

**EFFECTS OF METABOLIC SYNDROME SELF-MANAGEMENT PROGRAM ON  
EATING BEHAVIOR AND PHYSICAL ACTIVITY IN OLDER ADULTS  
WITH METABOLIC SYNDROME**

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**ABSTRACT**

This study aimed to evaluate the effects of the Metabolic Syndrome Self-Management (MSSM) program on eating behavior (EB) and physical activity (PA) in older adults with Metabolic Syndrome (MetS). Participants who met the inclusion criteria were randomly assigned to either the experimental (n=33) or control (n=33) group. The experimental group received the MSSM program and usual care, while the control group received usual care. The program duration was 6 weeks, and included 4-phase. The program focused on EB and PA. Data was collected at pre-test and post-test (6<sup>th</sup> week), EB were assessed using the Eating Behavior Questionnaire, while PA was assessed using The Rapid Assessment of physical activity. Data were analyzed using independent t-test. The results indicated that after participating in MSSM program, there was a significant improvement in mean score of EB and PA within the experimental group. In addition, after participating in the MSSM program, there was a significant difference in mean scores of EB between the experimental group (Mean = 17.60, SD = 5.20) and the control group (Mean = 25.09, SD = 5.58),  $p < .001$  and mean scores of PA the experimental group (Mean = 4.60, SD = 0.60) and the control group (Mean = 2.93, SD = 1.02),  $p < .001$ . In conclusion The MSSM program appears to be effective in improving EB and PA in older adults with MetS.

**Keywords:** self-management, metabolic syndrome, older adults, eating behavior, physical activity

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## Introduction

The Metabolic Syndrome (MetS) is a complex condition including abdominal obesity, insulin resistance, high blood pressure, and high blood sugar that increase the risk of developing cardiovascular disease and type 2 diabetes mellitus, amongst other chronic metabolic abnormalities. (Deerochanawong, 2006; Dunkley et al., 2012). The prevalence of MetS is increasing worldwide, especially among older adults (Bechtold et al., 2006; Bo et al., 2009). Moreover, prevalence of MetS has been shown to be 10–40% in most Asian countries (Chan, 2006). In the foreseeable future, at least 50% of people over 60 years of age may be impacted by this condition.

MetS is characterized by a group of metabolic factors, including high blood pressure, low high-density lipoprotein (HDL), high triglycerides (TG), impaired fasting glucose, and excess abdominal fat. Some of the underlying causes of this syndrome that give rise to the metabolic risk factors include: overweight or obesity, insulin resistance, physical inactivity, cigarette smoking, alcohol consumption, and genetic factors (Dunkley et al., 2012; The National Cholesterol Education Program Adult Treatment Panel [NCEP-ATP III], 2001; World Health Organization [WHO], 1999). Importantly, MetS affects older adults and causes many diseases and affects their quality of life. In fact, Sakurai et al. (2010) showed that MetS was associated with impaired activities of daily living (ADLs) and cognitive decline.

Lifestyle modification and weight loss should, therefore, be at the core of management of MetS and

its components (Cornier et al., 2008; NCEP-ATP III, 2001). Eating behaviors and sedentary lifestyle are known to contribute to the high prevalence of MetS (Hu et al., 2008). In addition, there is a consensus that other cardiac risk factors should be aggressively managed in individuals with MetS (Grundy et al., 2005). Therefore, eating behaviors and sedentary activity are associated with increasing of body weight, waist circumference, blood pressure, fasting plasma glucose, triglyceride and decreasing high density lipoprotein.

Older adults with MetS can manage their syndrome through lifestyle behaviors. Early management of the syndrome can control complications of disease such as type 2 diabetes and cardiovascular diseases. Self-management is a procedure that patients change some characteristics of their behaviors. Self-management refers to an individual's activities and means for controlling and caring for their own disease (Lorig & Holman, 2003). This approach can be a cost-effective strategy to manage chronic diseases with optimal resources from health care professionals. Along with other factors such as education, life style and social support, self-management is an important factor for improving patient outcomes in chronic diseases (Lorig et al., 1999; Schulman-Green et al., 2012).

