Original Article

Nutritional Education and Exercise Treatment Based on Cognitive Behavioral Treatment in the Saku Control Obesity Program (SCOP)

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Abstract

BACKGROUND: Long-term weight loss is difficult to maintain, but recently cognitive behavioral therapy has been shown to be effective for long-term weight loss and maintenance.

METHODS: The 119 participants, who had been assigned to program to lose weight, were interviewed by dietitians regarding their motivation for weight loss and psychological status and self-corrected problems with their eating activities and exercises, following recognition of problems, discussing solutions, and devising personal dietary plans and exercise plan to loose weight at 1.0-2.0 kg per month.

RESULTS: In women, the prevalence of motivation to resolve the situation ($n = 44$, 84.6%) was significantly higher than that of men ($n = 33$, 67.3%; $p < 0.05$). In men, awareness of the need to keep healthy by oneself was significantly associated with the motivation to resolve the situation ($p = 0.002$) and the availability of support from others ($p = 0.004$). Thirty problems and 29 dietary goals were set by participants. The percentages of intake of alcohol ($p < 0.05$) and intake of sweets ($p < 0.01$) as the problems and decrease of intake in specified foods ($p < 0.01$) and snacks ($p = 0.05$) as dietary goals were significantly different between men and women. Women with BMI over 31 kg/m² set fewer additional steps as exercise goals than those with BMI under 29 kg/m² ($p < 0.05$).

CONCLUSIONS: The characters of subjects such as psychological status and the problems and the target recognized by participants were different between gender and the degree of obesity.

KEY WORDS: cognitive behavioral treatment, health education, obesity, baseline data

Introduction

Obesity is increasing in prevalence in Japan, and it represents a major risk not only for metabolic syndromes, such as type 2 diabetes, ischemic heart disease, hypertension, gout, and dyslipidemias, but also some cancers.¹⁾ Loss of 10% of starting weight is thought to be associated with amelioration of risk factors such as hypertension, hypercholesterolemia, and hyperglycemia.²⁾ Traditional dietary treatment of obesity consists of an energy-reduced diet prescribed by dietitians to achieve weight loss in a short period.³⁾ Long term evaluations of obesity interventions indicate that weight loss accomplished through changes in diet and physical activity is rarely maintained.⁴⁾

Since Stuart first applied behavior therapy to weight loss in the obese,⁵⁾ more than 100 papers have been published in the field. The goal of behavioral treatment is for participants themselves to choose to reduce caloric intake and increase energy expenditures based on alternatives provided by professionals, such as the dietitians.

Recently, cognitive behavioral treatment has been applied to weight loss in the obese. Cognitive behavioral treatment (therapy) is a methodology for systematically modifying eating and activity habits, other behaviors, or negative thoughts that appear to contribute to obesity using a combination of self-monitoring, goal setting, stimulus control, cognitive restructuring, stress management, and social support. The cognitive behavioral treatment can be applied in an individual or group setting to achieve a long-term change in eating and physical activity behaviors. Studies suggest that frequent contact between

professionals and patients is necessary to achieve the weight loss. Several studies in a group setting showed that the treatments, typically delivered in 15–26 weekly 30- to 60-min group sessions consisting of fewer than 10 patients, produced a mean post-treatment weight loss of approximately 8.5 kg a 1 year.^{4-6,10)} However, long-term evaluations of interventions indicated that maintenance of weight loss is difficult.¹¹⁻¹³⁾ The U.S. Institute of Medicine defined success as a weight loss of 5% of body weight maintained for 1 or more years.¹³⁾ These results suggested that intensive intervention (weekly group sessions) is successful for weight loss up to 1 year, but long-term adherence to the weight-loss plan cannot be facilitated by these programs. Perri and Corsica evaluated several specific maintenance strategies to achieve better long-term outcomes, including a problem-solving model, relapse prevention training, motivation, and extended behavioral therapy.¹⁴⁾ However, a truly effective intervention treatment for obesity has not yet been established. Renjilian reported the benefits of group treatment as cost-effectiveness and greater weight loss in patients at the end of the program.¹⁵⁾ In the case of intensive intervention, such as weekly sessions for 6 months, individual treatment is more expensive than the group approach.

