Effects of a Self-management Support Program for Thai People Diagnosed with Metabolic Syndrome

Nattaya Suwankruhasn, Linchong Pothiban, Sirirat Panuthai, Pikul Boonchuang

Abstract: This randomized control trial examined the effects of the Self-management Support Program for People with Metabolic Syndrome on eating behaviors, physical activity, and metabolic control in three hospitals in Northern Thailand. Eighty-six participants who met the inclusion criteria were randomly assigned to either an experimental (n=44) or control (n=42) group. The experimental group received a self-management support program based on the self-management 5A model by Glasgow and colleagues, while the control group received standard care. The program duration was three months, and included six sessions; once a week for the first four weeks, then monthly for the second and third months. The sessions covered one education (diet and physical activity) session, three self-management skill training sessions, and two discussion sessions. Data was collected at baseline, three and six months. Eating behaviors were assessed using the Seven-Day Food Diary, while data on physical activity was collected using the Physical Activity Log. Data pertaining to metabolic control, waist circumference, systolic and diastolic blood pressure, blood glucose, triglycerides and HDL cholesterol was also collected.

The findings showed a significant positive effect on physical activity at 3-months and 6-months, and significant improvement in metabolic control including blood glucose and HDL cholesterol only at 6-months. However, this Program could not significantly improve eating behaviors, waist circumference, systolic and diastolic blood pressures, or triglyceride levels. Nurses may implement this Program to achieve designated outcomes, especially for controlling blood glucose and HDL cholesterol as well as determining barriers to change behaviors in targeted patients.

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Introduction

Metabolic syndrome (MetS) is a chronic condition consisting of a number of disorders such as abdominal obesity, high blood glucose, high triglycerides, low high-density lipoprotein (HDL) cholesterol, and elevated blood pressure that occur together in individuals. MetS has emerged a major clinical and public health problem. It contributes to

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doubling the incidence risk of cardiovascular disease within five to ten years[1], a major cause of death, not only in developed countries, but also in urban communities of developing countries, including Thailand.

The prevalence of MetS is increasing worldwide, including in Thailand. Metabolic risk factors are associated with high prevalence of MetS[2] and include high levels of fasting glucose, triglycerides and blood pressure, low HDL cholesterol, and central obesity. These risk factors require treatment for control, and include waist circumference to ≤ 80 cm in women or ≤ 90 cm in men, reduced systolic and diastolic blood pressure to ≤ 130/85 mmHg, reduced fasting plasma glucose to ≤ 100 mg/dl, reduced plasma to triglyceride level ≤ 150 mg/dl and raised HDL cholesterol level to ≥ 50 mg/dl in women or ≥ 40 mg/dl in men.[3] This control is undertaken by means of life style changes, particularly eating behavior and physical activity.[2]

Promoting healthy eating behaviors and physical activity are required strategies for controlling MetS, however these are difficult to change due to many barriers, including personal, cultural, environmental, and societal factors.[4] Changing people's behaviors by providing traditional health education or simple approaches such as information transference, general advice, and prescribing dietary or/and exercise regimens is difficult to achieve. Traditional health education usually focuses on teaching disease-specific skills and compliance to prescribed advice from health care providers.[5] Provision of information and skills is mainly based on health care providers' agendas rather than people's needs. Thus, adherence to medical treatment may be the issue. Furthermore, the focus of traditional health education is often not based on problem-solving behavioral change issues. When patients encounter problems and obstacles, they neither solve them nor maintain new behaviors. Therefore, a new approach is needed for changing unhealthy behaviors and should focus on teaching and training problem-solving skills.

Self-management support is one approach that offers the systematic provision of education and supportive interventions by health care providers. The interventions aim to increase patients' skills and confidence to manage their health problems and enhance behavioral change such as developing patient problem-solving skills, improving self-confidence, and supporting application of knowledge in real-life situations. Healthcare providers serve as transition coaches to teach individuals about their conditions and enhance their skills on illness management.[6]

Russell Glasgow and colleagues[7] developed self-management support within the 5As framework with clear processes and sequences for training activities meant to enhance patients' confidence for changing their behaviors. This approach includes treatment processes involving active participation, flexible activities in real life situations, and supporting patients during the behavior change process, and has been found to be effective in heart failure management,[8] diabetes self-management behaviors,[9] and chronic illness self-management.[10] It is anticipated that our provision of a Self-management Support Program for People with MetS (SSPPMS) would assist them to effectively manage eating behaviors and physical activity while controlling the disease.

Due to the weakness of traditional health education strategies, this study examined the effects of a SSP on eating behaviors, physical activity, and metabolic control among people with MetS.

