

# **Effects of an Eating Behaviour Modification Program on Thai People with Diabetes and Obesity: A Randomised Clinical Trial**

*Kamonpun Wattanakorn, Aporn Deenan, Saichai Puapan, Joanne Kraenzle Schneider*

**Abstract:** The purpose of this study was to evaluate the effects of an Eating Behaviour Modification Program on Thai people with diabetes and obesity. Based on motivational interviewing and self-regulation theory, the Program was developed to improve healthy eating behaviours. A sample of 76 people with diabetes and obesity were recruited using a cluster random sampling, then randomly assigned to an intervention or control group. The intervention group participated in four sessions which took 30-45 minutes per session, whereas the control group received materials and health education. The outcomes were evaluated using the Brief Illness Perception Questionnaire, the Three-Factor Eating Questionnaire, and the Seven-Day Physical Activity Recall questionnaire at weeks 0, 5, 9, and 13.

The results revealed that the intervention group had significantly higher scores on illness representations and eating behaviours and a significantly lower body mass index, body fat percentage, waist circumference, and blood sugar levels than the control group. Moreover, there were significant differences over times for all outcomes. These findings support contention that the Program was effective in promoting motivation, maintaining healthy eating behaviours, and may be used in nursing practice. However nursing research should be undertaking using this Program with different groups and across longer time periods.

*Pacific Rim Int J Nurs Res 2013 ; 17(4) 356-370*

**Keywords:** Eating behaviour; diabetes; obesity; modification program; randomised clinical trial

## **Introduction**

Diabetes mellitus (DM) is a chronic illness that is increasing in prevalence worldwide as well as in Thailand. Obesity is a major risk factor for the development of DM and increases complications for people who are already have diabetes, therefore, weight control should be a cornerstone of diabetes

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management. The purpose of this study was to modify eating behaviours of people with diabetes and obesity in Thailand using an Eating Behaviour Modification Program (EBMP).

## Literature Review

### **Prevalence of Diabetes**

The World Health Organization reported that in 2013 there were approximately 347 million people with diabetes worldwide and this number will likely increase.<sup>1</sup> The Bureau of Non-Communicable Disease, Ministry of Public Health, Thailand<sup>2</sup> also reported that in 2011 the mortality rate of people with diabetes was 11.88 per 100,000 population. The joint International Diabetes Federation (IDF) and International Association for the Study of Obesity<sup>3</sup> reported that people with obesity have 40 times increased risk of developing type 2 diabetes. Moreover, 44% of people with diabetes are overweight or obese.<sup>4</sup>

### **Diabetes mellitus and obesity**

People with diabetes and obesity generally exhibit abdominal fat which affects metabolism. Adipose tissue is related to fat distribution, free fatty acids, and adipocytokines.<sup>5</sup> The major cause of obesity is related to the storage of energy from excess dietary intake that is greater than what is needed for metabolism.

Obesity in people with diabetes promotes insulin resistance, which leads to a number of complications, including psychological problems.<sup>6</sup> With increasing insulin resistance, blood sugar levels also increase. When people with diabetes control their weight, the incidence of insulin resistance will decline.<sup>7</sup> Likewise, weight reduction in people with diabetes leads to decreasing blood sugar levels<sup>8</sup>, thus, dietary control for people with diabetes and obesity should be of particular interest.<sup>9</sup>

### **Diabetes Mellitus Management**

Obesity in people with diabetes is difficult to manage because there are various factors related to blood sugar control. People with diabetes frequently control their body weight for short periods of time, but regain weight later.<sup>10</sup> Although there are various commercial weight control programs, not all programs are useful because those programs usually advocate very low calories, fasting diets, various medications, or barometric surgeries which may result in diabetic ketoacidosis (DKA) and can lead to sudden death.<sup>10</sup> Thus, controlling body weight in this group should be tailored to their diabetic needs. Furthermore, weight reduction programs usually involve exercise and dietary management. However, people with diabetes tend to avoid exercising, even decreasing physical activity, because they lack the confidence to select the appropriate activity type, intensity, and length of time.<sup>6</sup> Therefore, dietary control may be more appealing to people with diabetes who have an already busy daily life.<sup>11</sup>

Several researchers have found dietary control to be strongly associated with weight loss<sup>12,13</sup> since it will reduce blood sugar levels and complications in people with diabetes and obesity.<sup>14</sup> Weight control is largely dependent on individuals' health behaviours. Researchers who use the self-regulation (SR) framework to guide interventions recognize individuals' roles in health behaviours, and although self-regulatory interventions may be effective, individuals must be motivated to make the initial commitment to engage in these interventions. One particular motivational intervention, motivational interviewing (MI), has shown promise with a number of health behaviours. Previous research has shown that MI was effective in changing eating behaviours<sup>15,16</sup> while others have demonstrated that SR facilitated long-term adherence to those behaviours.<sup>17</sup>