Older adults have some attitudes and beliefs from their lived experience that may cause negative effect on well-being – (Cramm et al., 2012). At the same time, this collection should include abilities to reinforce their strengths, thereby creating and consolidating important resources for the maintenance

of MetS and the prevention of chronic diseases. Thus, older people may benefit from self-management interventions that do not only focus on one specific (health) problem, but that cover all basic aspects of well-being, including those that help them to maintain well-being proactively (Steverink, Lindenberg, & Slaets, 2005). However, only a few researchers have used a multifactorial approach to self-management in older adults with MetS. In addition, previous MetS interventions were not specific to older adults' context and did not include the holistic dimensions of MetS. Therefore, there is a need to develop and evaluate interventions to manage eating behavior and physical activity in older adults with the MetS. Self-management approaches to therapy that focus specifically on instigating the development of skills that can be implemented on one's own may be especially well suited to enhancing self-efficacy. While the causal role of perceived self-efficacy has yet to be demonstrated, the concept has many implications for clinical practice. Treatments that can maximally influence self-efficacy provide graduated success experiences in performance-based procedures, they consider and utilize self-attribution processes and self-evaluative information, encourage individuals to develop their own abilities, and allow the individual personal choice and responsibility for the management of their behavior (Lorig & Holman, 2003; Omisakin & Ncama, 2011; Schulman-Green et al, 2012).

The purpose of this study was to evaluate the effects of a MSSM program on eating behavior and physical activity in older adults with MetS.

## **Research objective**

1. To compare eating behavior and physical activity between older adults with MetS who participated and those who did not participate in the MSSM program at post-test
2. To compare eating behavior and physical activity in older adults with MetS who participated in the MSSM program between pretest and posttest.

## **Research Methodology**

### **Design and setting**

The design of this study was a randomized controlled trial. Recruitment was conducted at the outpatient department of BangBo hospital in Samut Prakan Province and visited their home.

### **Randomization procedures**

The participants in research setting were randomly assigned into the experimental group or the control group. The randomization technique was used the sealed-envelope with no replacement technique. To assign groups, the researcher drew a ballot out of the 66 ballots that were mixed together in the envelope. Of the 66 ballots, 33 of them were marked with the letter "C" for the control group; 33 ballots had the letter "E" for the experimental group. Ballots were not replaced in the box.

### **Participants**

The participants were recruited into the study when they had; 1) ages between 60-74 years; 2) diagnosed with MetS within at least 2 weeks, having at least 3 out of 5 risk criterion determinants according

to the Third Report of the National Cholesterol Education Program Adult Treatment Panel (NCEP-ATP III) definition with the waist circumference of the World Health Organization-Asia Pacific. The criteria for MetS in this study was as follows: increased waist circumference ( $\geq 90$  cm. in men and  $>80$  cm. in women), hypertriglyceridemia (TG  $\geq 150$  mg/dL), low high-density lipoprotein cholesterol (HDL-C;  $<40$  mg/dL in men and  $<50$  mg/dL in women), high blood pressure ( $\geq 130/85$  mmHg or use of antihypertensive medication), and high fasting plasma glucose ( $\geq 110$  mg/dL or treatment of diabetes mellitus); 3) no cognitive impairment when completing the Thai Mental State Examination (TMSE), the TMSE score should be greater than 23 points; 4) no physical limitation as identified by functional status using the Barthel Activity of Daily Living (BAI) with scores between 12 and 20; 5) No heart disease or severe hypertension (systolic  $\geq 180$  mmHg, diastolic  $\geq 110$  mmHg); 6) no osteoarthritis including joint pain of knees and hips that limits exercise; 7) Other health conditions that limits exercise; 8) being able to understand and speak Thai, 9) Live in Samut Prakan province; 10) willing to collaborate and can participate in all aspects of this program.

Older adults have complications and other serious health problems (i.e. heart attacks and chest pains, extremely high blood pressures systolic  $\geq 180$  mmHg, diastolic  $\geq 110$  mmHg) were excluded. The participants were randomly assigned using simple randomization method. Sixty-six participants who met the inclusion criteria were equally randomly assigned to either the experimental (n=33) and control (n=33) group (Figure 1)

### **The Instruments for Data Collection**

**(a) The Demographic Questionnaire** was included age, gender, religion, educational level, marital status, health insurance, occupational status, incomes, household income, smoking status, alcohol consumption, health history, and previous disease.

**(b) The Eating Behavior Assessment (EBA)** was used to evaluate eating behavior. It was modified from the Eating Behavior Questionnaire developed by the Department of Health of Ministry of Public Health. This instrument was a 15-item questionnaire that have total score 75. The score can be divided into four levels: lower than 36 means very good eating behavior, 37-41 means good eating behavior, 42-47 means not good eating behavior, and higher than 48 means poor eating behavior. The Cronbach's alpha coefficient was .73.