Review of Literature

It is estimated that around 20%-25% of the world's adult population has MetS.[11] One study in Europe using the International Diabetes Federation definition found that the prevalence of MetS was 29.6%, compared to 25.9% using the 2005 Adult Treatment Panel (ATP) III criteria.[12] In North America and Australia, the prevalence of MetS is around 12-25% and in Asia, 10-30%.[13] In the USA, data showed approximately 34% of the population aged 20 years and over met the criteria for MetS.[14]

In Thailand, some surveys showed the prevalence of MetS in women was higher than in men. At 50 years and over, the prevalence of MetS in 2003-2004 increased from 9.5% to 24.7% for men, and from 7% to 29.5% among women.[15] A study among employees of the Electricity Generating Authority of Thailand

(EGAT) revealed that the prevalence of MetS based on the ATP III criteria was 19.3% in men and 11.8% in women.[16] Also studies focused in central Thailand revealed that the overall prevalence of MetS was 11% with 13.9% prevalence among men and 8.8% women.[17] and high prevalence of MetS was associated with high prevalence of metabolic risk factors.

Dietary factors and sedentary lifestyles are known to contribute to the high prevalence of MetS in the world. Lifestyle interventions that are consistently regarded as first-line management for MetS includes changing eating behaviors and improving physical activity.[2] Regular physical activity and aerobic exercise of about 30 to 60 minutes, 3 to 5 times per week, at a moderate intensity resulted in a mean increase in HDL cholesterol levels and a decrease in triglyceride levels, blood glucose levels, blood pressure, and waist circumference. Good aerobic workouts include brisk walking, jogging, swimming, cycling, aerobic classes, such as yoga, jazzercise, and kick boxing. Specific dietary changes for people with MetS are very important and must include reduction of saturated fat intake to lower triglycerides, and waist circumference; reduction of sodium intake to lower blood pressure; and reduction of high glycemic index and carbohydrate intake to lower triglycerides and blood glucose levels, and waist circumference. Recommended diets include more fruit, vegetables, whole grains, monounsaturated fats, and low-fat dairy products to reduce triglyceride levels and waist circumference.

Self-management support is a major strategy for controlling MetS, and in this study it was developed to comprise five A activities: (1) I assessment of knowledge, barriers to change behaviors, confidence to change, problem solving ability and target behaviors; (2) *advise:* provision of information about health risks and benefits to change and support behavioral changes; (3) *Agree:* collaboration between patients and health care providers on setting realistic goals based on patient's interest and confidence in their ability to change behavior and enhance confidence to change; (4) *Assist* patients' adjustment of goals and action plans, identify barriers, choose strategies or skills, offer social or environment support and increase confidence by using motivational interviewing techniques; and (5) *Arrange:* specify a plan for follow-up, ongoing support and maintenance behaviors. In conjunction with the program, a motivational interviewing technique has been used to assist people to increase self-confidence[18] and gives strategies to change their unhealthy behaviors by helping them recognize and resolve discrepancies between their present behavior, and their future goals and values.

Method

Ethical Considerations: Study approval was obtained from the Research Ethics Committee of the Faculty of Nursing, Chiang Mai University. Potential participants received an information sheet describing: the study purpose; what would be involved in research participation; assurance of confidentiality and anonymity issues, and the ability to withdraw at any time without consequences. Individuals agreeing to participate signed a consent form.

Design: This intervention study used a randomized two-group control trial

Sample: Samples were recruited based on inclusion criteria, then randomly assigned to either the experimental group or control group using the mixed permuted block 4 and allocation concealment method. Randomization was performed by a person blinded to the study. The experimental group received the SSPPMS while the control group received usual standard care based on the 2010 Clinical Practice Guidelines in Diabetes, Hypertension, and Dyslipidemia Control of the Ministry of Public Health Thailand.[19]

People with MetS, both men and women, who met the following inclusion criteria were recruited: (a) aged between 50 to 75 years; (b) having at least three out of the five criteria of MetS including abdominal obesity (> 90 cm in men, > 80 cm in women); high blood pressure level (≥ 130/85 mmHg), high fasting blood glucose level (≥ 100 mg/dL), high triglyceride levels (TG) (> 150 mg/dL), and low high-density lipoprotein cholesterol levels (HDL) (< 40 mg/dL in men and < 50 mg/dL in women); and (c) being able to read, write, and comprehend the Thai language. Exclusion criteria were having: (a) coronary artery disease, diabetes or co-morbidities and being incompetent to participate in the intervention; (b) systolic blood pressure more than 160 mmHg; and (c) fasting blood glucose of more than 300 mg/dl. Participation would be terminated if participants developed a severe condition during the program or could not join all sessions of intervention.