## **Conceptual Framework**

MI is “a client-centered, directive method for enhancing intrinsic motivation to change by exploring and resolving ambivalence”<sup>18</sup> and involves guiding more than directing, and listening rather than telling. Overall “MI spirit” is described as collaborative, evocative, and honoring patients’ autonomy.<sup>19</sup> MI uses a number of person-centered techniques to create a favorable climate for change and has five general principles, including rolling with resistance, expressing empathy, avoiding argumentation, developing discrepancy, and supporting self-efficacy which should be used throughout the interaction.<sup>19</sup> MI has been effectively used for weight reduction in overweight women with type 2 diabetes<sup>15</sup>, and has been shown to enhance adherence to change behaviours and significantly reduce HbA1c levels.<sup>20, 21</sup>

Self-regulation was incorporated into this intervention study to help sustain new behaviours.<sup>22</sup> SR is a strategy to generate goals, which focus on individuals’ needs to enhance adaptation to a specific situation, and proposes illness representations which can be cognitive and emotional. Cognitive representations refer to individuals’ view of their illness or their interpretation of their illness experience whereas emotional representations guide signify to the emotional reaction related to the illness experience. Illness representations include five attributes: *identity* refers to statements regarding beliefs about the illness label; *timeline* denotes individuals’ beliefs about the course of the illness; and *cause* indicates beliefs regarding the factors that are responsible for causing the illness. Further, *consequences* refers to beliefs regarding the impact of the illness on overall quality of life, and *controllability* of the *illness* implies belief in the ability to control an illness through coping behaviours.<sup>17</sup> Individuals develop coping procedures in response to illness representations. People who experience disconcerting health threats may engage in health promotion behaviours in managing their

health threats and in improving their health, thus, they self-regulate.<sup>17</sup>

### ***The EBMP intervention***

A literature review revealed several effective interventions that included individual MI to facilitate change in eating behaviours<sup>15, 21</sup> and self-regulation that sustained these new healthy behaviours.<sup>23</sup> MI is used to help elaborate individuals’ discrepancies between their current status (illness representations) and what they expect in the future. Consistent with SR, once the discrepancy becomes strong enough, behaviours change (coping procedures) take place. MI evokes intrinsic motivation and commitment to healthy eating behaviours, and reinforces and builds on participants’ feelings of personal efficacy.<sup>16</sup> Then individuals are encouraged to suggest realistic coping strategies to initiate and sustain healthy eating behaviours<sup>17</sup> that modify illness representations. However, little research has been done to examine the effects of MI and SR on physiological outcomes in people with diabetes and obesity. Therefore, an EBMP was developed to integrate MI and SR to improve and sustain physiological outcomes in Thai people with diabetes and obesity. Thus, the following hypotheses (H) were posed:

H1. People with diabetes and obesity who received the EBMP would score higher on illness representations and eating behaviour and lower on body mass index, body fat percentage, waist circumference and blood sugar levels than the control group.

H2. There will be significant differences in illness representations and eating behaviour scores, and body mass index, body fat percentage, waist circumference, and blood sugar levels, across the three time periods in the experimental group.

## **Method**

**Design:** This study was a randomised clinical trial to examine the effects of the EBMP on illness representations, eating behaviours, and physiologic

outcomes in people with diabetes and obesity.

**Population and Sample:** Thai people with diabetes and obesity ( $BMI \geq 25 \text{ kg/m}^2$ ) from 118 tambon (district) health promoting hospitals (THPHs) in a province in central Thailand were recruited by using cluster random sampling where we randomly chose two amphurs (small cities). Then we randomly chose two tambons from each amphur. People with diabetes and obesity were invited to participate if they met the following inclusion criteria: were diagnosed with type 2 DM; had no co-morbidities; were 20–60 years of age; had not participated in other intervention programs; and able to read, write, and understand the Thai language. People with diabetes and obesity who were pregnant, on weight-loss medication, or in a hyperglycemia or hypoglycemia crisis were excluded from the study.

**Sample size:** Considering an *a priori* effect size of 0.4, alpha of .05, and a power of .80 for 2 groups, a sample size of 36 participants per group was needed.<sup>24</sup> Expecting the attrition rate to be approximately 10%, an additional four participants were recruited to make a total of 40 participants per group.

People with diabetes and obesity from the four THPHs received study information via posters and brochures. After screening for eligibility, further details of the study were explained. Eighty people with diabetes and obesity volunteered to participate and signed the informed consent. Because the researchers expected a synergistic effect between healthy eating and exercise, and that men gain muscle and lose weight more quickly than women, they stratified by gender by randomizing men and women separately to assure equal numbers of both genders across groups. Randomization was done by using a computer-generated list.

