ประสิทธิผลของโปรแกรมการเพิ่มความสามารถในการจัดการตนเอง ของบุคคลที่มีความดันโลหิตสูง

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บทคัดย่อ

การวิจัยกึ่งทดลองนี้ มีวัตถุประสงค์เพื่อ พัฒนาและประเมินประสิทธิผลของโปรแกรมการเพิ่มความสามารถในการจัดการตนเองของบุคคลที่มีความดันโลหิตสูง โดยประยุกต์ใช้โปรแกรมการให้ความรู้เกี่ยวกับโรคความดันโลหิตสูงของแคนาดา และแบบจำลองการสร้างเสริมสุขภาพของเพ็นเดอร์ กลุ่มตัวอย่างเป็นบุคลากรมหาวิทยาลัยแห่งหนึ่งที่มีคุณสมบัติตามเกณฑ์จำนวน 62 คนจากผู้สมัครเข้าร่วมโครงการจำนวน 70 คน การจัดกลุ่มตัวอย่างใช้วิธีจับคู่จาก ระดับความดันโลหิต อายุ ระดับการศึกษา และลักษณะงานที่ทำ ได้จำนวน 31 คู่ แล้วสุ่มให้เข้ากลุ่มทดลอง และกลุ่มควบคุม

โปรแกรมการเพิ่มความสามารถในการจัดการตนเองใช้เวลา 8 สัปดาห์ ประกอบไปด้วยกิจกรรมหลัก ดังนี้ 1) ในสัปดาห์ที่ 1 กลุ่มทดลองและกลุ่มควบคุมได้รับความรู้ทั่วไปเกี่ยวกับโรคความดันโลหิตสูงพร้อมกัน 2) ในสัปดาห์ที่ 2, 4, 6 และ 8 เป็นกิจกรรมกลุ่มเพื่อพัฒนาทักษะในการจัดการตนเองทั้ง 7 ด้านสำหรับกลุ่มทดลอง คือ ด้านการลดโซเดียม การลดแอลกอฮอลล์ การลดไขมันแต่เพิ่มผักผลไม้; ด้านการออกกำลังกายแบบแอโรบิค ด้านการรักษาน้ำหนักของร่างกาย; ด้านการบริหารจัดการความเครียด; และด้านการปฏิบัติตามแผนการรักษาด้วยยาตามลำดับ มีการประเมินก่อนและหลังการทดลองในสัปดาห์ที่ 1 และ 10 ในระหว่างสัปดาห์ที่ 2-10 กลุ่มควบคุมดำเนินชีวิตตามปกติ ทดสอบประสิทธิผลของโปรแกรมในกลุ่มทดลอง ระหว่างก่อนและหลังการทดลองวัดจากค่าความดันโลหิตซิสโตลิค และไดแอสโตลิค น้ำหนักดัชนีมวลกาย เส้นรอบวงเอว และค่าระดับ HDL-C, LDL-C, Triglycerideในเลือด, การรับรู้ประโยชน์ของการปรับเปลี่ยนพฤติกรรม, การรับรู้อุปสรรคของการปรับเปลี่ยนพฤติกรรม, และ การรับรู้ความสามารถของตนเองในการปรับเปลี่ยนพฤติกรรม วิเคราะห์ข้อมูลโดยใช้สถิติ Paired t-test และ independent-t-test

ผลการวิจัยพบว่า ค่าความดันโลหิตซิสโตลิค, เส้นรอบวงเอว, และการรับรู้อุปสรรค ก่อนและหลังการทดลอง ของกลุ่มทดลอง มีความแตกต่างกันอย่างมีนัยสำคัญทางสถิติ

การศึกษานี้มีข้อเสนอแนะว่าโปรแกรมเพิ่มความสามารถในการจัดการตนเองสามารถนำไปประยุกต์ใช้ในการพัฒนาการจัดการตนเองเพื่อสร้างเสริมสุขภาพในสถานที่ทำงานอื่นๆ

คำสำคัญ : โปรแกรมการเพิ่มความสามารถในการจัดการตนเอง, โรคความดันโลหิตสูง, การสร้างเสริมสุขภาพ

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The effectiveness of an enhancing self-management program for people with hypertension

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Abstract

This quasi-experimental study aimed to develop and evaluate a self-management program for people with hypertension based on the Canadian Hypertension Education Program and Pender's Health Promotion Model. A total of 70 participants were recruited from university personnel, of which 62 met the inclusion criteria. The participants comprised 31 pairs that were matched in terms of blood pressure, age, education, and job characteristics and then randomly assigned to the experimental and control groups.