In this baseline survey, we clarified the characteristics of the psychological status of subjects and the problems and dietary goals that the subjects had realized and set at the first meeting in Saku Control Obesity Program (SCOP), because there were few reports about the problems and targets that the participants made, so far.

Methods

The study is a randomized controlled trial comparing the effect of 1-year behavioral treatment and exercise versus a control group conducted at the Saku General Hospital Human Dock Center. Details of the aim and design of the study are described in other paper written by Watanabe et al.^{16,17)}

Participants

235 participants (116 males, 119 females) out of 976 people, who had received the regular medical checkup, were finally recruited through the Saku General Hospital Human Dock Center. Inclusion criteria were age 40–64 years, at body mass index (BMI) over 28.3kg/m² within top fifth percentile, stated with desire to lose weight, and no serious medical condition. A total of 119 participants (59 men, 60 women) attended the first group session, and 116 participants (57 men, 59 women) were placed on a waiting list control group for a second session. All participants provided written informed consent, and the ethical committees of the National Institute of Health and Nutrition and the Saku General Hospital approved the study.

Interventions

Dietitians interviewed participants about their motivation for losing weight and to assess psychological status by considering the following: benefits to losing weight, probability of losing weight, level of motivation to resolve the situation, availability of support from others, level of awareness of the need to keep healthy by oneself, obstacles to executing the plans, and the amount of stress felt.

Using a behavioral management treatment, teams of health professionals, including doctors, registered dietitians, and physical activity instructors, conducted a weight-loss intervention that focused on self-management of diet, exercise, and individually set behavior goals. Participants had a brief interview with doctors followed by an individual session for 30–45 min with dietitians and a group session with physical activity instructors; if necessary, participants also received individual instruction in physical activity.

Various strategies were used to modify participants' behaviors, including self-monitoring, problem solving, goal setting, cognitive restructuring, stress management, stimulus control, and social support. Following recognition of the specific dietary problems, participants were expected to self-correct problems with their eating activity and exercise, choose a solution, implement a plan, and evaluate the outcome. During the individual sessions with dietitians every 3 months, participants evaluate their ability to self-monitor weight, physical activity (number of steps per day), accomplishment of the dietary and exercise plan, and daily diet activity. The dietitians provide positive feedback to participants for their progress in weight loss and engaged participants in problem solving to deal with obstacles. Then the dietitians help participant to recognize any dietary problems and to make plans for the following month. Between these face-to-face sessions, participants report their progress for the previous month and their new plans for the following month by mailing records to the dietitians in the months when they have no meeting with dietitians. When the reports are sent from the participants, dietitians and physical activity instructors send back their comments to the participants within 1 week.

The goal of weight loss was set at 1.0–2.0 kg per month, with a final goal of 10 kg lost by the end of the program. Nutritional education focused on individual dietary behaviors as clarified by monitoring participants' dietary records, especially fat intake, amount of grains, cooking methods, snacking, eating out, skipping meals, and alcohol intake. Each month, participants are also required to make their exercise plans with 1,000 more steps per day into the actual steps last month, with aim at the final goal of 10,000 steps per day by the end of the program.

Data Analysis

Data were analyzed using the Statistical Package for Social Sciences® (SPSS/PC, version 12.0, SPSS Inc., Japan). Differences between men and women with regard to psychological status, problem-solving strategies, and goal setting were analyzed using chi-square tests. Analysis of variance was used to examine differences between initial goals for exercise with regard to BMI.

Results

In this baseline survey, the data collected from 119 participants in first intervention group were analyzed for psychological characteristics and the data from 117 participants except 2 dropout participants were analyzed for problems and dietary and exercise goals.

The prevalence of motivation to resolve the situation in women was significantly higher than that of men ($p < 0.05$; [Table 1](#)). Compared to women, more men expected support from others ($p < 0.05$), particularly their wives. More women were aware of obstacles to executing their weight-loss plans, although the prevalence of seeing benefits to losing weight, probability of losing weight, awareness of the need to keep healthy by oneself, and stress were not different between men and women.