**Intervention group:** The EBMP group had four sessions spread across four weeks. To prevent intervention diffusion, the first researcher performed each session in a private room of THPH. The sessions

took an individual client-centered approach and lasted 30–45 minutes. The first session involved mainly MI approaches and included assessing and enhancing awareness of eating behaviours. The participants were encouraged to become aware of discrepancy between their current illness representations and then their attention was focused on the pros and cons of behaviour change. Then they recognized self-motivational statements and talked of committing to behaviour change. The therapeutic skills consisted of open-ended questions, affirmation, reflection, and summary techniques. The participants also shared information by the elicit-provide-elicit technique and through materials provided to them. The second session focused on promoting positive perceptions and setting the action plan (SR) for eating behaviours. The therapeutic skills consisted of expressing empathy, respecting autonomy, promoting collaboration, guidance for goal setting, and assisting with strategies to achieve goals (MI). The third session focused on self-monitoring and self-confidence. Here the therapeutic skills consisted of encouraging daily record keeping, monitoring symptoms and eating behaviours, appraising progress, listening reflectively, revising goals and strategies, and supporting self-efficacy. The final session focused on reinforcement and empowerment to maintain effective behaviours where the therapeutic skills consisted of promoting collaboration, appraising progress, facilitating effective strategies, and supporting self-efficacy.

**Control group:** In the first week the control group was provided with the same materials as the EBMP group, and the first researcher described details of these materials over 30 minutes. After that, participants were provided with health education by health care providers at 15-minute meetings once per month for three months.

**Materials for the intervention:** Each participant received a behavioural modification handbook, a guidebook, a pamphlet, and daily food record. The

handbook, *No Fat No Disease: Appropriate Eating 2:1:1*, developed by the Bureau of Nutrition.<sup>25</sup> It has various topics such as food control, effective eating, eating with others, eating in restaurants, cooking at home, and healthy menus for people with obesity. The guidebook *Begin Healthy: Low Sweet, Fat, Salty Diet and Increase Fruit, Vegetables Intake* was also developed by the Bureau of Nutrition.<sup>26</sup> The dietary weight management pamphlet for people with diabetes was developed by the researchers. It focuses on calculating appropriate body weight, setting goals for weight reduction, calculating daily energy intake, and estimating food exchange. The daily food record promoted monitoring (SR). The pamphlet and the food record were verified for face validity by five experts in diabetic nursing care and nutrition.

**Instruments for data collection:** Data were obtained through a number of instruments. Using a demographic questionnaire, participants' personal and socioeconomic data were collected (e.g., gender, age, education, occupation, number of years since their diabetes).

The *Brief Illness Perception Questionnaire* (BIPQ), developed by Broadbent, Petrie, Main, and Weinman<sup>27</sup> and modified for people with diabetes and obesity, is a rapid assessment of illness perceptions reflecting self-regulation. It has been shown to have good test-retest reliability over time. The BIPQ consists of nine items: five items assessed cognitive illness representations which were identity, timeline, consequence, personal control, and treatment control; two items assessed emotional representations; and one item assessed illness comprehensibility which reflects overall perception of self-regulation. Items 1–8 are scored from "not at all" (0) to "extremely" (10). For example, the first item asked "How much does being obese affect your life?" Negative items were reverse-coded. Scores could range from 0 to 80. High scores indicate positive cognitive and emotional representations of diabetes and obesity. The last item

asks participants to list in rank-order the three most important factors they believed caused their obesity.

The *Three-Factor Eating Questionnaire* (TFEQ) was developed by Stunkard and Messick.<sup>28</sup> This instrument was used to assess internalized multidimensional constructs that included behavioural, cognitive, and affective experiences which could reflect cognitive control of self-regulation. TFEQ consists of three components: 1) dietary restraints measures the tendency of people to restrict their food intake in order to control their body weight; 2) disinhibitions measures habitual, emotional, and situational susceptibility of people to seek food intake; and 3) hunger assesses the internal and external locus of hunger. Each factor was reported to have high test-retest reliability in various groups.<sup>28</sup> This instrument had two sections, one a true/false part and another where item responses ranged from "not at all" (1) to "extremely" (4). In the latter a sample item included: "How often are you dieting in a conscious effort to control your weight?" Negative items for both parts were reverse-coded. Scores ranged from 0–92. High scores indicated positive eating behaviours.

The *Seven-Day Physical Activity Recall* (PAR) was developed by Sallis *et al.*<sup>29</sup> to assess physical activity, and the test-retest reliability was shown to be between .86 to .99.<sup>30</sup> PAR is a semi-structured interview that estimates individuals' time spent in physical activity, and strength and flexibility activities for seven days prior to interview. The intensity of physical activity consists of sleep, light, moderate, hard, and very hard intensity. The kilocalorie per day is estimated from the number of hours spent at different activity levels. The activities for the past seven days are multiplied by their respective metabolic equivalent (MET) value and summed. This study used physical activity (average kilocalorie per day) as a covariate.

All instruments were translated from English to Thai by the first researcher and another bilingual speaker, compared, then back-translated by bilingual and bicultural nurse educator translators, and compared again. The instruments were then verified by five experts for similarity of interpretation, and tested with five Thai people with diabetes and obesity. Content validity of the questionnaire was reviewed by seven experts, and tested in this study. The content validity index of the Brief IPQ was 1.00; the TFEQ was .89, and the PAR was .95. All instruments were tested using Cronbach's alpha reliability with 30 people with diabetes and obesity having similar characteristics as the study participants. Internal consistency (alpha coefficient) for the Brief IPQ was .83; .89 for the PAR; and for the three TFEQ subscales (dietary restraints, disinhibitions, and hunger) .81, .73, and .77 respectively. When the TFEQ was used in 76 participants, the reliability of dietary restraints, disinhibitions, and hunger were .85, .79, and .82 respectively.

