The Effectiveness of Health Promotion Behavior Program (HPBP) in Thai Hypertensive Patients

Pantip Sangprasert and Netip Pradujkanchana
Department of Community Health Nursing, Faculty of Nursing,
and Health Promotion of Hospital Nursing Thammasat University,
Pathum Thani, 12121, Thailand.

Abstract

The purpose of this study is to examine the effect of Health Promotion Behavior Program (HPBP) in Thai hypertensive patients. A quasi-experimental study design was employed by obtaining samples from experimental and control groups. Each group is comprised of 22 participants, who are 35-59 years old, grade I hypertensive without complication of cardiovascular, respiratory, or skeletal diseases. The experimental group participated in the HPBP, but not in the control group. This program consisted of health education strategies, respiratory and exercise practical skill, care giver supporting, telephone counseling and home visiting for an 8-week period. The interview, questionnaires, respiratory, and exercise time records were collected and analyzed by Paired t-test and ANCOVA.

The results showed a statistically significant difference between groups. The experiment group had higher mean scores than the control group in several aspects including health perception status ($p < .001$), stress management behaviors ($p = .006$). However, the experiment group had lower mean scores in waist circumference ($p = .004$), respiratory rate ($P = .005$), diastolic blood pressure ($p < .001$). Within the experimental group, improvement after the treatment was shown in health perception status ($p = .005$), stress-management behaviors ($p = .006$), but decreased mean scores in waist circumference ($p = .003$), respiratory rate ($p = .011$), systolic blood pressure ($p = .02$), and diastolic blood pressure ($p < .001$). In summary, HPBP should be recommended for home-visit nurses in the development of intervention programs for hypertensive patients.

Keywords: health promotion behavior program, health perception status, stress-management behavior, hypertension

1. Introduction

Hypertension is a serious public health problem in many countries. Five billion people around the world are affected by it. For example, in the United States of America, 50 million people have hypertension—doubling the number of patients two years earlier [1]. In Thailand, it is estimated that more than 1.5 million more people will be afflicted with hypertension by the year 2025 and 17 million will have a high risk of heart disease [2]. Death from hypertension and

heart disease ranks third in the Thai population today [3]. Within a 12-year time span of follow up, every 10 mmHg increase in systolic and 5 mmHg in diastolic blood pressure increases the risk of death from cardiovascular disease by 1.3 times and 1.5 times, respectively[4]

The major cause of hypertension is an unhealthy lifestyle, such as consuming salty or fatty foods too frequently and being under stress for a long period of time. Eating fatty foods leads to obesity. This condition, especially when it occurs together with a prolonged period of stress, substantially increases the risk of high blood pressure and cardiovascular disease [5, 6]. Stress stimulates the autonomic nervous system and the endocrine system. If a person is under a stressful condition longer than an hour, his or her parasympathetic nervous system will be over-stimulated and a hormone called cortisol will be excessively released, causing high blood pressure and higher risk of heart disease, diabetes, and stomach ulcers. Moreover, if a person is under continuous stress for an extended period of time and cannot adapt to it, his or her mental condition may deteriorate to mental illness [7, 8, 9].

High blood pressure can be reduced. There are studies that found that doing regular aerobic exercise that is appropriate for the individual's age for 30-60 minutes each session and 3-5 times a week can reduce high blood pressure. The results were the systolic and diastolic blood pressures of a healthy subject decrease by 4.3 and 2.7 mmHg, respectively, and his or her heart rate at rest decreases by 10.6 beats/minute ($p < 0.05$) [10]. In another study, exercise reduced the systolic blood pressure of a group of patients with cerebrovascular disease and another group with cardiovascular disease by 10 mmHg and 5 mmHg, respectively, and their diastolic pressures were reduced by 7 mmHg and 6 mmHg, respectively[11]. There was also a study of a breathing exercise that helped to reduce blood pressure. It was found in this study that slow breathing, which helped decrease the breathing rate from 16.6 ± 2.8 times/minute to fewer than 10 times/minute, together with a 15 minute a day full exhalation exercise, could decrease systolic and diastolic blood pressure by 14 mmHg and 9 mmHg, respectively[12,13,14]. In another study of a semi-experimental nature, there was an investigation of the stress management behavior of patients with ischemic heart disease using techniques such as biofeedback, meditation, breathing exercise, and improvement of health status and stress conditions ($p < 0.05$) [7].

A survey of 300 patients with chronic illness (hypertension, cardiovascular disease, and diabetes mellitus) who received treatment at Thammasat Hospital during the months of July to September, 2006 showed that 36.4% of the patients did not do exercise in their leisure time and of those that did, 89.4% did not do it regularly. Eleven point four percent of these patients perceived that they had a high level of stress, and 73.2% did not manage their stress appropriately [16]. Worldwide, one of the top ten causes of death and disability is lack of exercise. Two hundred thousand people a year die from this cause [17]. According to an idea of Pender, the creation of new experience and personal inclination have both a direct and indirect impact on patients' physical and mental health. They indirectly affect their health by acting through their belief in and their positive perception of health promotion behavior; consequently, they positively perceive higher capability and fewer obstacles. These positive outcomes, in

turn, feedback and reinforce further health promotion behavior. In one study, a program for building positive perception of self-capability and self-care behavior was shown to significantly reduce high blood pressure of the members of a community ($p < 0.05$) [18]. Another study shows that support from family members and relatives encourage patients to do exercise on a regular basis [25]. Continual home visits by nurses also benefits patients substantially. It helps prevent complications, cuts down on family's expenses, and positively motivates the patients [26]. Continuous support from these two groups can make a considerable difference in the patients' health conditions.