Table 1 Sample characteristics of psychological status

Variables	levels	Men		Women		p value *
		n	%	n	%	
Benefits to lose weight	High	46	85.2	51	91.1	0.34
	Low	8	14.8	5	8.9	
Probability to lose weight	High	32	61.5	28	53.8	0.43
	Low	20	38.5	24	46.2	
Motivation to resolve the situation	High	33	67.3	44	84.6	0.04
	Low	16	32.7	8	15.4	
Availability of support from others	High	32	66.7	22	45.8	0.04
	Low	16	33.3	26	54.2	
Awareness of necessity to keep healthy by oneself	High	37	84.1	39	76.5	0.35
	Low	7	15.9	12	23.5	
Obstacles to executing plans	Yes	20	45.5	30	66.7	0.06
	No	22	50.0	15	33.3	
Feel stress	Yes	31	77.5	35	71.4	0.52
	No	9	16.7	14	28.6	

* Results of chi-square tests to examine the distribution of psychological status with men and women.

Table 2 Association of awareness of necessity to keep healthy by oneself and other psychological variables

Variables		Awareness of necessity to keep healthy by oneself									
		Men					Women				
		High		Low		p value *	High		Low		p value *
n	%	n	%	n	%		n	%			
Benefits to lose weight	High	32	72.7	6	13.6	0.96	39	76.5	7	13.7	<0.001
	Low	5	11.4	1	2.3		0	0.0	5	9.8	
Probability to lose weight	High	22	50.0	3	6.8	0.60	24	50.0	2	4.2	<0.01
	Low	15	34.1	4	9.1		12	25.0	10	20.8	
Motivation to resolve the situation	High	27	62.8	1	2.3	<0.01	35	72.9	6	12.5	<0.01
	Low	9	20.9	6	14.0		2	4.2	5	10.4	
Availability of support from others	High	26	60.5	1	2.3	<0.01	18	40.9	2	4.5	0.12
	Low	10	23.3	6	14.0		17	38.6	7	15.9	
Obstacles to executing plans	Yes	18	47.4	2	5.3	0.54	7	17.1	6	14.6	0.03
	No	15	39.5	3	7.9		24	58.5	4	9.8	
Feel stress	Yes	7	20.0	0	0.0	0.23	8	18.6	2	4.7	0.64
	No	23	65.7	5	14.3		24	55.8	9	20.9	

* Results of chi-square tests to examine the distribution of psychological status

Table 3 Recognition of problems related to diet

Classification		Contents		Men		Women		Classification		Contents		Men		Women	
				n	%	n	%					n	%	n	%
<i>Behaviors for diet</i>								<i>Meal contents</i>							
Behavior as a cause of eating too much	Eat fast	24	40.7	28	47.5	Eat specified foods too much	Eat too few vegetables	14	23.7	10	16.9				
	Eat much at supper	7	11.9	4	6.8		Take much fat or fatty food	18	30.5	16	27.1				
	Eat much	9	15.3	9	15.3		Take much salt or salty food	7	11.9	7	12.1				
	Can not leave food	2	3.4	7	11.9		Eat grains too much	7	11.9	6	10.3				
	Eat continuously for long time	0	0.0	1	1.7		Eat noodles too much	5	8.5	0	0.0				
	Eat meal served in large plate	1	1.7	1	1.7		Eat the main dish too much	4	6.8	2	3.4				
	Eat until feel full	1	1.7	1	1.7		Eat meat too much	4	6.8	0	0.0				
Time of eating	Eat late supper	4	6.8	4	6.8	Alcohol	Drink alcohol too much	13	22.0	3	5.1				
	Skip meal	3	5.1	4	6.8		Drink sweet beverage too much	3	5.1	5	8.5				
Behavior related eating	Lay down immediately after eating meal	2	3.4	4	6.8	Sweets	Eat fruits too much	1	1.7	3	5.2				
	Eat at any time when the others eat	0	0.0	1	1.7		Eat sweets too much	6	10.2	18	30.5				
	Eat something when I feel stress	1	1.7	0	0.0		Dietary balance	Eat unbalanced meal	2	3.4	0	0.0			
	Can not refuse when the others offer	0	0.0	1	1.7										
	Eat snacks surrounded myself	0	0.0	2	3.4										
	Buy too much	0	0.0	1	1.7										
	Snacks	Eat often outside	1	1.7	1	1.7									
Eat sweet snacks too much		5	8.5	15	25.0										
Eat snacks after supper		6	10.2	5	8.5