Finally, a Tanita weight measurement scale and stadiometer were used to measure height and weight for the BMI computation. The Omron body fat percentage monitor (Model BF 306) was used to measure body fat percentage. These instruments were calibrated before use. The Gulick II measuring tape (model 67019) was used for waist circumference measurement. The Accu-Chek Performa Portable meter was used to assess participants' blood sugar levels.

**Ethical Considerations:** This study was approved by the Research Ethics Committee of Faculty of Nursing, Burapha University, the provincial head of public health, and the health care providers of four THPHs in the study before data collection was initiated. The first researcher explained to each participant the purposes and procedures of the study, and their rights to confidentiality, anonymity, and to withdraw from the study at any time. After participants understood, they were asked to sign consent forms.

## Data collection

**Preparing the principal researcher:** Before the study, the first researcher participated in an MI skill-based training course and workshop offered by clinical psychologists. The researcher's MI competency was verified by a medical psychiatrist before starting the program.

**Preparing the research assistants:** To avoid bias, the researchers enlisted the help of registered nurses (RNs) as research assistants (RAs) for each THPH. Before initiating the Program, the RNs were trained to collect accurate and consistent data. To determine inter-rater reliability, the researchers and the RAs independently collected baseline measures on the first 10 participants to determine intra-class correlation. Retraining of the RAs was continued until an intra-class correlation of 0.8 was reached.

**Data collection procedures:** At week 0 (baseline assessment), the RAs collected data [illness representations (BIPQ), eating behaviours (TFEQ), physical activity (PAR), body mass index, body fat percentage, waist circumference and blood sugar levels] of all participants. One week later, the intervention groups started the EBMP and the control group started their education. After the 4-week programs, all data were obtained again at weeks 5, 9, and 13.

## Data analysis

Descriptive statistics were used to describe the participants' demographic data. Chi-squares and t-tests were conducted to compare the differences between the baseline data of both groups. A repeated measures MANCOVA using baseline values as covariates, was used to compare the differences between groups and changes in mean scores of illness representations, eating behaviours, BMI, body fat percentage, and waist circumference. A repeated measure ANCOVA using baseline values as covariates

was used to compare the differences between groups and changes in mean scores of blood sugar levels over time.

## Results

**Participants:** One participant in the control group died with heart failure and another moved to another province. Two participants in the EBMP group participated in only two sessions of the Program. With this 5% attrition rate, the final sample totalled 76 participants with 38 per group. The majority of participants were female (84.2%), married (67.1%), and had completed primary school but had not received any further formal education (81.6%). Their occupations included: farmers (30.3%), officials/merchants (27.6%), employers (21.1%), and housework or unemployed (21.1%). The majority reported that they had good/enough incomes (73.7%). The mean age was 49.9 years ( $SD=7.7$ ) and the average duration of DM was 5.2 years ( $SD=4.1$ ). As shown in Table 1, there were no significant differences in demographic characteristics and outcome variables at baseline between the EBMP and the control groups.