The 8-week self-management program included the following activities: 1) Week 1: health education about hypertension in general; 2) Weeks 2, 4, 6, and 8: self-management enhancing activities with the experimental group concerning seven aspects: reducing sodium, fat, and alcohol consumption; increasing fruit and fibre consumption; regular aerobic physical activities; maintaining normal body weight; managing stress; and medication adherence, respectively. The baseline and post-intervention data were collected in the first week and the tenth week. The control group lived their normal lives during the second to tenth weeks. The effects of outcome variables were compared with the baseline in the experimental group of systolic blood pressure, diastolic blood pressure, weight, body mass index, waist circumference, HDL cholesterol, LDL cholesterol, triglycerides, perceived benefits, perceived barriers, and self-efficacy regarding the lifestyle modifications. Data were analyzed using paired t-test and independent t-test.

The results showed that there would be significant changes in systolic blood pressure, waist circumference, and perceived barriers, and self-efficacy in the experimental group.

This study has suggested that an enhancing self-management program should be applied to promote self management in other workplace settings.

Keywords : enhancing self-management program, hypertension, health promotion

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Introduction

Hypertension is recognised as one of the major risk factors of coronary heart diseases and cerebrovascular diseases. For every increase of 10 mmHg in systolic blood pressure, the risk of cerebrovascular diseases increases by 40 percent and that of coronary heart diseases increases by 25 percent.[1]

In Thailand, coronary heart diseases and cerebrovascular diseases account for approximately 10 percent of the total disease burden.[1] In 2007, statistics from the Bureau of Policy and Strategy of the Ministry of Public Health in Thailand showed that hypertension had the highest incidence rate per 100,000 population among all non-communicable diseases. The admission rates increased fivefold in 11 years from 169.6 per 100,000 individuals in 1998 to 860.5 per 100,000 individuals in 2008. The rate has been increasing and never seems to decline. The Blood Pressure Screening Projects examined 20.7 million people aged 40 years and older and showed that 2.4 million people (11%) had abnormal blood pressure. Surprisingly, research also found that 70% of people with hypertension were not aware of it.[2]

Uncontrolled hypertension causes complications that can eventually lead to death. To prevent complications and control hypertension, many guidelines for healthcare providers have been developed and updated based on research evidence by several organizations.[3] For example, the World Health Organization International Society of Hypertension (WHO-ISH) and Mild Hypertension Liaison Committee have developed guidelines for hypertension care since 1999. The Canadian Hypertension Education Program[4] (CHEP) also developed guidelines to prevent and control hypertension based on seven aspects of behavior changes: 1) controlling sodium consumption to within 100 mmol/day (and 65-100 mmol/day for patients); 2) performing aerobic exercise for at least 30-60 minutes per day 4-7 days per week; 3) maintaining an appropriate body weight such that the Body Mass Index (BMI) is 18.5-24.9 kg/m^2 and keeping waist circumference lower than 102 cm for males and 88 cm for females; 4) controlling alcohol consumption to fewer than 14 and 9 units/week for males and females, respectively; 5) consuming less food with saturated fat and cholesterol and consuming more vegetables, fruits, fibre, whole grains, and plant-based protein, including low-fat dairy products; 6) using stress management techniques appropriate to the individual; and 7) adhering to medication.

The CHEP's recommendations emphasize goal setting in the treatment of hypertension to control regular blood pressure and reduce the risks of atherosclerosis, damage to vital organs, and comorbidities of hypertension. The recommended blood pressure for all patients is lower than 140/90 mmHg, and that for patients with diabetes or chronic kidney disease is lower than 130/80 mmHg. The CHEP recommendations have been updated annually, but these seven aspects of behaviour changes are still in use.[5,6] The CHEP offers multicomponent health behaviour changes to benefit people with high risk of cardiovascular diseases. Therefore, the CHEP guidelines

were adopted as a framework for this study.