Fig. 1. Prevalence of dietary problems in men and women. The complete list of dietary problems is shown in Table 3. * $p < 0.05$, ** $p < 0.01$

Table 2 shows the relationships between the awareness of the need to keep healthy by oneself and the other six psychological variables. In men, this awareness was significantly associated with level of motivation to resolve the situation ($p = 0.002$) and the availability of support from others ($p = 0.004$). In women, however, the awareness of the need to keep healthy by oneself was significantly associated with seeing the benefits of weight loss ($p < 0.001$), probability of losing weight ($p = 0.003$), motivation to resolve the situation ($p = 0.001$), and obstacle to executing the plans ($p = 0.027$).

Following the advice of dietitians, participants were asked to define the problems with their dietary habits and behaviors while setting personal goals for the following month. 30 recognized problems were classified into 8 categories and into two final categories of dietary behaviors and meal contents (**Table 3**). More than 40% of men and women recognized eating fast as a problem, and about 15% of men and women recognized eating too much as a problem. Insufficient intake of vegetables and excess intake of fat or fatty foods were recognized by both men and women. **Figure 1** shows the differences between men and women across the categories. With regard to meal contents, 41.7% of women reported eating too many sweets as a problem, whereas only 15.3% of men listed this as a problem ($p < 0.01$). In contrast, 22.0% of men reported drinking too much alcohol as a problem, whereas only 6.7% of women listed this as a problem ($p < 0.05$). The problems of behaviors as a cause of eating too much and eating specified food too much were major common problems to men and women.

At their first meeting, dietitians and participants discussed which problems could be solved easily and which were the most important to solve. Following these evaluations, participants set and declared their personal dietary goals. Twenty-nine dietary goals were set and fell into the categories of dietary behavior and meal contents and were classified into seven categories (**Table 4**). The most prevalent goal of both men (31%) and women (39%) was chewing well during meal time. More women than men set goals of decreasing their snacking after supper and not eating snacks between meals. Similar percentages of men and women set the goals of eating more vegetables and decreasing their intake of fat or fatty foods. 23.7% of men set the goal of consuming less alcohol, whereas only 3.4% of women set this

Table 4 The dietary goal-setting at first meeting

Classification	Contents	Men		Women	
		n	%	n	%
<i>Behaviors for diet</i>					
Decrease intake of snacks	Eat less snacks after supper	4	5.8	9	15.0
	Do not eat anything 2 hours before sleep	2	3.4	2	3.4
	Eat fruits on the time decided	2	3.4	3	5.1
	Quit a snack or eat less	9	15.3	19	32.2
	Do not eat nuts	2	3.4	0	0.0
Decrease the amount of meal	Eat with chewing food well	18	30.5	23	39.0
	Leave food when finish meal	0	0.0	5	8.5
	Do not eat once full	1	1.7	2	3.4
	Do not eat continuing for long time	0	0.0	1	1.7
	Serve a meal individually	3	5.1	2	3.4
	Record the energy displayed on foods	2	3.4	0	0.0
Eat regularly	Do not skip meals	3	5.1	2	3.4
Order of certain foods	Eat vegetables first	5	8.5	6	10.0
	Take some drinks or soup first	0	0.0	2	3.4
<i>Meal contents</i>					
Decrease intake of specified foods	Decrease intake of grains	10	16.9	7	11.9
	Decrease intake of main meal	1	1.7	2	3.4
	Decrease intake of meals	5	8.5	4	6.8
	Decrease side dish with alcohol	2	3.4	0	0.0
	Decrease intake of alcohol	14	23.7	2	3.4
	Decrease intake of salt or salty food	1	1.7	6	10.0
	Decrease intake of fat or fatty food	15	25.4	14	23.7
	Decrease amount of supper meals	2	3.4	0	0.0
Increase the amount of specified food	Increase intake of vegetables	16	27.1	14	23.7
Replace with low-calories from high-calories	Replace a main dish with other low-calories	5	8.5	1	1.7
	Replace with other kinds of grains	1	1.7	0	0.0
	Replace snacks with other low-calories	2	3.4	9	15.0
	Replace drinks with other low-calories	4	6.8	4	6.8
	Replace alcohol with other low-calories	0	0.0	1	1.7

goal. Compared to men, more women set the goals of decreasing salt intake and replacing high-calorie snacks with low-calorie foods.