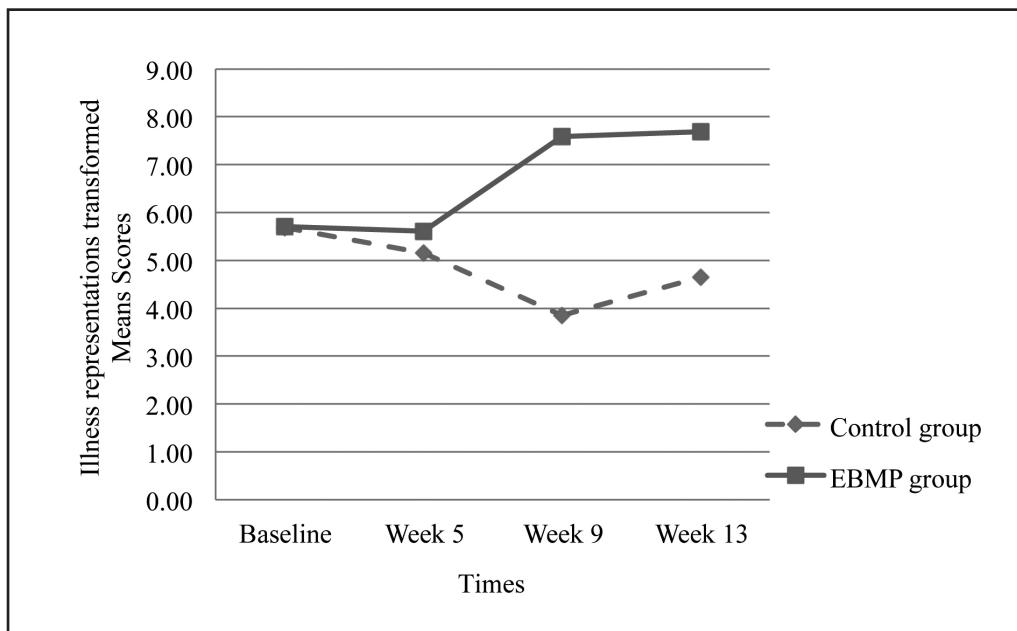
People with diabetes and obesity who received the EBMP had higher mean scores of illness representations ( $F=190.53, p=.00$ ) eating behaviour ( $F=83.94, p=.00$ ) and lower mean BMI, body fat percentage, waist circumference ( $F=285.15, p=.00$ ), and blood sugar levels ( $F=40.25, p=.00$ ) than the control group at 5, 9, 13 weeks supporting hypothesis 1 (H1). In the experimental group, there were significant differences of mean scores across the three time periods (H2) of illness representations ( $F=3.96, p=.02$ ), eating behaviour ( $F=.43, p=.02$ ), BMI, body fat percentage, waist circumference ( $F=3.51, p=.03$ ), and blood sugar levels ( $F=15.90, p=.00$ ). There were significant interactions of group by time on illness representations ( $F=8.25, p=.00$ ), eating behaviour ( $F=.47, p=.03$ ), BMI, body fat percentage, waist circumference ( $F=3.61, p=.03$ ), and blood sugar levels ( $F=9.50, p=.00$ ). Changes over time are presented in Figures 2–5. In conclusion, people with diabetes and obesity who participated in the EBMP improved their illness representations, eating behaviours, BMI, body fat percentage, waist circumference, and blood sugar levels.

**Table 1** Comparison of number percentage and mean of descriptive characteristics between two groups

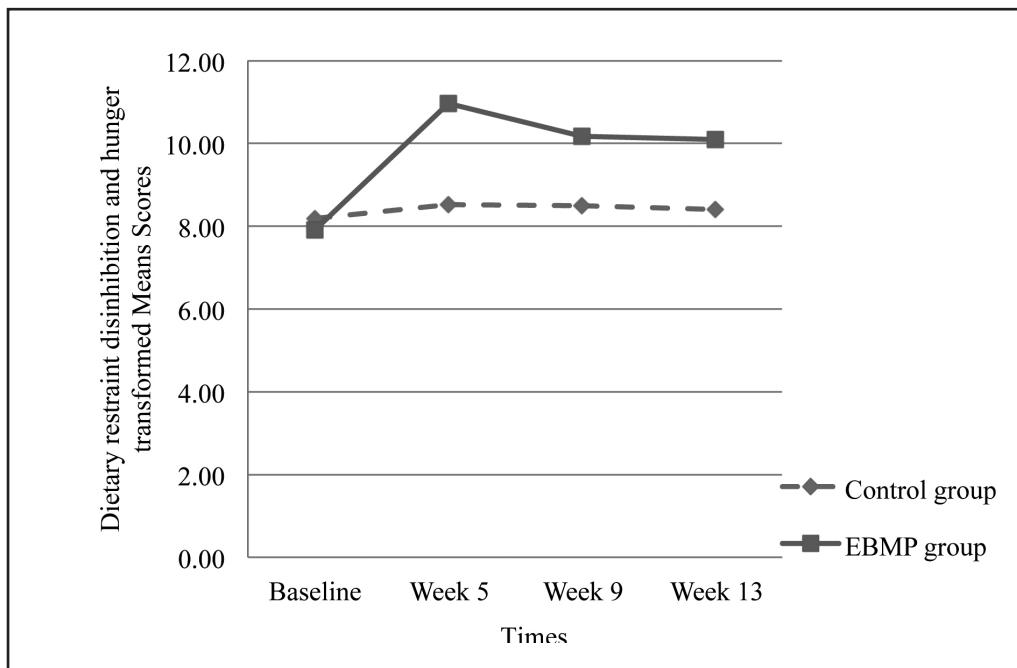
| Characteristics                     | Groups |       |         |       |                   |       | $\chi^2$<br>(df)   | <i>p</i> |  |  |
|-------------------------------------|--------|-------|---------|-------|-------------------|-------|--------------------|----------|--|--|
|                                     | Total  |       | Control |       | EBMP intervention |       |                    |          |  |  |
|                                     | N      | %     | N       | %     | N                 | %     |                    |          |  |  |
| Gender                              |        |       |         |       |                   |       | .00 <sub>(1)</sub> | 1.00     |  |  |
| Female                              | 64     | 84.21 | 32      | 84.21 | 32                | 84.21 |                    |          |  |  |
| Male                                | 12     | 15.79 | 6       | 15.79 | 6                 | 15.79 |                    |          |  |  |
| Marital status                      |        |       |         |       |                   |       | .54 <sub>(2)</sub> | .46      |  |  |
| Single / Separate / divorce / widow | 25     | 32.89 | 11      | 28.95 | 14                | 36.84 |                    |          |  |  |
| Married                             | 51     | 67.11 | 27      | 71.05 | 24                | 63.16 |                    |          |  |  |