**(c) The Rapid Assessment of Physical Activity (RAPA)** used to evaluate physical activity. This instrument developed by University of Washington Health Promotion Research Center (Topolski et al., 2006). The RAPA was a 9-item questionnaire with the response options of yes or no to questions covering the range of levels of physical activity from sedentary to regular vigorous as well as strength training and flexibility. The score of the first seven items was from 1 to 7 points with the scores categorized into one of five levels of aerobic activity: 1 = sedentary, 2 = under active, 3 = regular underactive (light activities), 4 = regular underactive, and 5 = regular active. Responses to the strength training and flexibility items were scored separately, with strength training = 1, flexibility = 2, or both = 3. The Cronbach's alpha coefficient was .72.

### Validity

Experts judged content validity of the Eating Behavior Assessment (EBA), The Rapid Assessment of Physical Activity (RAPA) Thai version, a MSSM Program description, the booklet of practice guide for older adults with MetS, and the notebook for recording eating behavior and physical activity. The panel of five experts included: two physicians who were expert in MetS and physical activity, a professor who was expert in MetS, a faculty member of health education and behavioral science and nursing, and a faculty member of gerontological nursing. The instruments were revised according to the recommendation of the experts. Panel members were asked to rate each item's clarity and fit with concept and definition, and to consider whether the conceptual domain of each concept had been adequately covered by the set of items. The rating score given by five experts were used in this investigation to calculate a content validity index (CVI;Waltz, Strickland, & Lenz, 2010). The CVI of both EBA and RAPA were 1.

### Reliability

The Eating Behavior Assessment (EBA) questionnaire and The Rapid Assessment of Physical Activity (RAPA) were revised and improved based on the suggestions and comments by the experts. The EBA and the RAPA questionnaires were tried out with 30 patients with similar characteristics as the samples of the study. The data obtained was used to calculate reliability using Cronbach's alpha coefficient. The alpha value of The EBA and the RAPA questionnaires were .73 and .72, respectively. In this study the Cronbach's alpha coefficient of The EBA

and the RAPA questionnaires were .76 and .74, respectively.

### Intervention

The MSSM program for older adults with MetS was intensive and interactive to train patients to monitor themselves and use patient-adjustable, written action plans. Besides improving patient knowledge, the MSSM programs have been shown to improve coping health behavior and symptom management. The MSSM program was composed of four phases: 1) assessment and planning 2) preparation, 3) self-management practice, and 4) evaluation.

### Data Collection for the Experimental Group

The steps in conducting the study were present as follow:

**Phase 1** focused on understanding participants' background and needs. This phase was for planning the level of activity appropriate to the background and needs to motivate self-management behaviors.

**Week 0:** The researcher introduced the assessment details to participants for about 10-15 minutes. After that, the research assistant collected baseline assessment (pre-test) data by interview using the demographic questionnaire, The Eating Behavior Assessment (EBA) and the Rapid Assessment of Physical Activity (RAPA).

**Phase 2** focused on increasing knowledge of MetS in older adults. The research aspects included; definitions, metabolic risk factors, signs and symptoms, progression and complication syndrome, treatment, metabolic syndrome management, and knowledge of

the age related changes. Eating behavior guidelines were the determinant of a daily food plan. Physical activity and exercise guideline include basic information about daily physical activity, problem solving of common issues, kind of activity and exercise appropriated to older adults. The knowledge is an antecedence of self-management skills. Therefore, participants must be prepared sufficiently knowledge about their health conditions and treatment to help them make a decision on changing their health behaviors.

**Week 1:** The first phase of the program began with the researcher developing relationships, assessment, identification of needs, and acknowledgment of strengths. This phase was an important step for the researcher to understand the background of participants. The researcher approached participants in order to 1) Individually assess older adults and their caregivers' MetS knowledge, 2) Identify factors that lead to preserving and promoting healthy behaviors.

**Week 2:** The second phase of the program at week 2, after the participant could clearly identify the problem and establish a goal to solve the problem, the researcher proceeded to the preparation phase. The researcher provided MetS knowledge and medication management in an individual consultation. Patient education was frequently seen as an important component of programs to manage MetS. The goal of such education was to teach the patient about the disease's symptoms, pathophysiology, course, outcome, and treatment. Patients who had more knowledge about MetS were assumed to be in better position to participate in the management of syndrome. Cognitive process was needed for mastery of the modeling that was widely applied to develop

intellectual, social, and behavioral competencies.