The sample size was calculated using the power analysis technique with a significance level of 0.05, a power of 0.90, and the effect size =0.63 that was obtained from a meta-analysis of behavioral types of diabetes self-management education interventions.[20] The total number of participants, including an extra numbers to compensate for the attrition rate of 7%, was 92. Participants completing the study protocol (93.48% retention) included 44 participants in the experimental group and 42 participants in the control group. The drop out rate was 6.52%, due to individuals moving to other provinces, no longer being in need of additional health checks, and no longer having available time to participant.

Data collection: The instruments used were the Demographic Data Form, the 7-day Food Diary, the Physical Activity Log Book, and the Self-Confidence Scale.

The Demographic Data Form, developed by the researchers, collected information on age, gender, educational level, family income, the number of MetS factors, and medication.

The 7-Day Food Diary collected data on eating behaviors from which the daily nutrient intake covering carbohydrates, protein, fat, cholesterol, fiber, sodium and sugar were calculated using the INMUCAL-Nutrients software program, developed by Institute of Nutrition, Mahidol University, Thailand version 2006. The researcher modified the 7-day food diary from Dietary Assessment – Weight Food Diary.[21] Participants recorded food and beverages consumed in the past seven days. Details of consumed food and beverages included brand names, places and times of consumption, descriptions of preparation and cooking methods, recipes for composite dishes, and amount consumed. Food portion sizes were measured using cups, tablespoons, teaspoons, grams, and pieces. The criterion validity was estimated using the reference data of the Dietary Questionnaire for Epidemiological Studies[22]; the correlation coefficient for meat, snacks and beverage was 0.896 ($p < .05$) and for fruit and vegetables were 0.619 and 0.538, respectively ($p < .05$). The test-retest reliability of the 7-day Food Diary was acceptable ($r = 0.78$) (ranged from 0.70-0.85 for food diaries).[23]

The Physical Activity Log Book collected data on daily physical activity, and was modified from the Community Health Activities Model Program for Seniors.[24] Participants recorded all daily activities, including occupation, household, transportation, and leisure-time, for seven consecutive days. The daily metabolic equivalents (MET) value (Met-h day) was calculated. The sum of the MET value was used to classify physical activity levels: inactive (32-35.9 MET), light active (36-38.9 MET), moderate active (39-42.9 MET), and very active (≥ 43 MET). The criterion validity of the Physical Activity Log was shown by a statistically significant strong relationship with the Physical Activity Questionnaire[24] ($r = .901$, $p = .050$). The two-week test-retest reliability coefficient showed an acceptable level of 0.93 (ranged from 0.5 to 0.9 for physical activity diaries and logs).[25]

Data pertaining to metabolic control included waist circumference that was collected using the anthropometry tape, and systolic and diastolic blood pressure that was measured using the OMRON IA2 automatic blood pressure equipment. Blood samples were collected for testing blood glucose, triglyceride, and HDL cholesterol levels. The blood tests were conducted at the Faculty of Medical Technology lab in Chiang Mai University.

Intervention: Intervention: The SSPPMS was developed based on self-management using the 5A's model of Glasgow and colleagues.[7] The Program aimed to increase knowledge, self-management skills and confidence to effectively manage behavioral change (eating behaviors and physical activity). The SSPPMS also focused on supporting the experimental group to meet the goal of controlling metabolic indicators through eating behaviors and physical activity. The process covered: setting goals and achieving goals; developing self confidence leading to behavioral change; acting to change behavior and control metabolic indicators; monitoring progress; solving problems of personal self-management plans; offering social and environmental support and encouraging through continuous contact and maintenance behaviors.

The SSPPMS lasted three months, and included a two hour session in each of the first four weeks, and then one session in months two and three. Small group sessions were held with three to four members in four education and discussion sessions (120 minutes/session), lead by the researcher. The first session focused on the provision of information about MetS, MetS management (diet and physical activity), metabolic control, and self-management skills.

The second session involved goal setting, create an action plan, and self-monitoring progress. Activities included a review of target eating behaviors and physical activity, effective goals, and practicing writing goals and an action plan. Participants, together with the researcher, set goals and an action plan for eating and physical activity based on an individual's conditions, interest and priority. Participants additionally learned how to record dietary consumption and physical activity, and were given the food exchange book, measuring spoons and cups, a food diary, a physical activity booklet, and a physical activity log.

