking, resistance

Table 1. Per cent compliance to meals of diet plan and physical exercise by subjects of the cognitive group treatment for obesity (n = 32)

Meals/exercise	Range	Mean ± SD
Diet		
Early morning	56.25–81.25	70.12 ± 8.32
Breakfast	40.62–95.31	81.86 ± 10.67
Mid-morning	46.87–84.37	67.41 ± 11.37
Lunch	37.5–93.75	74.96 ± 13.71
Evening tea	51.25–88.75	70.42 ± 13.86
Dinner	40.62–90.00	72.01 ± 10.37
Post-dinner	30.00–75.00	50.06 ± 11.35
Physical exercise		
Walking	73.23–79.82	76.40 ± 8.84
Resistance exercises	23.00–25.07	24.00 ± 3.43
Aerobic exercises	32.38–35.20	33.79 ± 6.78

Table 2. Anthropometric parameters of the selected working women in the control and experimental groups

Anthropometric parameters	Control group (n = 34)			Experimental group (n = 32)		
	Week 0	Week 10	P-value	Week 0	Week 10	P-value
Basic anthropometric parameters						
Weight (kg)	70.97 ± 5.96	71.24 ± 6.14	0.31^{NS}	72.10 ± 4.84	69.21 ± 4.99	≤0.01***
Waist circumference (cm)	95.02 ± 12.38	95.21 ± 12.05	0.89^{NS}	97.19 ± 9.55	92.42 ± 9.08	≤0.01***
Hip circumference (cm)	101.87 ± 17.56	104.34 ± 4.53	0.50^{NS}	105.41 ± 3.19	102.52 ± 2.55	≤0.01
Derived anthropometric parameters						
Body mass index (kg m^2)	29.13 ± 2.03	29.25 ± 2.28	0.29^{NS}	29.42 ± 1.58	28.24 ± 1.67	≤0.01***
Waist–hip ratio	1.12 ± 1.13	0.91 ± 0.11	0.34^{NS}	0.92 ± 0.09	0.9 ± 0.09	≤0.01***
Waist–height ratio	0.61 ± 0.09	0.61 ± 0.08	0.94^{NS}	0.62 ± 0.07	0.59 ± 0.07	≤0.01***
Conicity index	1.29 ± 0.16	1.29 ± 0.15	0.96^{NS}	1.31 ± 0.12	1.27 ± 0.11	≤0.01***

Values are mean ± SD. ^{NS}Non-significant; ***Significant at 1%.

exercise and aerobic exercise was reported by 24.00–76.40% of the subjects. Among different exercises, walking showed the maximum compliance (76.40%), followed by aerobic exercise (33.74%), whereas resistance exercise depicted a poor compliance (24%). Similarly, Dhir *et al.*[22] have reported that compliance to weight loss diets and physical exercise by adult working women ranged from 71.6% to 96.1% and 23.8% to 79.2% respectively[23] also reviewed compliance for different Mediterranean diets and exercise among diabetic patients and reported compliance level in the range 61.8–75.5%.

Anthropometric parameters

The findings revealed that there was a significant ($P \leq 0.01$) reduction in body weight after a trial of 10 weeks, the reduction being 4% of the initial body weight in the experimental group, while a 0.4% increase was observed in the control group (Table 2). The help of behavioural therapy intervention, 10 kg weight loss was observed within follow-up of a year[24]. Our researchers[25,26] also reported an average weight loss of 7.7 and 4.2 kg respectively, during an intervention trial of 34 weeks among obese adults. A significant ($P \leq 0.01$) change was also observed in WC and HC among subjects of the experimental group; the reduction is 4.9% and 2.74% respectively. However, an increase of 0.2% and 2.38% respectively, was found in the control group. Similarly, among derived anthropometric measurements, significant ($P \leq 0.01$) changes were observed in BMI, WHR, WHtR and CI, the reduction being 4.0%, 2.2%, 4.8% and 3.05% respectively, in the experimental group after the treatment for 10 weeks, while an increase of 0.41%, 1.90%, 0.0% and 0.0% respectively, was observed in the control group. A reduction in WC, WHR and BMI of overweight and obese adolescents by the CBT intervention for six months[27]. A reduction in BMI of 0.34 kg/m^2 by a behavioral intervention to reproductive-aged women[28]. In another study, a reduction in weight, WC, WHR and BMI was reported as –5.0 kg, 5.5 cm, –0.031 and –1.8 kg/m^2 respectively, after six months of follow-up among CBT–TEB group women[16]. Anthropometric parameters in four groups, namely control, normal protein (NP), high protein (HP) and high protein with exercise (HP + E) are studied[29]. A significant ($P \leq 0.01$) reduction in weight was reported in all three groups except the control group. BMI also showed similar patterns with an increase of 1.6% in the control and the rest showed a decreasing trend, i.e. by 1.7% (NP), 3.0% (HP) and 3.8% (HP + E).