Following Thailand's public health policy of prevention rather than treatment, we have developed two health promotion programs: a program that encourages more caregiver involvement and a program that requires nurses to pay more house visits. The goal of these programs has been to change inadequate health promotion behavior into sustained healthy habits. Particularly for this study, there was improved self-efficacy of patients' perception. Their capability to engage in health promotion behaviors is more positive. Then, they practice the behaviors to do. In order to achieve this objective, we used various strategies and methods, such as health promotion procedures, e.g. exercise skills, breathing exercise, and a health promotion handbook [19].

2. Purpose and Aims of the study

To evaluate the effectiveness of a health promotion program for hypertension patients with the participation of care givers in the family.

The Specific Objectives

1. To find the differences in the health perception status, behavior promotion, and changes in physical, respiratory, circulatory and heart functions between the experimental group and the control group before and after the experiment was done.

2. To find the differences in the perception and the behavior promotion, and the changes in physical, respiratory, circulatory, and heart functions before and after the experiment in each group separately.

Hypotheses: There were differences between the experimental group and the control group after the experiment and there were positive changes that occurred in the experimental group after the experiment.

3. Methodology

Population: the population in this study consisted of males and females aged 35 to 59 years who were diagnosed with high blood pressure and who were residing in the Klong Luang District of Pathum Thani province.

Sample Group: The sample group was simply sampled from two communities from each Tambon. A group from one community acted as an experimental group, while the other acted as a control group. Each group consisted of 22 participants. The participants were purposively selected according to the following criteria : One, had high blood pressure of grade 1 or less (130-159/85-99 mmHg); Two, had no other chronic illness such as heart disease, ischemic heart disease, musculo-skeletal disease, or diseases of the respiratory system, including asthma and emphysema. Medical assessment was carried out to ensure that the participants' disease

conditions would not be an obstacle to their general exercise or breathing exercise practice; Three, were willing to participate and signed an agreement to that effect; Four, would not change their drug regimen during the 8 weeks of participation in the study; Five, passed the Barthel Activities Daily Living (ADL) Index assessment with a grade that indicated that they were able to rely on themselves fully or needed only a little help from other people; Six, were able to read and write (or listen) in such a way that they could comprehend and respond to the questions in the questionnaires.

Instrument: This study used 3 kinds of instruments, as follows:

1. An instrument for health promotion, namely, a program for hypertension patients having the participation of caregivers in the family : The program was made up of 5 components, as follows: 1) To assess the needs and problems of the patients and their caregivers related to the patients' health; 2) To foster their awareness of the importance and necessity of health promotion behavior; 3) To generate motivation so that they would be willing to perform physical and mental health promotion behavior; 4) To train the skills of physical and mental health promotion behavior; 5) To offer consultation to the patients by medical personnel making home visits or phone calls.

2. Instruments for data collection, namely: 2.1) questions on the patients' personal information such as gender, age, education level, and occupation; 2.2) a Visual Activities Scale (VAS) for measuring the patients' awareness of their health condition. Patients drew a cross on a line that represented the degree of their awareness of their health condition during the past two weeks. The length from the origin to the cross mark was measured using real numbers from 1 cm to 10 cm. This instrument was tested as valid with a Cronbach's alpha coefficient of reliability of 0.72; 2.3) Questions on the patients' perception of stress [8]. The questions were closed-ended and concerned the positive and negative feelings that the patients felt in their everyday living. Out of the 24 questions in total, 12 were about the positive aspects, while the other 12 were about the negative ones. A 3-point rating scale was used to indicate the frequency of the occurrence of the feelings; namely: felt most often, felt sometimes, and never felt at all. This instrument was tested as valid at a Cronbach's alpha coefficient of 0.90; 2.4) twelve closed-ended questions on the patients' stress management behavior [16] concerning the redirection and dissipation of stress, relaxation, and stress control. A 4-point rating scale was used to indicate the frequency of stress management actions; namely: did regularly, did frequently, did sometimes, and never did at all. The Cronbach's alpha coefficient of reliability was tested to be 0.80; 2.5) Exercise log form for recording the breathing exercise and aerobics exercise activities at home.

3. Instruments for health assessment namely: medical equipment, weighing scale, weight and tape measuring, digital blood pressure monitor (Micro life model 3BTO-AP), and respiratory rate counter (Resp Rate Model RR-150). All were calibrated before being used and the same devices were used throughout the entire study. The personnel that did the measurements were trained together and understood their roles very well.

Data Collection: After the protocol and informed consent were approved by the Research Ethics Committee of Thammasat University, permission from the Faculty of Nursing

to conduct the study in the selected area was sought and granted, and then the leaders of the communities were contacted. Subsequently, our group went to meet these leaders and all patients and introduced the purposes of the project, and the details of the patients' rights were explained thoroughly. All patients gave their written informed consent before any study-related procedure was undertaken. The study design and profile are laid out in Figure 1 and 2 below.