**Table 1** Comparison of number percentage and mean of descriptive characteristics between two groups (Continued)

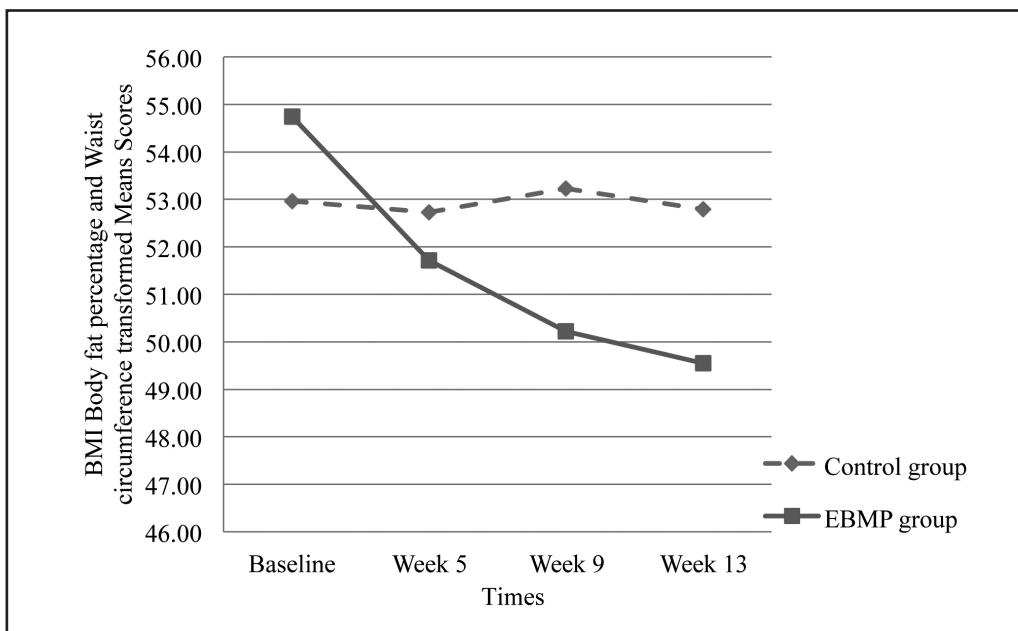
| Characteristics             | Groups |       |         |       |                   |       | $\chi^2$<br>(df)    | <i>p</i> |  |  |
|-----------------------------|--------|-------|---------|-------|-------------------|-------|---------------------|----------|--|--|
|                             | Total  |       | Control |       | EBMP intervention |       |                     |          |  |  |
|                             | N      | %     | N       | %     | N                 | %     |                     |          |  |  |
| Education                   |        |       |         |       |                   |       | 1.40 <sub>(1)</sub> | .24      |  |  |
| None / primary school       | 62     | 81.58 | 33      | 86.84 | 29                | 76.32 |                     |          |  |  |
| Higher than primary school  | 14     | 18.42 | 5       | 13.16 | 9                 | 23.68 |                     |          |  |  |
| Occupation                  |        |       |         |       |                   |       | 3.48 <sub>(3)</sub> | .32      |  |  |
| Official / merchant         | 21     | 27.63 | 13      | 34.21 | 8                 | 21.05 |                     |          |  |  |
| Farmer                      | 23     | 30.26 | 12      | 31.58 | 11                | 28.95 |                     |          |  |  |
| Employer                    | 16     | 21.05 | 8       | 21.05 | 8                 | 21.05 |                     |          |  |  |
| Housework / no work         | 16     | 21.05 | 5       | 13.16 | 11                | 28.95 |                     |          |  |  |
| Income                      |        |       |         |       |                   |       | .27 <sub>(2)</sub>  | .60      |  |  |
| Rich / enough               | 56     | 73.68 | 27      | 71.05 | 29                | 76.32 |                     |          |  |  |
| Poor                        | 20     | 26.32 | 11      | 28.95 | 9                 | 23.7  |                     |          |  |  |
|                             | Mean   | S.D.  | Mean    | S.D.  | Mean              | S.D.  | <i>t</i>            | <i>p</i> |  |  |
| Age (years)                 | 49.88  | 7.70  | 49.87   | 7.71  | 49.89             | 7.80  | -.02                | .99      |  |  |
| Duration of DM (years)      | 5.17   | 4.06  | 4.61    | 2.88  | 5.70              | 4.90  | -1.15               | .25      |  |  |
| Family income (baht/ month) | 9,095  | 98.15 | 9,258   | 36.52 | 8,944             | 38.68 | .14                 | .89      |  |  |
|                             | .00    |       | .82     |       | .46               |       |                     |          |  |  |