Body composition parameters

The per cent FM of subjects in the control group increased significantly ($P = 0.06$); however, the per cent FM in the experimental group decreased by 2.0 over a period of 10 weeks. The per cent MM and FFM of the experimental group increased significantly ($P \leq 0.01$ and 0.13), i.e. 3.1 and 2.4 respectively. A small but significant ($P = 0.04$) increase in per cent BM by 1.5 was also observed in the experimental group (Table 3). A behavioural therapy with regard to weight loss diets along with the prescribed exercise schedule by researcher[22] revealed that the weight loss programme, including low-calorie and high-protein diets along with physical exercise, was effective in reducing FM and increasing FFM among adult women during 12 weeks of the programme. With the help of CBT intervention, a positive change, i.e. a decrease in FM (–4.8 kg) and an increase in FFM (+1.1 kg) among adolescents, was reported[30]. Similarly, other researcher[31] observed a reduction in FM by 13% and an enhancement in FFM by 6.3% among overweight women with breast cancer.

Nutrient intake

The results revealed that subjects in the experimental group reduced their energy intake to an average value of 1334 kcal during the 10 weeks intervention period compared to the average of 2030 kcal before the start of the experimental trial. No significant change in energy intake was observed in the control group. The group treatment effectively reduced carbohydrate intake from 343 to 166 g ($P \leq 0.01$) and fats

Table 3. Body composition parameters of the selected working women in the control and experimental groups

Body composition parameters	Control group (n = 34)			Experimental group (n = 32)		
	Week 0	Week 10	P-value	Week 0	Week 10	P-value
Fat mass (kg)	27.95 ± 6.98	29.15 ± 6.66	0.05**	28.26 ± 4.42	26.69 ± 4.24	≤0.01***
Fat (%)	39.51 ± 9.91	40.99 ± 9.26	0.06*	39.13 ± 5.06	38.62 ± 5.76	0.37^{NS}
Muscle mass (kg)	41.43 ± 2.70	41.26 ± 2.66	0.48^{NS}	42 ± 2.16	41.61 ± 2.77	0.12^{NS}
Muscle mass (%)	58.68 ± 4.93	58.28 ± 5.32	0.28^{NS}	58.4 ± 3.2	60.24 ± 3.42	≤0.01***
Fat free mass (kg)	43.66 ± 2.83	43.85 ± 2.51	0.70^{NS}	44.32 ± 2.25	43.74 ± 2.78	0.02***
Fat free mass (%)	61.84 ± 5.20	61.86 ± 4.50	0.98^{NS}	61.82 ± 3.99	63.33 ± 3.36	0.13^{NS}
Total body water (kg)	32.19 ± 5.19	32.33 ± 5	0.73^{NS}	32.03 ± 3.74	31.39 ± 3.97	0.07*
Total body water (%)	45.55 ± 7.29	45.52 ± 6.47	0.95^{NS}	44.58 ± 5.78	45.56 ± 6.66	0.05**
Bone mass (kg)	2.22 ± 0.17	2.24 ± 0.12	0.41^{NS}	2.32 ± 0.18	2.27 ± 0.14	≤0.01***
Bone (%)	3.14 ± 0.33	3.16 ± 0.21	0.64^{NS}	3.23 ± 0.27	3.28 ± 0.22	0.04**

Values are mean ± SD. ^{NS}Non-significant; *Significant at 10%; **Significant at 5%; ***Significant at 1%.