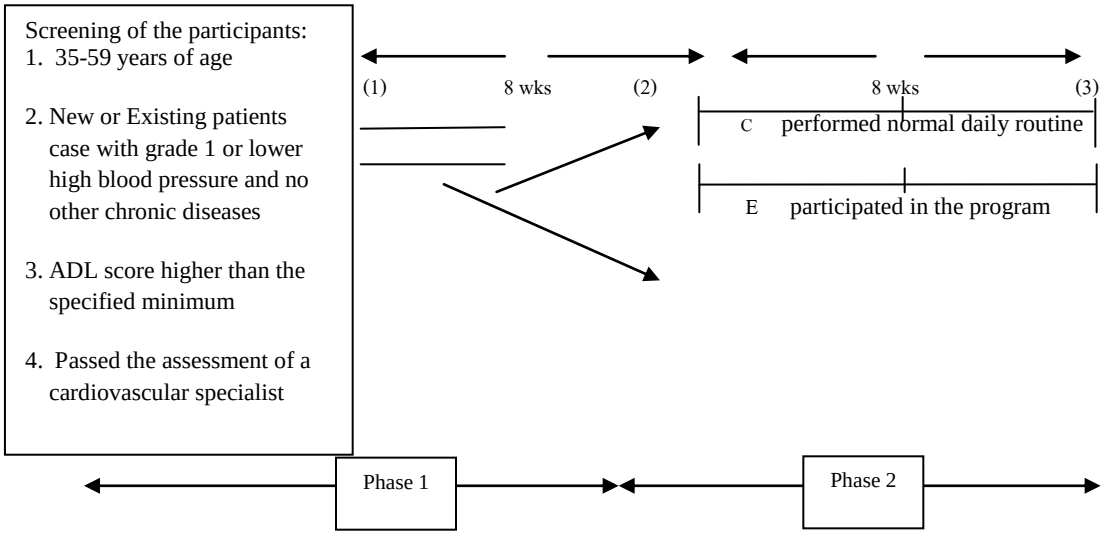


Fig. 1 Study design. C=control group; E= experiment group; wks=weeks

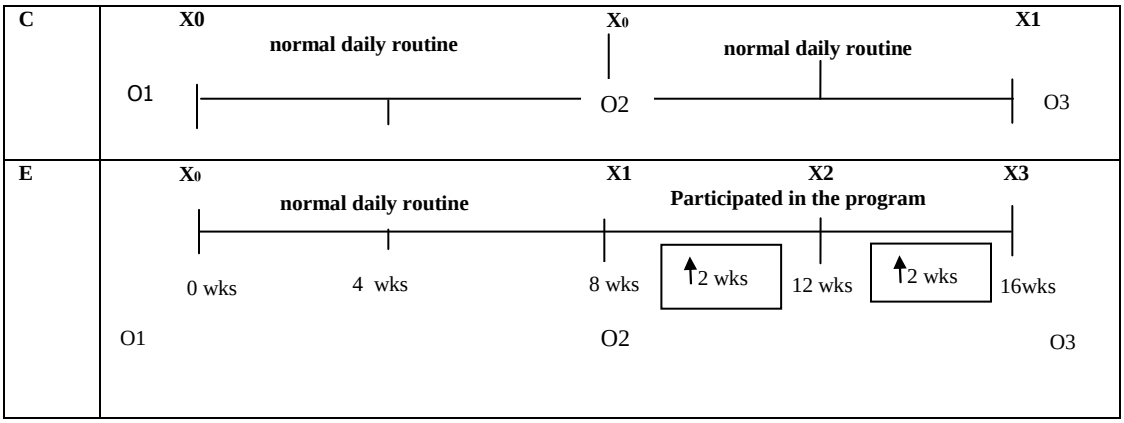


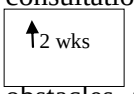
Fig. 2 Study Profile.

O1 signifies the acceptance of applications and the screening process.
O2 and O3 signify the second and third data collection: 1st round of physical and mental health assessment and collection of questionnaires in O2 and 2nd round in O3.
X0 signifies that the health promotion program has not started yet.
X1 signifies the 1st stage of implementation of the program has been applied to the experimental group (week 8); it consists of implementation of group educational strategies,

health promotion skills practice, group support, health promotion handbook, support from the family caregivers with participation; This step of implementation took 3 hours.

X2 signifies the 2nd stage of implementation of the program has been applied to the experimental group (week 12); it consists of support from the family caregivers, physical and mental assessment, discussion of problems, obstacles, and feelings, encouragement and consultation on other issues; This step of implementation took 2 hours.

X3 signifies the 3rd stage of implementation of the program (ended in week 16); it consists of assessment of changes of health promotion behavior from the record log kept at the patients' residence, physical and mental assessment, discussion of the interpretation of physical and mental changes, discussion of problems, obstacles, and feelings, encouragement and consultation on other issues; This last step of implementation took 2 hours.



signifies follow-ups on physical and mental assessment, discussion of problems, obstacles, and feelings, encouragement and consultation on other issues by phone calls and home visits every 2 weeks.

Control Group: had normal life style throughout the study and were given a consultation similar to the experimental group at the end of the project.