Pender's Health Promotion Model (HPM) offers a framework of factors that influence health behaviors. The HPM classifies health behavior determinants into three specific propositional groupings: a) individual characteristics and experiences, b) behaviour-specific cognitions and affects, and c) situational/interpersonal influences.[11] The category of behaviour-specific cognitions and affect is considered to be the primary determinant of health promotion behaviours.[20] The category includes six variables: perceived benefits of action, perceived barriers to action, perceived self-efficacy, activity-related affect, interpersonal influences, and situational influences. All of them are proposed to exert a direct influence on health behaviours and are amenable to change through nursing actions.[21]

Perceived benefits of action refer to an individual's beliefs that taking certain actions will result in desired outcomes. More perceived benefits of action result in greater likelihood of engaging in health-promoting behaviour. Perceived barriers to action are the beliefs that affect performance of a specific health behaviour. If perceived barriers are high, the behaviour is unlikely to occur. Perceived self-efficacy is viewed as the beliefs in one's capabilities to organize and execute the courses of action required to achieve a given goal.[22] We included three of these variables: perceived benefits of action, perceived barriers to action, and perceived self-efficacy, since the other three variables are beyond our control.

Chodosh et al.[7] conducted a meta-analysis of 13 hypertension self-management programs among elderly patients with chronic illnesses. The study concluded that self-management programs could reduce systolic blood pressure by 5 mmHg (effect size -0.39 [CI, -0.51–0.28]) and diastolic blood pressure by 4.3 mmHg (effect size -0.51 [CI, -0.73–0.30]). However, there was not enough information to indicate what components of the study impacted these changes. Funk et al.[8] conducted a multi-site randomised controlled trial to examine the effectiveness of programs that aim to decrease blood pressure through lifestyle changes for 18 months. The experimental group received one of the following interventions: 1) the Established Guidelines (EG) or 2) EG with Dietary Approaches to Stop Hypertension (DASH). The study results showed that the participants in both experimental groups could make adjustments to their lifestyles and lower their blood pressure.

Hacihasanoglu and Gözüm[9] tested the effectiveness of patient education and home monitoring for medication adherence and management of hypertension at primary health care facilities in Turkey using a randomised controlled method. Groups A and B received medication adherence education. Group B received additional education about healthy lifestyle behaviours, while Group C was a control receiving routine care. Participants in both groups A and B received individualised structured instruction in six monthly sessions. Healthy lifestyle behaviours and perceived self-efficacy regarding medical adherence in groups A and B improved significantly after the experiment. Systolic and

diastolic blood pressures were also reduced significantly.

Suksiri et al.[10] conducted a quasi-experimental study to evaluate the effectiveness of a program that adapted Pender's Health Promotion Model to reduce serum lipids among naval personnel. The experimental group received a set of 3 activities to reduce serum lipid within 4 weeks. The experimental group reported significantly greater perceived benefits, greater perceived self-efficacy, greater intention to perform behaviours, and lower perceived barriers to perform actions than the control group. They had significantly better food consumption, exercises, and physical activity than the control group. The experimental group also had significantly lower plasma cholesterol, lower low-density lipoprotein (LDL), and higher high-density lipoprotein (HDL).

Most of these studies were large projects with multiple lifestyle changes targeted and long-term interventions. However, Funk et al. suggest that the focus should be on one aspect of behavioural change at a time. Some interventions were conducted in clinics, and some were at the patients' homes. Only one was conducted at the workplace, which lasted for four weeks.[10] There is still a question of whether it is possible to develop a self-management program for people with hypertension at the workplace that covers a shorter period of time.

This study was conducted at Suan Dusit University, which offers annual health screenings to its personnel. The health screenings showed that of the 1,179 people who participated in the program, 610 had hypercholesterolemia (51.73%), 44 had hypertension (3.73%), and 42 had high plasma glucose (3.56%). These health problems were closely related and caused greater risks of cardiovascular diseases. The research team considered hypertension as the first target because it can be self-monitored with non-invasive intervention. In caring for hypertensive patients, early detection and behaviour changes are equally important, because effective behaviour changes can prevent or lower the severity of complications increase patients' quality of life. Therefore, faculty members from various departments of the Faculty of Nursing collaborated develop a program to promote self-management behaviours among university personnel with hypertension based on the recommendations from CHEP[4] and the HPM.[11,19-21]

Aims

The purposes of this study were to develop and evaluate an enhancing self-management program for people with hypertension using CHEP and Pender's HPM.

Outcome measures

The effectiveness of the program was assessed by the following outcome measures: 1) Health status, i.e. systolic and diastolic blood pressures, weight, BMI, waist circumference, HDL-cholesterol, LDL-cholesterol, and triglycerides, 2) Perceived benefits of lifestyle modifications, 3) Perceived barriers to lifestyle modifications, 4) Perceived self-efficacy regarding lifestyle modifications.