Table 4. Daily intake of major nutrients by the selected working women in the control and experimental groups

Nutrients	Control group (n = 34)			Experimental group (n = 32)		
	Week 0	Week 10	P-value	Week 0	Week 10	P-value
Energy (kcal)	2050 ± 191	2061 ± 193	0.66^{NS}	2030 ± 121	1334 ± 123	≤0.01***
CHO (g)	350 ± 18.9	354 ± 19.0	0.10^{NS}	343 ± 23.8	166 ± 16.5	≤0.01***
Protein (g)	49.35 ± 2.31	53.07 ± 2.49	0.54^{NS}	43.87 ± 4.01	63.07 ± 7.46	≤0.01***
Fat (g)	53.50 ± 8.62	54.04 ± 8.71	0.12^{NS}	53.3 ± 6.07	49.01 ± 6.68	0.03**
Calcium (mg)	668.5 ± 98.6	663.6 ± 98.4	0.24^{NS}	792.5 ± 268	1725.2 ± 288.1	≤0.01***
Iron (mg)	13.67 ± 3.15	12.71 ± 2.93	0.40^{NS}	14.37 ± 3.27	17.46 ± 4.68	≤0.01***

Values are mean ± SD; ^{NS}Non-significant; **Significant at 5%; ***Significant at 1%.

Table 5. Frequency and duration of physical exercise of subjects in the control and experimental groups

Physical exercise	Control group (n = 34)			Experimental group (n = 32)		
	Week 0	Week 10	P-value	Week 0	Week 10	P-value
Walking as exercise						
Weekly frequency score	1.6 ± 1.77	1.63 ± 1.80	0.33^{NS}	1.57 ± 1.86	3.63 ± 1.64	≤0.01***
Duration (min)	10.83 ± 12.58	10.42 ± 11.08	0.65^{NS}	10.71 ± 12.81	29.77 ± 12.11	≤0.01***
Aerobic exercise						
Weekly frequency score	–	–	–	–	0.53 ± 1.12	–
Duration (min)	–	–	–	–	2.63 ± 5.34	–
Resistance exercise						
Weekly frequency score	–	–	–	–	0.57 ± 1.09	–
Duration (min)	–	–	–	–	2.00 ± 4.58	–

Values are mean ± SD; ^{NS}Non-significant; ***Significant at 1%.

from 53.3 to 49.01 g (P = 0.03). However, a significant increase in protein intake from 43.87 to 63.07 g ($P \leq 0.01$), calcium from 792.5 to 1725.2 mg ($P \leq 0.01$) and iron from 14.37 to 17.46 mg ($P \leq 0.01$) was observed (Table 4). The results indicated a positive behavioural change in the eating pattern of the subjects through cognitive group treatment, which resulted in decreased intake of energy (–696 kcal), carbohydrates (–177 g) and fat (–4.29 g) whereas enhanced intake of protein (19.2 g), calcium (932.7 mg) and iron (3.06 mg). Researcher[30] observed a decrease in energy intake (–558 kcal), carbohydrate intake (–62.1 g) and fat intake (–17.9 g) by the CBT intervention.

Statistical analysis revealed that a positive change in the daily nutrient intake due to the cognitive group treatment for 10 weeks influenced the anthropometric profile and body composition of the subjects. The energy intake was significantly and positively correlated with FM ($P \leq 0.01$); carbohydrates with body weight ($P \leq 0.05$) and FM ($P \leq 0.01$); protein intake with body weight, HC and FM ($P \leq 0.05$), and fat intake with FM ($P \leq 0.05$). A significant but negative correlation was found between daily fat intake and MM ($P \leq 0.05$). The results indicated that the short-term cognitive group treatment proved effective in positively changing the intake of macronutrients, which helped reduce adiposity.