**Phase 3** was promoting the effective performance of self-management skills (eating behaviors and physical activity) and to increase self-efficacy. Perceived self-efficacy plays an important mediating role in self-management activities, adopting and maintaining lifestyle behavior changes, resulting in improved health outcomes (Marks, Allegrante, & Lorig, 2005).

**Week 3-4:** The third phase of the program at week 3-4 was self-management practice. The researcher provided motivation and skills for management lifestyle behaviors changes. Participants were the managers about what they want to accomplish, alternative ways to accomplish their goals, short-term plans, action plans, or agreements with themselves: how they wanted to carry out their action plans and check their results, changes they wanted to make, and rewards they wanted to receive.

**Week 5:** The fourth phase of the program at week 5-6; the process needed the participant's self-monitoring strategy and active participation between the participant and researcher. During the visit, the older adults, caregivers, and the researcher assessed the outcomes of the self-management practices, using the information from the self-monitoring, self-reinforcing, self-evaluating, and maintaining behavioral change. Participants and caregivers were asked to record their self-monitoring, reinforcing, self-evaluating, and health behaviors.

**Phase 4** used a behavioral approach that required a self-regulation and self-monitoring process. Participants recorded their eating behavior daily regarding kind of foods, and quantity of foods. 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. Participants recorded their daily physical activity including kind of physical activity, and duration of physical activity.

**Week 6:** The research assistant collected data by interviewing for posttest assessment by using the EBA and the RAPA.

#### Data Collection for the Control Group

The researcher assessed baseline information and delivered health education about MetS and usual care. Participants in the control group could consult the researcher if they had a health problem. The

research assistant collected pre-test data by interview using the demographic questionnaire, the EBA, and the RAPA. Six week later, the research assistant collected post-test assessment by interview using the same instruments (see Figure 1).

**Ethical Considerations:** Study approval was obtained from the Research Ethics Committee of Faculty of Nursing, Burapha University. Potential participants received an information sheet describing: the study purpose, involvement in research participation, assurance of confidentiality and anonymity issues, and ability to withdraw at any time without any consequences. Individuals who agreed to participate were asked to sign a consent form.

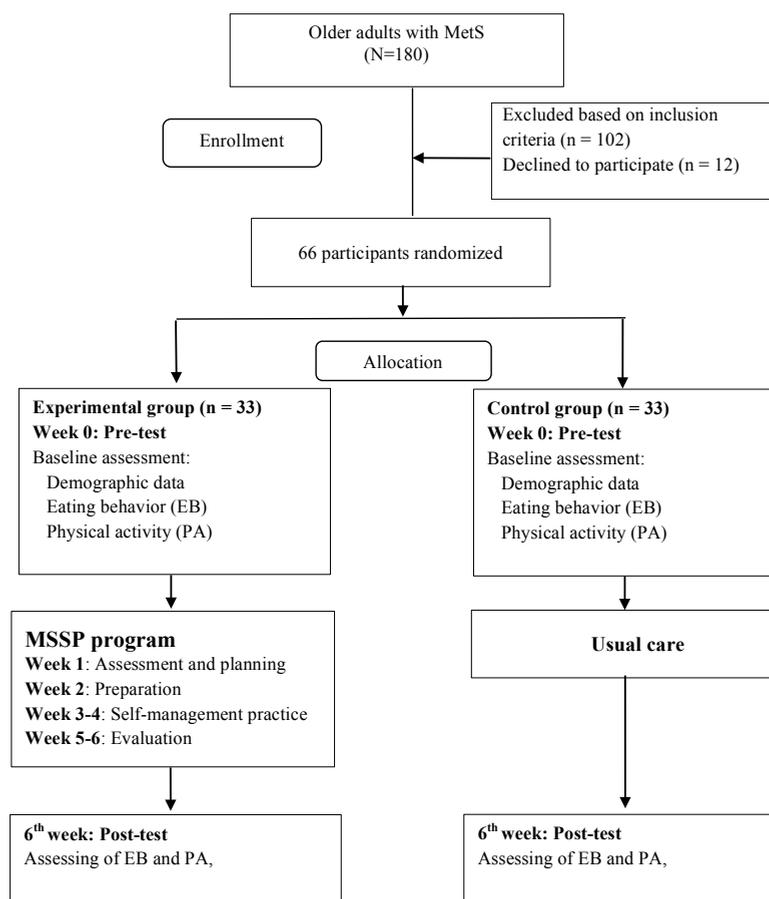


Figure 1 Flow chart of participants' recruitment and allocation

### 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 pre-test. The difference between the pretest-to-posttest within the intervention and control group at week 6 was examined by using paired- t-test and difference between the intervention and control groups at post-test was examined using the independent t-test for significance of the intervention effect.