Research hypotheses

The research hypothesis was that systolic and diastolic blood pressures, weight, BMI, waist circumference, LDL cholesterol, and triglycerides would decrease but HDL cholesterol would increase in the experimental group at the end of the program (week 10) compared with the baseline. It was also expected that the perceived benefit and perceived self-efficacy would increase while perceived barriers would decrease after the intervention.

Methods and Design

The study was a quasi-experimental study with a pre-/post-test control group design

Participants and setting

Participants were recruited from the university's personnel according to the following inclusion criteria: blood pressure ≥140/90 mmHg or diagnosis and treatment for essential hypertension, female gender, age 40-65, and willingness to participate in the project. Only female participants were recruited due to a recommendation by the Ethical Review Committee to control for major confounding variables in this small sample size. Using G* Power version 3.1.3[19], the estimated sample size was 27 pairs for a statistical test for the difference between two dependent means (matched pairs) with an effect size of 0.5, α of 0.05, and test power of 0.8. Out of 70 applicants, 62 participants met the inclusion criteria. They were match paired in consideration of blood pressure, age, education, and job characteristics due to our previous study,[22] which revealed that participants' job characteristics were associated with their physical activities and cardiovascular risk scores. We then randomly assigned each pair to a control group and an experimental group.

Instruments and validation

The instruments used in this study comprised 1) a digital sphygmomanometer (alp-k2 -1802 arm cuff), 2) a scale to measure weight (Tanita-Innerscan Body Composition Monitor), 3) a plastic tape measure with dual scales in centimetres and inches to measure waist circumference, 4) a booklet on foods, desserts, beverages and their calorie contents, 5) a pillow for slow and deep breathing exercises, 6) a booklet on antihypertensive medications, 7) personal notes for recording blood pressure and other personal health information, and 8) a questionnaire developed by the researchers based on the HPM and the CHEP. The questionnaire consisted of four parts: a) demographic information, b) perceived benefits of behaviour changes, c) perceived barriers to behaviour changes, and d) perceived self-efficacy regarding behaviour changes in seven aspects. Parts b, c, and d each had 12 items rated on a 5-level scale.

The questionnaire was face validated for language and clarity by three lay people and was content validated by five experts in this area. The edited version was tested for reliability with 30 people who had similar characteristics to those of the participants, yielding Cronbach's alpha coefficients of perceived benefits, perceived barriers, and perceived self-efficacy of 0.78, 0.91, and 0.66, respectively.

Data Collection

The intervention: an enhancing self-management program

Two informal group meetings were held among potential participants at their workplace prior to beginning the project to explore their health problems, health behaviours, preferred health promotion activities, limitations (e.g. lack of transportation, time constraints, etc.), and support needed to participate in the project. The program was designed to last 8 weeks and included the following activities:

Week 1: Health education about hypertension, its complications, and how to take care of oneself was given to participants in both groups

Weeks 2-8: Self-management skill development activities for the experimental group utilised the HPM as follows: 1) to enhance perceived benefits of participants by giving information about lifestyle changes on seven aspects, 2) to decrease perceived barriers to lifestyle modification by exploring barriers the participants anticipated when performing activities at home, giving group advice, and giving the opportunity to share experiences with other participants; and 3) to promote perceived self-efficacy through models or demonstrations and giving the participants opportunities to practice. The participants were also encouraged to set appropriate goals for behaviour changes. They were asked to record their blood pressures in their personal notes every day or at least once per week in the morning after waking up and to bring these notes to the sessions. At each weekly session, the researcher measured their blood pressure, body weight, and waist circumference and provided feedback to the participants. Participants were also asked about their experiences with behaviour changes between each session.

Week 2: The topics focused on limiting sodium, alcohol, and food consumption. Activities included the following: 1) food and beverage display, where researchers provided explanations, responded to participants' questions, and taught the participants about nutrition facts and ingredients on labels and packages. Specific nutrition facts and ingredients explained in this session were a) saturated, monounsaturated, polyunsaturated, and trans fats, b) sodium in food, condiments, snacks, and beverages, c) different types of alcohol beverages, showing the percentage of alcohol and the amount allowed per week; 2) a talk by a well-known health promoter to increase awareness and give inspiration about the importance of food and hypertension control; and 3) medical examinations in which participants spoke with a physician about their BMI, waist circumference, blood pressure, and laboratory test results.