Data Analysis: The following statistics were used: paired t-test and ANCOVA

4. Results

Regarding the general characteristics of the population, the control group consisted of 8 males and 14 females, with an average age of 48.7 $\pm$ 4.6 years. Most had completed primary school (63.6%) and had an occupation that involved sedentary movement (72.7%), such as vendors. Eighteen point two percent performed light to moderate movement in their job, such as clerks, administrative officers, and drivers. A few performed heavy movement in their job (9.1%), such as labourers, farmers, and construction workers. As for the experimental group, ten were males and 12 were females, with an average age of 53.3 $\pm$ 5.2 years. Most also had completed primary school (72.7%), and most had an occupation that involved sedentary movement (86.4%). Some performed heavy movement in their job (9.1%), and a few performed light to moderate movement in their job (4.5%), as shown in Table 1.

From the records kept in the exercise log at the patients' home, it was found that the majority did exercise for more than 90 minutes a week (45.5%), and 41% did it between 45-90 minutes a week. The maximum amount of exercise time spent was 358 minutes per week, and the minimum was 15.6 minutes per week. The average value was 101.6 $\pm$77.9 minutes per week. As for the breathing exercise, most patients spent time doing it between 45-90 minutes a week (81.9%). The maximum amount of time spent was 179.4 minutes, and the minimum was nil (did no breathing exercise at all). The average value was 32.8 $\pm$ 36.4 minutes per week.

Results: *from a comparison between the two groups regarding their per-ception and behavior and the changes in physical, respiratory, circulatory, and heart functions*

Before the experiment, the experimental group and the control group differed only in 2 variables; namely, their perception of health status ($p = 0.043$) and their hip circumference ($p = 0.032$). There were no significant differences in the other variables ($p < 0.05$), as shown

on the first line in the box of each variable in Table 2.

After the experiment, with the initial differences of the 2 variables mentioned above taken into account by performing an analysis of covariance (ANCOVA), it was found that the average values of the 5 variables of the experimental and the control group were significantly different. These differences are as follows: 1) The experimental group had a better perception of health than the control group by 2.43 points at $p < 0.001$ (mean diff with 95%CI = 1.43, 3.44); 2) The experimental group scored better on stress management behavior than the control group by 2.96 points at $p = 0.006$ (mean diff with 95% CI = 0.92, 5.01); 3) The change in the average waist circumference of the experimental group was more pronounced than that of the control group by -0.17 inches at $p = 0.004$ (mean diff with 95% CI = -0.281, -0.56); 4) The breathing rate of the experimental group decreased more than that of the control group by -3.60 times per minute at $p = 0.005$ (mean diff with 95%CI = -6.08, -1.13); and 5) the diastolic blood pressure of the experimental group decreased more than that of the control group by -10.14 mmHg at $p < 0.001$ (mean diff with 95% CI = -15.33, -4.96). Besides the 5 variables mentioned above, there were also differences in the other variables (perception of stress, weight, BMI, hip measurement, and systolic blood pressure), but the differences were not statistically significant at $p < 0.05$, as shown on the third line in the box of each variable in Table 2 and in the graphs showing the differences between factors in Figure 3.

Results: *on the differences within group with of the perception, the behavior, and the changes of physical, respiratory, circulatory, and heart functions*

Within the experimental group, beneficial and statistically significant changes were seen in 6 variables. These variables are as follows: the score on the perception of health increased from 6.13 $\pm$ 2.3 points to 7.95 $\pm$ 1.7 points, an increase of 1.8 $\pm$ 0.6 points ($p = 0.005$); The score on stress management behavior increased from 26.68 $\pm$ 5.1 points to 29.32 $\pm$ 4.4 points, an increase of 2.6 $\pm$0.9 points ($p = 0.006$); Waist circumference was reduced from 36.38 $\pm$ 4.1 inches to 35.21$\pm$4.3 inches, a reduction of 1.2 $\pm$ 0.3 inches ($p = 0.003$); Respiration rate decreased from 17.66 (6.2) breaths/minute to 14.10 $\pm$ 6.5 breaths/minute, a decrease of 3.6 $\pm$ 1.3 breaths/minute ($p = 0.011$); Systolic blood pressure decreased from 149.27 $\pm$ 20.6 mmHg to 138.86$\pm$19.7 mmHg, a decrease of 10.4 $\pm$4.3 mmHg ($p = 0.025$); and diastolic blood pressure decreased from 91.66 ฑ 10.9 mmHg to 83.04 $\pm$ 9.6 mmHg, a decrease of 8.6 $\pm$ 1.6 mmHg ($p < 0.001$). The control group, on the other hand, showed no statistically significant differences in any variables before or after the experiment at $p < 0.05$, as shown in Table 3.