The third session focused on strategies for problem solving. The activities included accomplishments and problems encountered during implementation of techniques learned in the second session, the learning experiences and strategies used, practicing strategies for dealing with barriers using the scenarios of problem situation of diet and physical activity, and adjusting goals and action plans.

The fourth session emphasized the promotion of self-management skills and support to maintain healthy eating and increase physical activity. Activities included reviewing accomplishments and problems encountered by a participant's performance of self-management techniques learned from session two and three, discussion of the problems and the techniques used, feedback with all activities records, and encouragement to moving goals towards maintaining healthy eating and increasing physical activity.

In each session, participants had their confidence level assessed for performing healthy eating behaviors and physical activity. Participants whose confidence score was lower than seven, were re-motivated by the researcher using motivational interviewing techniques. The activities in session four were continued once again in months two and three.

Usual care: In all hospitals, those with MetS received treatment based on the same clinical guidelines mentioned above, including health assessments, giving advice about their conditions, and treatment advice. Registered nurses who work at the diabetes/hypertension clinic provided health education. The education topics provided was mostly common health education including disease, medication, diet and exercise, and signs and symptoms to revisit hospital.

Data collection: Data and blood samples of both groups were collected by the researcher at the baseline and at three and six month intervals after program implementation. At three months, the researcher monitored the ability of participants regarding change of eating behavior, physical activity, and the metabolic control parameters. At six months, the monitoring regarding changes to new behaviors and the maintenance of existing behaviors and metabolic control parameters were repeated.

Data analysis: Descriptive statistics were used to analyze demographic data and clinical characteristics. Independence t-test and chi-square tests were used to examine the difference of characteristics between experimental and control groups at baseline. The Mixed Model ANOVA with Repeated Measures was conducted to examine the difference in mean score of eating behaviors, physical activity, and metabolic control between both groups.

Results

Analysis of demographic data, the number of MetS factors, medication, and mean score of eating behaviors, physical activity, and metabolic controls at the baseline indicated non- significant differences between the experimental and control groups (see **Table 1**).

Table 1 Demographic Characteristics of the Experimental and Control Groups

Demographic characteristics	Experimental (n = 44) n (%)	Control (n = 42) n (%)	*p*-value
Age (yrs)			
Mean (SD)	59.57 (9.99)	62.67 (7.89)	.744[t]
Range	50-75	50-75	
Gender			
Male	3 (6.8%)	12 (28.6%)	.545[c]
Female	41 (93.2%)	30 (71.4%)	
Educational level			.849[c]
Primary school	30 (68.18%)	34 (80.95%)	
Secondary school Education	9 (20.5%)	3 (6.8%)	
High school education	1 (2.3%)	2 (4.5%)	
Diploma	3 (6.8%)	3 (6.8%)	
Bachelor degree	1 (2.3%)	0	
Income (baht/month)			
Mean (SD)	6466.67 (977.396) (211.59 USD)	6261.90 (685.684) (204.89 USD)	.854[t]
The number of MetS factors			.144[c]
3	26 (59.1%)	22 (50.0%)	
4	13 (29.5%)	16 (36.4%)	
5	5 (11.4%)	4 (9.1%)	
Medication			.362[c]
None	17 (38.6%)	11 (29.5%)	
Antihypertensive drugs	6 (13.6%)	9 (20.5%)	
Anti-diabetic drugs	0	1 (2.3%)	
Lipid-lowering drugs	3 (6.8%)	0	
Antihypertensive drugs plus Anti-diabetic drugs	3 (6.8%)	7 (15.9%)	
Antihypertensive drugs plus Lipid-lowering drugs	8 (18.2%)	4 (9.1%)	
Anti-diabetic drugs plus Lipid-lowering drugs	1 (2.3%)	3 (6.8%)	
Antihypertensive drugs plus Anti-diabetic drugs plus Lipid-lowering drugs	6 (13.6%)	7 (15.9%)	

Note. [t] = t-test, [c] = chi-square test, MetS = Metabolic syndrome

When comparing the two groups at three points of measurement, there was no significant difference in eating behaviors between the experimental and control groups (see **Table 2**). For physical activity and metabolic control, the results showed that there were significant time effects in physical activity, and metabolic control indicators including systolic blood pressure, fasting blood glucose, triglycerides and HDL cholesterol between three points of measurement, whereas no significant time effect in waist circumference and diastolic blood pressure was demonstrated (see **Table 3**).