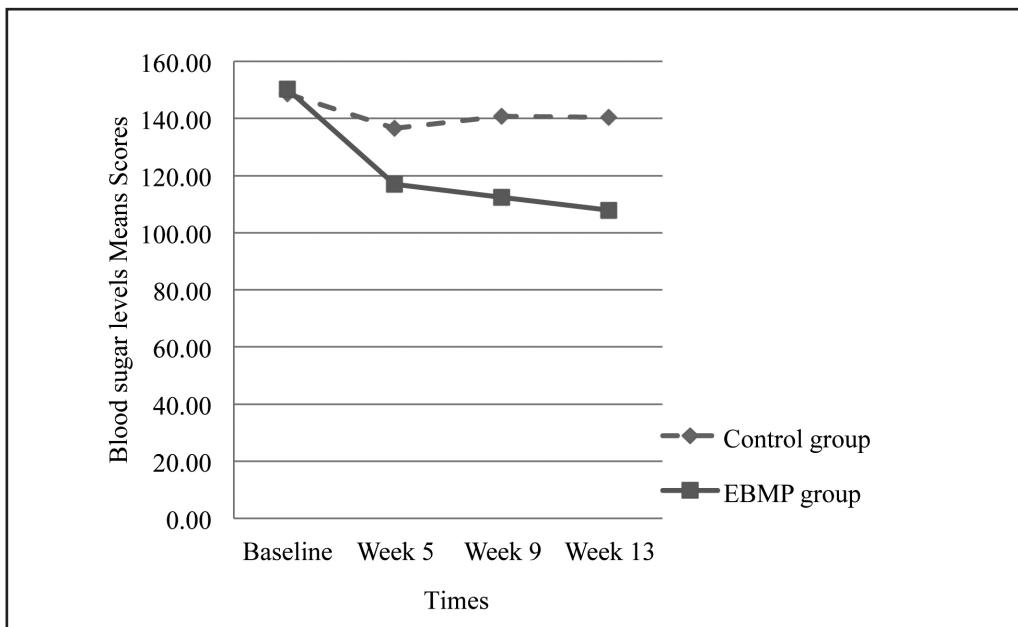
**Figure 1** Changes over time of mean scores of illness representations transformed



**Figure 2** Changes over time of mean scores of eating behaviours transformed



**Figure 3** Changes over time of mean scores of BMI, body fat percentage and waist circumference transformed



**Figure 4** Changes over time of mean scores of blood sugar levels

## Discussion

Overall, the EBMP, which integrated MI and SR, positively affected health behaviours and physiological outcomes. Almost all participants in this study were female with an approximate 50-year mean age. These characteristics appear to support the successful changing of behaviours, and this study finding demonstrated that past experiences of participants could facilitate to initiate healthy eating behaviours. Married women in Thailand usually take the lead role in selecting and preparing food for their families. That role could promote them to sustain their healthy behaviours as well. Although most of the participants graduated only from primary school, this was not an obstacle for them in using this Program.

The EBMP is a therapeutic approach through which people with diabetes and obesity became aware of the potential for changing behaviours that resulted in improved health. This Program promoted a positive perception of participants' illness representation (in particular, understanding cause, consequence, and perceived controlling eating behaviours). Throughout the EBMP sessions, participants initiated appropriate goals, resolved their barriers, and initiated and sustained healthy eating behaviours. The EBMP helped participants recognize and avoid overeating, high-fat foods, and high sugar soft drink. Instead participants selected and prepared healthy foods. Moreover, they were more inclined to weigh themselves frequently and observe their changing habits. They improved overall diabetic management such as low sugar, fat, and salty diet including adherence to medication and emotional management which affected blood sugar levels. Those behaviours contributed to decrease these physiological outcomes during the three months.

Previous researchers found that a combination of MI and a problem solving treatment could improve dietary behaviours.<sup>31</sup> West *et al.*<sup>15</sup> conducted five individual MI sessions to improve weight loss in

women with type 2 diabetes, and Greaves *et al.*<sup>21</sup> showed that individual behavioural counseling using MI could reduce weight loss. Additionally, Brug *et al.*<sup>32</sup> demonstrated that patients of MI-trained dietitians had significantly lower saturated fat intake post-treatment. Likewise, Tripp *et al.*<sup>33</sup> demonstrated that MI combined with diet counseling was a trend toward lowered body mass index and waist measurements. Newnham-Kanas *et al.*<sup>34</sup> found that MI with weekly coaching sessions could reduce waist circumference of adults with obesity. These studies were congruent with Vail-Gandolfo<sup>35</sup> who illustrated that MI could be educationally-based to promote self-care behaviours to reduce HbA1c in people with diabetes. Therefore, the findings of previous studies support the effects of the EBMP in this study.

The effectiveness of the EBMP is also congruent with previous studies that improved weight maintenance and blood sugar levels. For example, Wing *et al.*<sup>23</sup> demonstrated that face-to-face interventions based on self-regulation could decrease the risk of weight regain. Calhoun *et al.*<sup>36</sup> found MI could improve self-care with Type 2 diabetes. Gosse<sup>37</sup> considered that the self-regulation model of illness representation could support self-management to reduce HbA1c in diabetics, whilst Limruangrong *et al.*<sup>38</sup> confirmed that a self-regulation program could control blood sugar levels in Thai people with gestational diabetes. However, the effects of the EBMP on body mass index, body fat percentage and waist circumference, including blood sugar levels, were not significant difference between groups in week 5. These might be associated with personal habit, stage of change, or the short observational period.