5. Discussion

From the study, it can be concluded that beneficial changes occurred in the experimental group, but did not occur in the control group, even though their general characteristics were very similar. For example, the experimental group better perceived their health increased by a score of 1.8 ± 0.6 points ($p = 0.005$), and their score on stress management behavior increased by 2.6 ± 0.9 points ($p = 0.006$). These results may be explained in terms of the beneficial effects of the health promotion program. For example, group support, such as exchanges of experience and opinions,

had helped the patients with some of the problems they encountered, as shown in the following instances: There was a member of the group that complained, "I felt very uncomfortable when performing the breathing exercise," so the other members of the group demonstrated to her the right way to do it and this made her feel much better afterward. This feedback mechanism directly and indirectly affected the patients' practice of health promotion behavior through their awareness of their own feelings and the purpose of such behavior [19]. This effect made them appreciate the correct behavior and induced them to practice it further. Another example is that new experience gained from the program might motivate the patients to find the power within them to begin practicing health behavior that they had never done before, as seen in the following instances. A member of intervention group commented while participating in a group discussion: "I now go to the market by bicycle instead of by bus." Another one said, "I walk home from the main street instead of using the motorcycle taxi service." One member mentioned being less tired after physical exertion because she kept up with her exercise routine regularly: "I don't feel tired anymore when I walk cross the overhead pedestrian bridge." And another member commented that, "I felt better and when I can't sleep, I do breathing exercises and it makes me fall asleep easier" Incidentally, the continual practice of these beneficial behaviors was made possible, in part, by the encouragement and support from family caregivers. This finding is in line with the results from other studies, that the patients' family had a considerable impact on their continuing with the correct behavior at home. Furthermore, in this study, the community members had taken a further step in order to help the patients by forming a support group for hypertension patients and their family after the project was completed.

One factor that might be responsible for the success of this program was the continual involvement of nurses and other medical personnel. Nurses in our project provided care, made assessments, and held consultations constantly throughout the program by making phones calls and paying home visits. Their work helped prevent complications from occurring, cut down on family expenses, and generated strong motivation to follow the program. Moreover, their work successfully met the goal of holistic nursing and brought about the participants' trust and faith in the nursing profession. Also, their work was in accordance with the top priority task of public health nursing or community health nursing; namely, to pay home visits regularly. Nurses in general community spent more than 83% of their working time paying home visits [26].

The positive physical changes that occurred in the experimental group were the result of the patients' adherence to their regular aerobic exercise routine. Some or these changes were as follows: their waist circumference reduced by 1.0 $\pm$ 0.3 inches ($p = 0.003$); respiratory rate decreased by 3.6 $\pm$ 1.3 breaths/minute ($p = 0.011$); systolic blood pressure decreased by 10.4 $\pm$ 4.3 mmHg ($p = 0.025$); and diastolic blood pressure decreased by 8.6 $\pm$ 1.6 mmHg ($p < 0.001$). The appropriate exercise routines suggested in this project may account for these beneficial changes. In this program, the patients were advised to do two exercise routines: aerobic exercise and breathing exercise. These two kinds of exercise were to be done regularly at least 3 times a week for 20-30 minutes at a

time [6, 22]. According to a study, when the two kinds of exercises are done together, they jointly help reduce blood pressure significantly [18], and the finding from this study showed the same result. Adhering to these exercise routines helped prevent the risk of the patients' current grade 1 hypertension from deteriorating into a more severe grade. To expound on the relevant facts about breathing exercises further, there have been reports that deeper and fuller inhalation and exhalation, which made for slower respiratory rate, dissimulated the sympathetic nervous system, so the muscles surrounding the blood vessels became relaxed and the vessels dilated, lowering the blood pressure. When the exercise was done regularly for 15 minutes a day and 45 minutes a week, it slowed down the normal respiration rate of 16.6 $\pm$ 2.8 breaths/minute to 10 breaths/minute, and blood pressure was reduced by 14/9 mmHg[12,13,14]. Moreover, this kind of meditation breathing may help reduce stress because it increases the efficiency of oxygen transport. In this study, most of the experimental group did between 45-90 minutes of breathing exercise a week, with the average value of 32.8$\pm$36.4 minutes/week.

Doing regular general exercise also helps and reduces the breathing process. One study reported that regular exercise for an extended period of time reduced respiration rate by 3.6 breaths/ minute. This fact was explained as follows: body exercise strengthened the muscles involved in the breathing action, increased the ability of the capillaries to exchange oxygen, increased the amount of blood flow into and out of the lungs, and increased the volume of air inhaled and exhaled because the lungs were capable of larger expansion. All of these made for deeper and fuller inhalation and exhalation and a slower breathing rate [27]. In this study, 45.5% of the patients in the experimental group did general exercise for more than 90 minutes/week with an average of 101.6 $\pm$ 77.9 minutes/ week.

For some variables, there were no statistically significant differences between the experimental group and the control group. For example, there was no difference in the perception of stress. This result might be explained in that they lived in a similar environment, doing similar activities. Their level of stress was no different before or after the experiment; particularly, they perceived only a little stress or a normal level of stress and there were no agents that might affect their stress level in the 8-week period of the study. Additionally, there were no statistically significant differences in weight, body mass index, hips measurement, and systolic blood pressure ($p < 0.05$). These results might be explained in that most of the members of the sample group had an occupation that involved sedentary movement such as housework, baby-sitting, and administrative work (72-86%). Nevertheless, within the experimental group, the members' waist and hips circumference were reduced by 1.7 inches and 0.47 inches, respectively. This finding might be the result of the patients doing regular aerobic exercise, which helped redistribute the fat from the middle part of the body (as can be seen in the decrease in the ratio of waist and hips circumference from 0.89 to 0.87) and helped reduce or delay the onset of complications such as cardiovascular disease[5]. Other reasons that might account for the lack of differences in some physical measurements are that a longer period of time than 8 weeks might be needed to effect physical changes and

that food consumption might play an important part in the outcomes of this experiment. As for the finding that there were no differences before and after the experiment within the control group, it might be explained that the control group did not perform the activities in nor receive the consultation from the health promotion program. They continued to perform their own normal everyday activities. They did not benefit from the health promotion activities such as breathing exercise, stress management exercise, general exercise appropriate to their chronic illness, and support from family members and group. All of which directly and indirectly affected their health condition.