Table 2 The Comparison of Eating Behaviors Between the Experimental and Control Groups at Each Point of Measurement

Intake	Group	Mean (SD)			Effect			
					Time		Time*group	
		Baseline	Three months	Six months	*F*	*p*-value	*F*	*p*-value
Carbohydrates (%)	Experimental	58.01 (11.47)	61.83 (10.48)	57.94 (11.72)	.223	.800	.807	.448
	Control	60.43 (11.71)	59.62 (9.76)	58.19 (11.95)				
Protein (%)	Experimental	15.99 (4.21)	15.44 (4.49)	16.61 (4.36)	.707	.494	.225	.799
	Control	16.43 (5.28)	16.14 (4.63)	16.49 (5.13)				
Fat (%)	Experimental	26.03 (9.84)	22.74 (8.31)	25.45 (9.24)	1.376	.255	1.313	.272
	Control	23.69 (9.73)	24.21 (8.08)	25.35 (9.75)				
Cholesterol(g)	Experimental	216.20 (158.30)	203.70 (176.47)	215.90 (180.83)	.088	.915	.074	.929
	Control	203.69 (168.76)	209.8 (163.82)	182.80 (174.91)				
Fiber (g)	Experimental	9.27 (4.78)	9.28 (7.57)	8.91 (6.08)	1.207	.302	.587	.557
	Control	9.05 (5.29)	9.98 (6.54)	7.84 (4.61)				
Sodium (mg)	Experimental	2000.00 (1375.35)	1853.00 (908.77)	2101.00 (1204.91)	.099	.893	.576	.551
	Control	2190.83 (1262.30)	2252 (1213.28)	2150.31 (990.26)				
Sugar (g)	Experimental	38.56 (31.24)	32.03 (21.44)	34.97 (28.19)	.347	.688	1.973	.147
	Control	37.71 (30.74)	43.21 (28.57)	45.65 (33.69)				

Table 3 The Comparison of Physical Activity and Metabolic Control Between Groups and Each Point of Measurements

Intake	Group	Mean (SD)			Effect			
					Time		Time*group	
		Baseline	Three months	Six months	*F*	*p*-value	*F*	*p*-value
PA (MET)	Experimental	36.06 (3.13)	40.43 (3.23)	39.27 (3.76)	33.157	.000****	23.807	.000****
	Control	37.39 (3.22)	37.90 (3.67)	37.28 (3.52)				
WC (cm)	Experimental	94.25 (9.71)	93.09 (9.92)	91.55 (9.83)	2.013	.148	19.225	.000****
	Control	92.57 (10.67)	94.83 (10.15)	94.79 (10.37)				
SBP (mmHg)	Experimental	145.32 (17.76)	136.43 (15.96)	134.65 (14.60)	7.311	.001****	3.743	.026*
	Control	142.62 (16.64)	139.93 (15.36)	141.48 (19.83)				
DBP (mmHg)	Experimental	84.45 (7.34)	79.25 (9.64)	80.09 (9.64)	2.257	.117	3.808	.031*
	Control	81.76 (14.52)	82.10 (9.65)	82.98 (9.97)				
FBS (mg/dL)	Experimental	109.36 (34.71)	101.33 (30.90)	102.74 (29.29)	5.390	.007**	2.357	.102
	Control	116.79 (35.57)	106.76 (26.06)	119.43 (37.13)				
TG (mg/dL)	Experimental	165.23 (78.32)	156.25 (96.70)	158.16 (81.32)	3.277	.046*	1.136	.320
	Control	203.76 (132.06)	168.24 (63.77)	180.00 (67.93)				
HDL (mg/dL)	Experimental	44.75 (9.11)	47.80 (10.86)	52.34 (10.82)	9.956	.000****	.657	.520
	Control	41.90 (9.86)	45.38 (12.34)	46.93 (11.03)				

PA = physical activity. WC = waist circumference. SBP = systolic blood pressure. DSP = diastolic blood pressure. FBS = fasting blood sugar. TG = triglyceride. HDL = high density

Due to the significant time effect or interaction effect between groups in physical activity and systolic blood pressure at three points of measurement, the paired sample t-test was used to analyze the mean difference of the two variables at each point of measurement. In addition, as there was no interaction effect in blood glucose, triglyceride, and HDL cholesterol at three points of measurement, the independent t-test was used to compare the mean of blood glucose, triglycerides, and HDL cholesterol at each point of measurement. The results indicated that the physical activity level of the experimental group was significantly higher than that of the control group at both 3-months and 6-months, while HDL cholesterol of the experimental group was significantly higher than that of the control group at 6-months. Additionally, blood glucose levels of the experimental group were significantly lower than that of the control group only at 6-months. However, waist circumference, systolic and diastolic blood pressure, and triglyceride were not significantly different at any point of measurement after completing the program.