In conclusion, integrating MI and SR in the EBMP could demonstrate holistic nursing care by focusing on the client-centered approach. Nursing's role is to help clients improve and maintain effective health behaviours. This study provides nursing evidence of promoting healthy behaviours for people with diabetes and obesity.

## **Recommendations**

The EBMP can be applied in nursing practice especially in people with diabetes and obesity in different settings and more long term. The knowledge gained from this study could be applied to nursing education by training advanced nurse practitioners to enhance clients' motivation and promotion of self-regulation. The EBMP could be incorporated into the nursing curriculum such as within a master degree in nursing. However, future studies, involving this Program need to be undertaken with different groups (e.g., younger or older persons with diabetes and obesity, or within various cultures) and using longitudinal studies over a longer period. Furthermore, the combination of eating behaviour and exercise in the EBM program should be examined.

## **Limitations**

Like all studies, this study had limitations. Generalizability is limited due to the participants coming from four THPHs of one province in Thailand. Moreover, only Thai people with diabetes and obesity were studied, so the applicability of findings to other cultural settings is limited.

## **Acknowledgement**

A thank you is extended to all participants in this study, and the Thailand Nursing and Midwifery Council and Praboromarajchanok Institute, Ministry of Public Health, Thailand for financial support of this study.

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## ผลของโปรแกรมปรับเปลี่ยนพฤติกรรมการบริโภคอาหารของผู้ป่วยโรคเบาหวานคนไทยที่มีภาวะอ้วน

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**บทคัดย่อ:** การศึกษาครั้งนี้ มีวัตถุประสงค์เพื่อทดสอบผลของโปรแกรมปรับเปลี่ยนพฤติกรรมการบริโภคอาหารของผู้ป่วยโรคเบาหวานคนไทยที่มีภาวะอ้วนโดยการประยุกต์ใช้เทคนิคการสัมภาษณ์เพื่อประเมินสร้างแรงจูงใจและทุติยภูมิการกำกับตนเองเป็นกรอบในการศึกษา กลุ่มตัวอย่างเป็นผู้ป่วยเบาหวานที่มีภาวะอ้วน จำนวน 76 รายที่ถูกสุ่มตัวอย่างแบบงาลุ่ม แล้วสุ่มเข้ากลุ่มทดลองและกลุ่มควบคุม กลุ่มทดลองได้รับโปรแกรมเป็นการสอนท่านราษฎร์ จำนวน 4 ครั้งๆ ละ 30-45 นาที กลุ่มควบคุมได้รับเอกสารและการสอนสุขศึกษา เครื่องมือที่ใช้ในการเก็บรวบรวมข้อมูลประกอบด้วยแบบสอบถามข้อมูลส่วนบุคคล แบบสอบถามการรับรู้เกี่ยวกับความอ้วนสำหรับผู้ป่วยโรคเบาหวาน แบบสอบถามปัจจัยที่เกี่ยวข้องกับการบริโภคอาหารและแบบสัมภาษณ์การทำกิจกรรมที่ใช้แรงกายในช่วง 7 วันที่ผ่านมา ซึ่งใช้ระดับที่ 0, 5, 9 และ 13

ผลการศึกษาพบว่ากลุ่มทดลองมีคะแนนเฉลี่ยของตัวแปรที่ศึกษาสูงกว่ากลุ่มควบคุมอย่างมีนัยสำคัญทางสถิติ ได้แก่ การรับรู้การเจ็บป่วย พฤติกรรมการบริโภคอาหาร นอกจากนี้ยังพบว่า กลุ่มทดลองมีดัชนีมวลกาย เปอร์เซ็นต์ไขมันในร่างกาย เส้นรอบเอวและระดับน้ำตาลในเลือดต่ำกว่า กลุ่มควบคุมอย่างมีนัยสำคัญทางสถิติ และผลการวิเคราะห์ทางสถิติพบว่ามีความแตกต่างอย่างมีนัยสำคัญทางสถิติของตัวแปรผลลัพธ์ในช่วงเวลาที่เปลี่ยนแปลงไป จากผลการศึกษาสนับสนุนว่า โปรแกรมปรับเปลี่ยนพฤติกรรมการบริโภคอาหารสามารถช่วยส่งเสริมให้ผู้ป่วยเกิดแรงจูงใจปรับเปลี่ยนพฤติกรรมการบริโภคอาหารแบบยั่งยืน และสามารถนำไปใช้ในการปฏิบัติการพยาบาลได้ จึงควรมีการศึกษาเพิ่มเติมในกลุ่มผู้ป่วยอื่นๆ และใช้โปรแกรมในระยะยาวขึ้น

*Pacific Rim Int J Nurs Res 2013 ; 17(4) 356-370*

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