Table 6. Feedback of cognitive group treatment by the selected working women ($n = 32$)

Feedback	Never	Rarely	Sometimes	Often	Always
Able to modify oneself to have a positive self-image	–	–	2 (8)	16 (52)	12 (40)
Able to shift one's negative self-talk towards a positive one	–	–	5 (20)	12 (48)	8 (32)
Able to shift towards more conscious thoughts rather than automatic ones	–	1 (4)	3 (15)	15 (60)	6 (24)
Able to identify cognitive distortion	–	1 (4)	6 (24)	13 (52)	5 (20)
Able to control one's overeating due to anxiety	–	1 (4)	3 (12)	10 (40)	11 (44)
Able to manage one's overeating due to stress	–	2 (8)	4 (16)	9 (36)	10 (40)
Able to construct healthy boundaries for oneself	–	–	8 (32)	11 (44)	6 (24)

Values in parentheses are percentages.

Physical exercise

The cognitive group treatment emphasized the importance of exercise, especially daily walking, as well as aerobic and resistance exercises twice a week. The results in Table 5 reveal that none of the subjects in the control and experimental groups performed regular aerobic and resistance exercises. The weekly frequency score of walking and duration of walking as exercise were only 1.6 and 10.83 min, respectively, in the control group. The corresponding values in the experimental group were 1.57 and 10.71 min. A significant ($P \leq 0.01$) increase in weekly frequency score for walking from 1.57 to 3.63 and walking duration from 10.71 to 29.77 min was observed in the experimental group. Negligible weekly frequency scores of resistance and aerobic exercises after 10 weeks of cognitive group treatment were observed among the subjects, which may be attributed to the harsh summer weather or the subjects not exercising regularly. Statistical analysis revealed that the duration of the walking was significantly but negatively ($P \leq 0.05$) correlated with WC and CI. Therefore, walking as an exercise proved instrumental in reducing abdominal adiposity among the subjects who received cognitive group treatment of 10 weeks. A significant effect of CBT among obese children was the increasing physical activity[30]. Aerobic exercise for a period of 12 weeks among healthy adults revealed a significant decrease in FM and a rise in FFM[32]. Similarly, other study[33] reported that an increased level of physical exercise, a hypocaloric diet and adequate protein intake promote the reduction of FM and increase in muscle strength among obese individuals.

Feedback on the treatment

The effectiveness of the cognitive group treatment was analysed using a 5-point scale of never, rarely, sometimes, often and always among the subjects (Table 6). The feedback depicted the perceived change in oneself due to the cognitive group treatment, as reported by the subjects. Forty per cent of the subjects reported that they were always able to modify themselves to have a positive self-image, whereas 52% were often able to cope with positive self-image. Thirty-two per cent of the subjects reported to always be able to shift their negative self-talk towards a positive one, while 48% were often able to cope. Similarly, 24% of subjects were always able to shift their thoughts to more conscious ones rather than automatic ones, whereas 60% were often able to cope. Similarly, 24% of subjects were always able to shift their thoughts to more conscious ones rather than automatic ones, whereas 60% were often able to cope, Similarly to identify cognitive distortion, maximum subjects, i.e. 52% were often able to cope. Following the cognitive group treatment, 44% of the participants reported consistent control overeating caused by anxiety, whereas 40% stated they could frequently cope with the situation. Similar trends were followed for the reporting of self-restriction on overeating due to stress always and often among 40% of the subjects. Majority, i.e. 44% of the subjects were able to construct healthy boundaries for themselves, while 24% were often able cope with the situation. While the current study yielded noteworthy results, it is important to note that the participants chosen were highly motivated individuals who approached the intervention with strong conviction. The researchers continuously motivated the participants of the study. Moreover, the study was of short duration; therefore, consistency in following the intervention was optimum, which may be the cause of highly significant post-intervention results. Overall, the impact of the cognitive group treatment was positive as maximum participants were able to bring about changes in themselves to cope up with eating disorders due to stress, anxiety and other mental attributes. This resulted in positive changes in the anthropometry and body composition parameters. It involved sessions to bring about positive changes in the thinking process and to correct the overall eating patterns by reducing emotional eating that may be induced by stress, anxiety and other mental attributes. Therefore, the cognitive group treatment can be used as an effective tool in reducing adiposity among self-motivated Indian women.

Conflict of interest: The authors declare that there is no conflict of interest.

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