### Results

Demographic characteristics of the experimental group and control group were examined using Chi-Square tests and Independence t-test. All

demographic characteristics between the experimental and control groups were not significant differences ( $p > .05$ ). In the experimental group, the majority was: ages between 60–64 years old (57.5%), female (57.6%), Buddhist (97%), married (60.6%), complete primary school (87.8%), mean income 8,339.39 (9,859.64), non smokers (87.9%), non drinkers (90.9%), and having four criteria of MetS (42.4%) and five criteria (36.4%).

In the control group, the majority was: ages between 60–64 years old (63.6%), female (51.5%), Buddhist (87.9%), married (66.7%), complete primary school (81.1%), mean income 15,151.52 (SD = 20,345.41), non smokers (87.9%), non drinkers (84.4%), and having three and four criterions of MetS equally (36.4%).

**Table 1** Comparison of EB and PA in the experimental group between pretest and posttest (n=33)

Group	Variables	Pre-test	Post-test	t	df	p-value
		Mean (SD)	Mean (SD)			
Experimental group	EB	27.93 (8.68)	17.60 (5.20)	7.07	32	.000*
	PA	2.63 (1.05)	4.60 (0.60)	-9.39	32	.000*

\* $p < .001$

Table 1 shows that the mean EB score of the experimental group at pre-test was 27.93 (SD = 8.68) after receiving the MSSM program, the mean EB score significantly decreased from pre-test to post-test (Mean = 17.60, SD = 5.20,  $p < .001$ )

The mean PA score of the experimental group at pre-test was 2.63 (SD = 1.05) after receiving the MSSM program, the mean PA score significantly increased from pre-test to post-test (Mean = 4.60, SD = 0.60,  $p < .001$ )

**Table 2** Comparison of EB and PA at posttest between experimental and control group (n=33)

Variables	Groups	Pre-test	Post-test	d	t	p-value
		Mean (SD)	Mean (SD)			
EB	Experimental	27.93 (8.68)	17.60 (5.20)	-10.33	6.71	.000*
	Control	24.27 (4.97)	25.09 (5.58)	0.81		
PA	Experimental	2.63 (1.05)	4.60 (0.60)	1.96	-7.39	.000*
	Control	3.27 (1.15)	2.93 (1.02)	-0.33		

\*p < .001

Table 2 shows comparisons of the means differences of EB and PA between the experimental and control group. The EB and PA were significant differences between the experimental and control group (p < .001).

### Discussion

These findings illustrated that the MSSM program could improve EB and PA of the participants at post-test when compared between the experimental and the control group. Participants who received the MSSM program and managed their lifestyle behaviors such as control carbohydrate and low sugar intake and increase physical activity. This program promoted participants to enhance their self-management to control eating behaviors and increase physical activity. The MSSM program included four phases.

The process of the program used empathic understanding, reflecting, and enhanced self-efficacy that focused on physical activity for controlling physiological indicators such as fasting plasma glucose, triglyceride, waist circumference, blood pressure, and body weight. The recording process also increased participants' awareness on their sedentary

activities and promoted change (Suwankruhasn, Pothiban, Panuthai, & Boonchuang, 2013). These findings were congruent in some parts with Suwankruhasn et al. (2013) who used a self-management support program for Thai people diagnosed with MetS for self-management physical activity and eating behaviors. The results found significant increase mean of physical activity at post-test and follow-up but no effect on eating behaviors. Moreover, relevance previous studied of Jopa, Suntayakorn, Prachnban, and Wanitchakorn (2010) study the effects of self-management program on controlling metabolic syndrome among middle age people and Moattari, Ghobadi, Beigi, and Pishdad (2012) study impact of self-management on metabolic control indicators of diabetes patients.

### Implementation

This study found effectiveness of the MSSM program in changing behaviors towards EB and PA in older adults with MetS. Therefore, the principle of the MSSM program, which was based on a self-management concept, should be promoted to use in older adults with MetS in various settings. .

### Recommendations for future research

Based on limitations of these study, recommendations for further study include::

1. This study focused on older adults only in an urban area, therefore, a future study should be conducted to test the effectiveness of this program in a rural area.

2. This study specific only older adults, therefore, a future study should be repeated in other age groups.

3. This study implemented the MSSM program over a three- month period, and the outcomes were measured immediately after implementing the program, , therefore, a longitudinal study should be further explored to test persistency of behavior changes.

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