Discussion

Results from this study revealed that a SSPPMS is effective in increasing physical activity and improving metabolic control particularly for controlling HDL cholesterol and blood glucose, but unsuccessful in improving eating behaviors, waist circumference, systolic and diastolic blood pressure and triglycerides. It may be due to the complex nature of eating behaviors as there are many influential factors including biological need and preferences, cultural, social, religious, economic, environmental, and even political factors.[26] A healthy eating behavior is also influenced by immediate and competing demands and preferences that can derail intended diet controls.[27] For instance, a person with MetS prefers high fat to low fat food because of taste or flavor preferences. As a consequence, that person fails to control the competing preference leading to poor dietary control. Moreover healthy foods' availability and price have the potential to influence dietary intake.[28] Resources to eat healthy are limited in the community, less readymade healthy food options exist, and some people cannot afford the cost of healthy food. There are temptations and attractive foods for stimulating hungriness including food and restaurant advertisements or food gift vouchers, but these foods are of less nutritional value and are mostly high in carbohydrates, fat, cholesterol, salt, sugar, and are low in fiber. Inadequate community resources may be another reason to explain the failure of the program to change eating behavior.

Moreover, in Thai culture, extended families are typical and the eating behavior of the senior family member is strongly influenced by young family members.[29] Seniors may find difficulty controlling their diets because the young often plan the menu and cook for them based upon their preferences. So, management of eating behaviors requires social support especially from family and community members. Lack of social support, and family support in particular, may explain the failure to change of eating behavior among the experimental group participants in this study. Our findings indicated that factors influencing change of eating behaviors were the individual and social environment. Interestingly, the social environment factor emerged during the intervention period. The emphasis of the SSPPMS was mainly focused on individuals, and thus may not be strong enough to change behaviour if family or community are not involved. This was consistent with Fisher et al.[30] who stated that improving healthy eating behaviors needs a multilevel approach that emphasizes the relationship between individual behavior and social environments. However, the consumption of the experimental group tended to meet dietary recommendations.

The result from this study was different to another one where the intervention could reduce fat intake and increase fiber intake after twelve months.[31] Pettman and colleagues, who studied the effects of a self-management program for overweight adults with

MetS, also found significantly reduced overall energy intake and improved diet intakes after twelve months.[32] The time for reaching the goals in the above two studies was about 12 months, which was longer than in this study.

In regards to physical activity, the experimental group had higher levels of physical activity than the control group. This result confirms the hypothesis that a self-management support program could improve physical activity. The small group education and individual coaching approach increased participants' knowledge and self-management skills for collaborative goal setting and action plans, problem solving, and self-monitoring. Small group discussions also increased the confidence in the competence of the experimental group to perform physical activities and provided social support.

Another reason supporting the effectiveness of SSPPMS was self-selecting physical activity. The experimental group selected a type of exercise based on their preference and set their own goals to increase physical activity. The self-selection of physical activity has motivated and raised the confidence of the experimental group to take action. Moreover, the effectiveness of the Program may be from self-monitoring via daily recording. Completing a regular daily record increased awareness of the experimental group for keeping up the activity level and reminded them to exercise. The record also increased awareness of participants of their sedentary activities and promoted change. It can be concluded that keeping a regular record encouraged people to maintain exercise.

Furthermore, feedback of information was provided to the experimental group on their progress on physical activity in terms of daily energy expenditure as a daily MET activity value and the frequency of exercise in order to stimulate them to have action. Providing regular feedback on physical activity is important for checking the sufficiency of participants' awareness. People only consider changing their behavior when they become aware that they are having too little physical activity.[33] Feedback, therefore, could motivate people with MetS to carry on exercise.

High self-confidence among the participants may be a reason for the program's success. Prior to each intervention, the participant was individually assessed on their self-confidence for physical activity. In case that the score was lower than seven, the researcher consistently motivated or re-motivated the participant by means of motivational interviewing techniques until the score was above seven.

Another explanation for the success of SSPPMS may be attributable to social support. The experimental group received social support from many sources to enhance their physical activity and informational support about disease management from the researcher. In addition, they received support from the community in terms of forming various exercise groups that they could participate in exercises and providing areas for exercise close to their houses such as temple courtyards and parking lots. Moreover, friends and family also encouraged them to engage in physical activity by providing round trip transportation to exercise venues. It was found that the experimental group who received the SSPPMS exercised regularly and strictly followed an action plan.