Compared to men, more women (30.5% vs. 50.0%) set a goal of decreasing the intake of snacks ($p < 0.05$). In contrast, more men (72.9%) set a goal of decreasing the intake of a specified food compared to women (48.3%; $p < 0.01$; **Figure 2**). There were no differences between the genders with regard to the other five goal categories.

Fig. 2. Prevalence of dietary goals in men and women. The complete list of dietary goals is shown in **Table 4**. * $p < 0.05$, ** $p < 0.01$

The final exercise goal was basically set at 10,000 walking steps per day. At the beginning of the program, 21 participants already walked over 10,000 steps per day on average, and their exercise goal was to maintain this level of exercise. The remaining participants walked fewer than 10,000 steps, and their goal was to walk an additional 1,000 steps per day every month, except those participants who had knee or lower back pain. For those participants who were walking fewer than 10,000 steps per day, the average walking steps per day at the beginning of the program were 6314.6 ± 1915.7 (SD) steps in men and 6780.6 ± 1582.4 steps in women, the additional walking steps first goals were 1232.8 ± 789.4 steps in men and 928.1 ± 597.1 steps in women, and the target exercise goals per day were 7581.6 ± 1934.7 steps in men and 7662.8 ± 1470.8 steps in women; there were no significant differences between genders.

Fig. 3. The additional steps as an exercise goal among body mass index (BMI) tertiles in men and women. Data represent subgroup mean $\pm$ SD. * $p < 0.05$

Fig. 4. Prevalence of the diet problems between body mass index (BMI) levels over or under 30 kg/m² in men and women.

Fig. 5. Prevalence of the diet goals between body mass index (BMI) levels over or under 30 kg/m² in men and women. * $p < 0.05$; chi-square tests

Among those participants who set exercise goals, the relationship between BMI and the number of additional steps in the goal was analyzed by BMI tertiles. At baseline, there were no differences among BMI tertiles with regard to level of exercise. Those participants with BMI ≥ 31 set goals of significantly fewer additional steps compared to those with BMI < 29 ($p < 0.05$; [Figure 3](#)).

The mean BMI was 30.5 kg/m² and the median was 29.8s kg/m². We divided two groups over and under 30 kg/m² BMI, in order to clarify relationships between BMI and the dietary problems and dietary goals. There were not significant differences of the percentage of dietary problems between the BMI levels over and under 30 kg/m² in women and men. ([Figure 4](#)). Among the dietary goals, the percentage of the decreasing intake of snack was different between the BMI levels over and under 30 kg/m² in women ($p < 0.05$; [Figure 5](#)).

Discussion

Most studies of traditional obesity treatment, including dietary restriction, nutritional education, and an increase in exercise, have demonstrated limited success. Other methods that have been used as an adjunct to dietary restriction in the treatment of obesity include lifestyle modification, drugs, therapeutic starvation, very low calorie diets, and surgical treatment. Long-term weight loss and maintenance requires management strategies including a combination of nutritional education and physical activity as well as behavioral interventions.¹⁸⁾

In the SCOP study, we constructed a strategy for obesity treatment that mainly included cognitive behavioral treatment for nutritional education and physical activity. The dietitians interviewed participants about their levels of social support, stress, motivation, and self-efficacy. More men expected support from others, such as their wives and family than women ([Table 1](#)). In addition, in men, the awareness of the need to keep healthy by oneself was significantly associated with the motivation to resolve the situation and the availability of support from others ([Table 2](#)). Studies have shown that social support is an important aid in weight maintenance,^{19,20)} although the effect of family involvement on weight control is unclear. Wing et al. reported better weight maintenance when participants, especially women, were treated together with their spouses.²¹⁾ In contrast, Black and Lantz reported weight maintenance to be better when participants were treated alone, particularly men.²²⁾ In the present study, however, men expected the support from others even though they were aware of the need to keep healthy by themselves in order to succeed in their weight loss.