Study Limitations and Recommendations

The amount of time spent on doing breathing exercise and aerobics exercise was quite low because the sample group was of adult-working ages; therefore, our goal of increasing the amount of exercise time adequately was not reached. For instance, the wide average amount of time the experiment group spent on breathing exercise was only 32.8 ± 36.4 minutes/week, and one member did not even try to do it, while their average time of doing aerobics exercise was only 101.6 $\pm$ 77.9 minutes/ week. If the patients had been continually encouraged to do more exercise, and if the length of the study had been more than 8 weeks, the beneficial effects might have been more distinct. Another factor that had a great impact on the physical changes was the patients' eating habits. It was very hard to control their eating habits because the subjects often selected foods that they could conveniently buy, not because the foods were appropriate for their high blood pressure condition. Other social factors also played important parts in either supporting their continual practice of health promotion behavior or discouraging it; factors like their values, beliefs, and culture in the communities.

Recommendations

Our experience from implementing the health promotion program, together with the training of skills of breathing and aerobics exercise that are appropriate to high blood pressure patients, has given us some insights into the health promotion process, and we would like to share them and offer a few suggestions with regard to the 3 following points:

1. Endemic Education: the results of this study can be used to develop a promotion exercise by skill training method, and a self-help group procedure with family care givers, that may be conducted by visiting nurses. An effective training method may play an important role in preventing complications to and deterioration of high blood pressure conditions.

2. Health Service: the results of this study can be used to help improve hospital health service procedures such as discharge plan and home visit. This suggestion applies to community health centers and public health centers as well. Good consultation work from a competent health team can make a great impact on the health of families and the community. It can reduce their dependence on unneeded health service, which in turn, helps them cut down their family expenses and reduce the workload of the hospital.

3. Research Study: the results of this study can be used to formulate new, related studies such as a study on prevention of stress and high blood pressure, a study on changes that occurs in the patients' family, a follow-up study on the long-term sustainability of this

health promotion program for a period of 6 months to 1 year with support from the community leaders, or a program to develop a family and a community network support for hypertensive patients.

6. Acknowledgements

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Table 1 Number and percentage of participants in the control group and experimental group categorized by gender, age, education level, and occupation (n = 22 per group)

General Characteristics	Control Group	Experimental Group	Total
	Number (%)	Number (%)	Number (%)
Gender:			
- Male	8 (36.4)	10 (45.5)	18 (40.9)
- Female	14 (63.6)	12 (54.5)	26 (59.1)
Age (years): $\overline{X} \pm$ S.D.	48.7 $\pm$ 4.6	53.3 $\pm$ 5.2	51.0 $\pm$ 5.3
Educational Level:			
- Primary School	14 (63.6)	16 (72.7)	30 (68.2)
- Secondary School	7 (31.8)	4 (18.2)	11 (25.0)
- vocational certificate, high vocational, Certificate, diploma	1 (4.5)	2 (9.1)	3 (6.8)
Occupation:			
- Perform sedentary movement, e.g. vendors, housemaids	16 (72.7)	19 (86.4)	35 (79.5)
- Perform light to moderate movement, e.g. clerks, administrative officers, drivers	4 (18.2)	1 (4.5)	5 (11.4)
- Perform heavy movement, e.g. labourers, farmers, construction workers	2 (9.1)	2 (9.1)	4 (9.1)

Table 2 Comparison of the average values of the perception of health, the perception of stress, stress management behavior, and the changes of physical, respiratory, circulatory, and heart function before and after the experiment between the control group and experimental group (n = 22 per group)

Variable	Control Group $\overline{X}$ (SD)	Experimental Group $\overline{X}$ (SD)	p-value (2-tailed)
1. Perception of Health			
- Before the experiment	4.78 (1.9)	6.13 (2.4)	**.043***
- After the experiment	4.95 (1.9)	7.95 (1.7)	**.000*****
Mean diff with 95%CI (ANCOVA) Experimental - Control	2.43 (1.43,3.44)		**.000*****
2. Perception of Stress			
- Before the experiment	50.32 (11.9)	52.59 (11.6)	**.525**
- After the experiment	51.27 (11.3)	54.36 (7.9)	**.299**
Mean diff with 95%CI (ANCOVA) Experimental - Control	1.60 (-2.11,5.31)		**.388**
3. Stress Management Behavior			
- Before the experiment	24.50 (4.8)	26.68 (5.1)	**.152**
- After the experiment	25.14 (4.1)	29.32 (4.4)	**.002*****
Mean diff with 95%CI (ANCOVA) Experimental - Control	2.96 (0.92,5.01)		**.006*****
4. Weight (kg)			
- Before the experiment	66.27 (9.7)	68.74 (11.7)	**.452**
- After the experiment	66.27 (9.6)	69.02 (10.8)	**.378**
Mean diff with 95%CI (ANCOVA) Experimental - Control	0.43 (-0.56,1.42)		**.381**
5. BMI (kg/m^2)			
- Before the experiment	26.07 (3.9)	26.94 (4.7)	**.509**
- After the experiment	26.09 (4.0)	27.06 (4.4)	**.449**
Mean diff with 95%CI (ANCOVA) Experimental - Control	0.13 (-0.26,0.53)		**.502**