For the control group who received the traditional health education approach, the findings showed no improvement of physical activity and so this aspect of the Program needs further investigation and modification. This approach usually focuses on routine instruction of technical disease-specific skills and provides information.5 The instruction is regardless of the needs or context of people and does not provide coaching for behavioral change.[34]

Regarding metabolic control, the finding revealed that the Program had benefits on blood glucose, and HDL cholesterol. Six months after the intervention, blood glucose of the experimental group was significantly lower than that of the control group, and HDL cholesterol of the experimental group was significantly higher than that of the control group. The improvements of these parameters may result from the participants' adherence to medication regimen and the recommended lifestyle, particularly controlling carbohydrate intake (less than 60% of total calories) and regular moderate intensity physical activity. Carbohydrate intake is the nutrient mostly influencing blood glucose level,[35] and keeping carbohydrate intake to recommended levels tends to decrease blood glucose. Regular moderate-intensity physical activity improves blood glucose level by improving insulin sensitivity and increasing metabolism for energy. Performing dietary control together with moderate-intensity physical activity could reduce blood glucose by 0.45 mmol/L or 8.11 mg/dl.[36] In this study, the experimental group showed an average 57.94% of total calories from carbohydrate intake which followed the recommendation resulting in decreased blood glucose level by 6.62 mg/dl.

The increase of HDL cholesterol in the experimental group may have resulted from increased physical activity level. Moderate intensity physical activity can positively alter HDL cholesterol metabolism by increasing the rate of synthesis.[37] Grundy et al[2] reported that the best exercise to raise HDL cholesterol and lowering blood glucose is a good aerobic workout so in this study, the experimental group participated in Lanna Thai dances and Chi-gong, which increased concentrations of serum HDL cholesterol. It was found that their HDL cholesterol was increased approximately 7.59 mg/dl from baseline at the sixth month. They started moderate-intensity physical activity at three months after the intervention, their HDL cholesterol increased in the following three months. It may be explained that the experimental group had low-intensity physical activity at baseline and started to have moderate-intensity physical activity after three months. So, moderate-intensity physical activity may be too short for changing blood glucose and HDL cholesterol level. On the other hand, the experimental group maintained the moderate intensity physical activity for three more months, which may be adequate to change blood glucose and HDL cholesterol level. This is consistent with another finding[38] that using the aerobic exercise program in older women induced a significant increase in HDL cholesterol (7.87 mg/dl) after eight months of training.

However, our findings showed that the Program may not be effective in decreasing waist circumference, blood pressure, and triglyceride level which may be related to unchanged eating behavior in this study. Improved waist circumference, systolic and diastolic blood pressures and triglyceride was reported when people modified their food consumption, including reducing carbohydrate, salt, sugar, and fat diets, and diet fiber, as well as limiting alcohol intake. Moreover, they need to do moderate-intensity physical activity too.[39] This finding revealed that the experimental group did not significantly improved eating behavior.

Limitations

First, although randomization was used to decrease the effects of extraneous variables, participants were not balanced in terms of gender. The majority of participants were females, which made it difficult to determine gender-specific responses. Replication of the study with different gender responses is needed to broaden the generalization of the study. Second, the present program omitted the monitoring of home blood pressure due to limited research funding. A systematic review and meta-analysis[40] showed that home blood pressure monitoring has the potential to improve hypertension control. Thus, not monitoring blood pressure, it may decrease the effects of the SSPPMS on systolic and diastolic blood pressure. Further studies are needed to include home blood pressure monitoring in the Program.

Conclusions and Recommendations

The SSPPMS developed for this study is effective in increasing physical activity and improving metabolic control, particularly for controlling blood glucose and HDL cholesterol. The program can be integrated into regular service of diabetic or cardiovascular clinics in both primary and secondary care setting, as the finding demonstrated its effectiveness in improving physical activity and metabolic control including blood glucose and HDL cholesterol. Small group education and discussion for self-management among people with MetS who have poor metabolic control should be provided to help people change their behavior. Additionally, our findings provide evidence to grow knowledge in nursing science regarding behavior change approach and multiple risk factors reduction. They add to the knowledge of primary prevention strategies in diabetes and cardiovascular disease. The findings may evidence that can be integrated into nursing curricula at undergraduate and graduate levels for better nursing intervention of people with MetS.