The motivation to resolve the situation was significantly more prevalent in women than in men ($p < 0.05$; [Table 1](#)). In women, the awareness of the need to keep healthy by oneself was also significantly associated with recognition of the benefits and probability of losing weight, the motivation to resolve the situation, and realizing the obstacles to success. Many studies have reported that a higher motivation for weight reduction was related to greater weight loss.²³⁾ However, the Weight Loss Readiness Test (WLRT), which was developed to assess weight loss readiness²⁴⁾ and motivation, failed to predict weight loss.^{23,25)}

In the SCOP study, the dietary goals were well matched with problems, as participants were first asked to list potential problems and then set goals based on these. More than 40% of men and women recognized eating too fast as a problem and about 15% saw eating too much as an issue ([Table 3](#)). Likewise,

both men and women recognized as problems eating too few vegetables, too much fat or fatty foods, and high salt intake. More women listed eating sweet snacks as a problem, whereas more men saw alcohol intake as an issue ([Figure 1](#)).

Compared to men, significantly more women set the goal of decreasing the intake of snacks, whereas more men aimed to decrease the intake of specified foods, including drinking alcohol, revealing that the favorite foods and the problem eating behaviors were different between men and women ([Table 4 and Figure 2](#)). The dietary goal of “Decrease intake of fat or fatty food” was set mainly in the category of “Decrease intake of specified foods” in both men and women. In women, more participants over 30 kg/m² BMI focused about decreasing intake of snacks including 5 goals related snacks than that under 30 kg/m² BMI, even though the percentage of snacks in the problems was not different between BMI levels. The goals set by participants were in line with sound dietary advice, as studies have shown that weight loss and maintenance is associated with reduced frequency of snacks,²⁶⁾ less dietary fat,²⁶⁻³⁰⁾ and increased intake of vegetables and fruits.²⁶⁾

The dietitians usually proposed setting an exercise goal of an additional 1,000 steps per day to the actual steps last month. Although there was no difference among BMI tertiles with regard to the mean number of walking steps at the beginning of the intervention, women in the highest tertile (BMI = 31+) set significantly fewer additional steps as an exercise goal ([Figure 3](#)), suggesting that women in this tertile hesitate to walk. In women, there was a significant difference in the percentage of decreasing intake of snacks as a dietary goal between BMI levels over and under 30 kg/m² ([Figure 5](#)). This result may show that the participants in SCOP could set the successful dietary goal to lose weight by themselves with the guidance of the dietitians, as reported in previous study.²⁶⁾

Self-monitoring of body weight and food intake were reported as important factors in weight loss as well as weight maintenance.^{27,31,32)} In this study, the participants self-monitored and recorded items such as weight, daily food intake, and daily evaluations of their personal dietary and exercise goals and reported to dietitians the results of their efforts at the end of each month.

Obesity is recognized as a complex disorder involving appetite regulation and energy metabolism, and it is associated with a variety of comorbid conditions. Many studies have shown that traditional obesity treatment has been effective over the short term, but long-term outcomes do not mirror those satisfactory results. Lang and Froelicher concluded that the combination of a low-calorie diet, an increase of physical activity, and behavioral therapy should be incorporated in obesity treatments.¹⁸⁾ They also found that interventions involving frequent behavioral therapy, such as weekly sessions, seemed to improve the participants’ adherence to changes in eating and exercise patterns and produced better outcomes. Elfhag and Rossner reviewed a variety of potential factors and concluded that weight maintenance was associated with an internal motivation to lose weight, social support, better coping strategies, a better ability to handle life stress, self-efficacy, autonomy, assuming responsibility in life, and greater overall psychological strength and stability.³³⁾

This survey baseline data revealed that the psychological characters were different in gender and the problems and dietary and exercise targets were also different in gender and BMI.

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