Table 2 Comparison of the average values of the perception of health, the perception of stress, stress management behavior, and the changes of physical, respiratory, circulatory, and heart function before and after the experiment between the control group and experimental group (n = 22 per group) (continued)

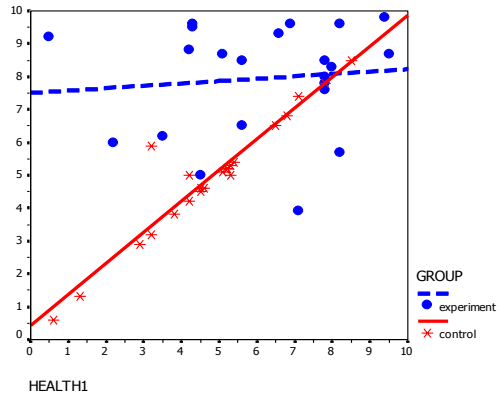
Variable	Control Group $\overline{X}$ (SD)	Experimental Group $\overline{X}$ (SD)	p-value (2-tailed)
6. Waist circumference (inches)			
- Before the experiment	34.64 (3.8)	36.38 (4.1)	**.152**
- After the experiment	35.39 (3.3)	35.21 (4.3)	**.873**
Mean diff with 95%CI (ANCOVA) Experimental - Control	-0.17 (-0.281,-0.56)		**.004****
7. Hip circumference (inches)			
- Before the experiment	38.58 (3.2)	40.81 (3.5)	**.032***
- After the experiment	39.15 (2.7)	40.34 (3.2)	**.186**
Mean diff with 95%CI (ANCOVA) Experimental - Control	-0.53 (-1.46,0.41)		**.262**
8. Respiration Rate (breaths/minute)			
- Before the experiment	17.69 (5.3)	17.66 (6.2)	**.984**
- After the experiment	17.73 (5.4)	14.10 (6.5)	**.05**
Mean diff with 95%CI (ANCOVA) Experimental - Control	-3.60 (-6.08,-1.13)		**.005****
9. SBP (mmHg)			
- Before the experiment	140.95 (13.8)	149.27 (20.6)	**.124**
- After the experiment	140.54 (16.3)	138.86 (19.7)	**.759**
Mean diff with 95%CI (ANCOVA) Experimental - Control	-5.47 (-15.74,4.79)		**.288**
10. DBP (mmHg)			
- Before the experiment	92.93 (6.9)	91.66 (10.9)	**.646**
- After the experiment	93.98 (10.6)	83.04 (9.6)	**.001****
Mean diff with 95%CI (ANCOVA) Experimental - Control	-10.14 (-15.33,-4.96)		**.000*****

*p < 0.05 **p < 0.01 ***p < 0.001 **Note**: Comparison between groups made by ANCOVA test
BMI= Body Mass Index; SBP=Systolic Blood Pressure; DBP= Diastolic Blood Pressure

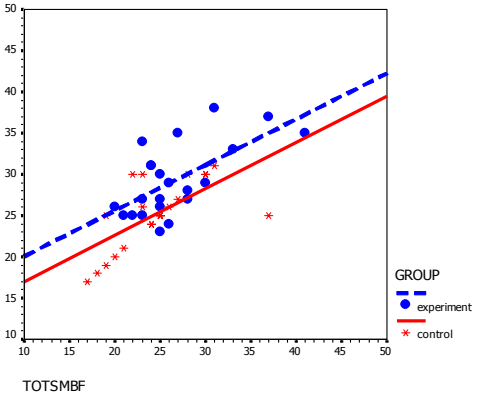
Table 3 Comparative average values (with standard deviation) of the perception of health, perception of stress, stress management behavior, and the changes in physical, respiratory, circulatory, and heart functions before and after the experiment within the control group and the experimental group (n = 22 per group)