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ผลของโปรแกรมสนับสนุนการจัดการตนเองต่อพฤติกรรมการรับประทานอาหาร การทำกิจกรรมทางกาย และควบคุมเมตาบอลิก ในผู้ที่มีภาวะเมตาบอลิกซินโดรม

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บทคัดย่อ: การศึกษาครั้งนี้มีวัตถุประสงค์เพื่อศึกษาผลของโปรแกรมสนับสนุนการจัดการตนเองต่อพฤติกรรมการรับประทานอาหาร การทำกิจกรรมทางกาย และการควบคุมภาวะเมตาบอลิกในผู้ที่มีภาวะเมตาบอลิกซินโดรม ที่ใช้บริการใน 3 โรงพยาบาลเขตภาคเหนือของประเทศไทย กลุ่มตัวอย่างที่มีคุณสมบัติตรงตามที่กำหนดจำนวน 86 คน ทำการสุ่มเข้ากลุ่มทดลอง 44 คน และกลุ่มควบคุม 42 คน กลุ่มทดลองได้รับการดูแลด้วยโปรแกรมสนับสนุนการจัดการตนเองที่ออกแบบโดยผู้วิจัย สร้างขึ้นโดยอาศัยโมเดลการจัดการตนเองแบบ 5A ของกลาสโกว์และคณะในปี ค.ศ. 2002 ส่วนกลุ่มควบคุมได้รับการดูแลตามมาตราฐาน การดำเนินการโปรแกรมใช้เวลา 3 เดือน มีการเข้ากลุ่มทั้งหมด 6 ครั้ง ซึ่ง 4 ครั้งแรกจะเข้ากลุ่มทุกสัปดาห์เป็นจำนวน 4 สัปดาห์ โดยสัปดาห์แรกจะเป็นการให้ความรู้ในเรื่องการรับประทานอาหารและการทำกิจกรรมทางกาย ครั้งที่ 2-4 เป็นการฝึกทักษะการจัดการตนเอง ส่วนครั้งที่ 5-6 เป็นการอภิปรายกลุ่ม โดยมีระยะเวลาห่างกัน 1 เดือน การเก็บรวบรวมข้อมูลพฤติกรรมการรับประทานอาหาร การทำกิจกรรมทางกาย และการควบคุมเมตาบอลิกกระทำ 3 ครั้งคือ เริ่มต้น ที่ 3 และ 6 เดือน การประเมินพฤติกรรมการรับประทานอาหารใช้สมุดบันทึกการรับประทานอาหารภายใน 7 วัน เพื่อคำนวนหาสารอาหารที่ได้ในแต่ละวันด้วยโปรแกรมคอมพิวเตอร์ที่พัฒนาโดยสถาบันโภชนาการ มหาวิทยาลัยมหิดล ส่วนระดับการทำกิจกรรมทางกายประเมินจากสมุดบันทึกการทำกิจกรรมทางกายโดยคำนวนเป็นพลังงานที่ใช้ในแต่ละวัน ส่วนข้อมูลการควบคุมภาวะเมตาบอลิกประเมินจากขนาดรอบเอว ความดันโลหิต ระดับน้ำตาลในเลือด ระดับไตรกลีเซอไรด์ และระดับเอสดีแอลคอเลสเตอรอล

ผลการวิจัยพบว่า กลุ่มทดลองมีระดับการทำกิจกรรมทางกายเพิ่มขึ้นทั้งที่ 3 และ 6 เดือน นอกจากนี้ที่ 6 เดือนพบว่า กลุ่มทดลองมีระดับเอสดีแอลคอเลสเตอรอลเพิ่มสูงขึ้นและระดับน้ำตาลในเลือดลดลงอย่างมีนัยสำคัญทางสถิติ อย่างไรก็ดีในการศึกษาวิจัยครั้งนี้ไม่พบการเปลี่ยนแปลงของพฤติกรรมการรับประทานอาหาร ขนาดรอบเอว ระดับความดันโลหิต และระดับไตรกลีเซอไรด์ในเลือด

ดังนั้น พยาบาลสามารถนำโปรแกรมนี้ไปใช้กับผู้ป่วยที่มีภาวะเมตาบอลิกซินโดรม เพื่อช่วยให้ผู้ป่วยสามารถควบคุมภาวะเมตาบอลิก โดยเฉพาะการควบคุมระดับน้ำตาลในเลือดและระดับเอสดีแอลคอเลสเตอรอล ร่วมทั้งสามารถช่วยผู้ป่วยในการกำหนดปัญหาและอุปสรรคในการเปลี่ยนแปลงพฤติกรรม

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คำสำคัญ: การสนับสนุนการจัดการตนเอง พฤติกรรมการรับประทานอาหาร การทำกิจกรรมทางกาย การควบคุมภาวะเมตาบอลิก เมตาบอลิกซินโดรม

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