Data	Before the experiment $\overline{X}$ (SD)	After the experiment $\overline{X}$ (SD)	Diff (Mean)	95%CI	t	p-value (2-tailed)
1. Perception of health						
- Control group	4.78 (1.9)	4.95 (1.9)	0.17	(-0.43,0.10)	1.28	**.214**
- Experimental group	6.13 (2.3)	7.95 (1.7)	1.81	(-3.03,-0.59)	3.09	**.005****
2. Perception of stress						
- Control group	50.32 (11.9)	51.27 (11.3)	0.95	(-2.88,0.97)	1.03	**.315**
- Experimental group	52.59 (11.6)	54.36 (7.9)	1.77	(-5.88,2.33)	0.89	**.380**
3. Stress management behavior						
- Control group	24.50 (4.8)	25.14 (4.1)	0.64	(-2.30,1.03)	0.79	**.436**
- Experimental group	26.68 (5.1)	29.32 (4.4)	2.64	(-4.43,-0.84)	3.05	**.006****
4. Weight (kilograms)						
- Control group	66.27 (9.7)	66.27 (9.6)	0.01	(-0.73,0.72)	0.01	**.990**
- Experimental group	68.74 (11.7)	69.02 (10.8)	0.29	(-1.09,0.52)	0.74	**.468**
5. BMI (kg/m^2)						
- Control group	26.07 (3.9)	26.09 (4.0)	0.02	(-0.29,0.25)	0.18	**.863**
- Experimental group	26.94 (4.7)	27.06 (4.4)	0.12	(-0.43,0.19)	0.82	**.420**
6. Waist circumference (inches)						
- Control group	34.64 (3.8)	35.39 (3.3)	0.76	(-1.68,0.17)	1.70	**.104**
- Experimental group	36.38 (4.1)	35.21 (4.3)	-1.17	(0.45,1.89)	-3.39	**.003****
7. Hips circumference (inches)						
- Control group	38.58 (3.2)	39.15 (2.7)	0.57	(-1.37,-0.23)	1.47	**.157**
- Experimental group	40.81 (3.5)	40.34 (3.2)	-0.47	(-0.15,1.10)	-1.57	**.132**
8. Respiration rate (breaths/minute)						
- Control group	17.69 (5.3)	17.73 (5.4)	0.04	(-0.13,0.04)	1.0	**.329**
- Experimental group	17.66 (6.2)	14.10 (6.5)	-3.55	(0.89,6.22)	-2.78	**.011***
9. SBP (mmHg)						
- Control group	140.95 (13.8)	140.54 (16.3)	-0.41	(-7.25,8.07)	-0.11	**.913**
- Experimental group	149.27 (20.6)	138.86 (19.7)	-10.41	(1.46,19.35)	-2.42	**.025***
10. DBP (mmHg)						
- Control group	92.93 (6.9)	93.98 (10.6)	1.04	(-5.64,3.54)	0.47	**.641**
- Experimental group	91.66 (10.9)	83.04 (9.6)	-8.61	(-5.25,11.99)	-5.32	**.000*****

*p < 0.5 **p < 0.01 ***p < 0.001 **Note:** Comparison within groups made by Paired-t test



a



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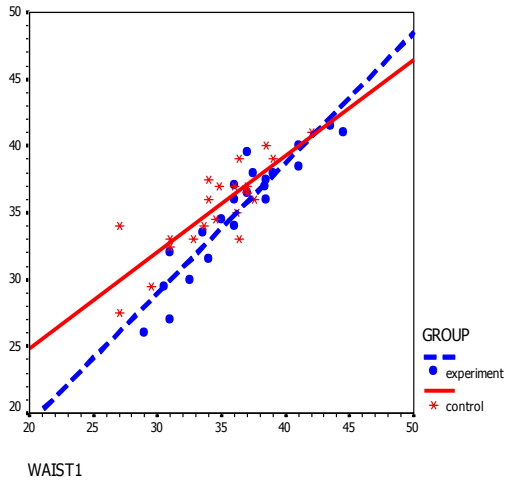

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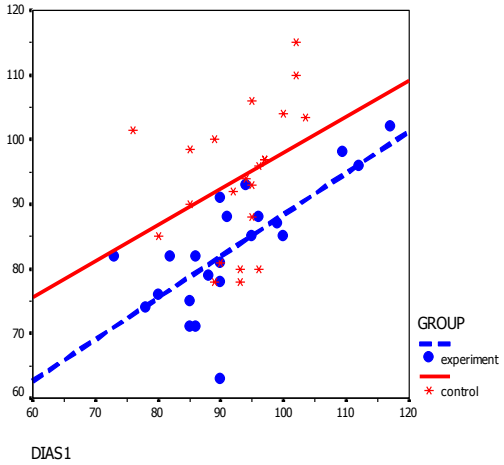
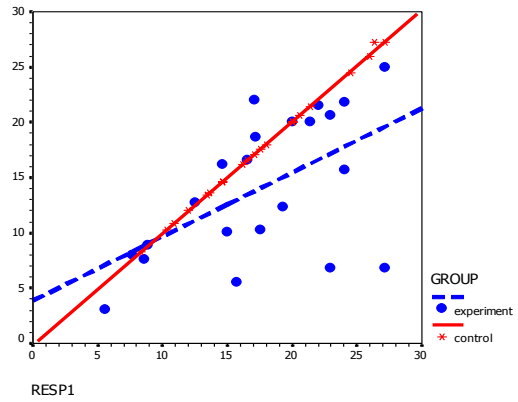


d



e

Fig. 3 : Figure a, b c, d, and e are graphs of the comparative average values of the perception of health, stress management behaviors, waist circumference, diastolic blood pressure, and breathing rate between the experimental group and the control group

Note: HEALTH 1 signifies the perception of health before the experiment
HEALTH 2 signifies the perception of health after the experiment
TOTSMBF signifies the stress management behavior before the experiment
TOTSMBH signifies the stress management behavior after the experiment
WAIST 1 signifies the average value of waist circumference before the experiment
WAIST 2 signifies the average value of waist circumference after the experiment
DIAS 1 signifies the average value of diastolic blood pressure before the experiment
DIAS 2 signifies the average value of diastolic blood pressure after the experiment
RESP 1 signifies the average value of breathing rate before the experiment
RESP 2 signifies the average value of breathing rate after the experiment

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