Week 4: This session focused on weight control skills and aerobic physical activities. Activities included the following: 1) a presentation about body weight control principles, food calorie calculation, setting weight reduction goals, and weight control by increasing daily physical activity and controlling the types and amount of food consumed. Participants participated in food choice and calorie calculation games and received manuals that had the calories of various

foods, desserts, and beverages. 2) Body weight, waist circumference, blood pressure, and pulse and respiration rates were measured to monitor changes. Measurement tapes for measuring waist circumference were given to participants for self-monitoring. 3) Tai chi exercises for health and arm swing exercises were demonstrated and practiced.

Week 6: This session focused on developing stress management skills using slow and deep breathing techniques, which are proven to be effective decreasing blood pressure.[23-25] Researchers demonstrated placing a small pillow on the abdomen to observe its movement as a way to control slow and deep breathing. Participants were allowed to take a pillow to practice further at home.

Week 8: This session focused on improving knowledge and developing skills regarding antihypertensive medications. Activities included the following: 1) providing informative booklets on antihypertensive medications and 2) organising question and answer sessions with a cardiologist.

The outcome variables on systolic and diastolic blood pressures, weight, BMI, and waist circumference were collected from both groups of participants in week 1 and 10 from August to October 2014 using standard procedures. A self-administered questionnaire was then administered with the assistance of the research team. The laboratory tests for HDL cholesterol, LDL cholesterol, and triglycerides were done at the same time by certified laboratory technicians. During weeks 2 to 8, participants in the experimental groups participated in the activities described for three hours in each session. The control group lived their normal live and were invited to exercise their right to participate in the same activities during weeks 12-20.

Ethical consideration

The project was approved by the University's Ethical Review Committee for Human Research (certificate no. SDU-RDI 2013-H001). Applicants were informed about the purpose of the study, activities relating to participation, potential risks and benefits of participation, confidentiality and anonymity issues, voluntary involvement, and the right to withdraw from the study at any time without repercussions. All participants signed informed consent forms prior to taking part in the study.

Data analysis

Descriptive statistics were used to describing the participant characteristics. The Shapiro-Wilk test was used to test the normality of variables. Independent t-tests were performed to compare the outcome variables between the experimental group and the control group, and a paired t-test was applied within each group to compare the results from before and after the intervention.

Results

1) Demographic information of the participants

During the study, one participant from the experiment group dropped out due to retirement, but her counterpart was allowed to participate as

planned. Thus, a total of 30 pairs of participants were included in the analyses. The demographic information of both groups, in terms of educational levels and job characteristics were similar to each other. Most of participants had Bachelor's degree or higher (56.70% in experimental group and 43.30% in control group) followed by those with primary or secondary education (40% in experimental group and 53.40% in control group). As for their job characteristics, the majority of participants had administrative or academic works (40% in experimental group and 53.30% in control group) followed by service and supporting works (40% in both groups). Some of them were being treated for hypertension (30% in the experimental group and 50% in the control group).

2) Comparisons of outcome variables between the experimental and control groups using independent t-tests.

The Shapiro-Wilk test revealed that all studied variables had normal distributions, allowing the use of parametric statistics for further analyses. According to the pre-experiment data, there were no significant differences between the experiment and control groups in regard to average age, systolic and diastolic blood pressures, weight, BMI, waist circumference, HDL cholesterol, LDL cholesterol, and triglycerides at the 95% confidence level, as shown in Table 1.

Table 1 Comparisons of ages and outcome variables between experimental and control groups before and after the experiment using independent t-tests

Variables	Normal values	Before			After		
		Experiment group (N=30) ($\bar{X}$±S.D.)	Control group (N=30) ($\bar{X}$±S.D.)	t-test	Experiment group (N=30) ($\bar{X}$±S.D.)	Control group (N=30) ($\bar{X}$±S.D.)	t-test
Age	40-65 yrs.	52.03±6.09	53.07±5.64	-1.85			
BP Systolic	≤140 mmHg	138.00±15.57	136.10±13.91	0.49	131.13±16.04	133.63±17.65	-.52
BP Diastolic	≤90 mmHg	87.77±15.70	87.50±10.88	0.08	85.80±13.04	88.43±10.19	-.84
Weight (kg.)	-	66.71±14.07	64.46±11.66	0.67	67.02±14.02	65.51±12.07	0.48
BMI	18.5-24.9 kg/m^2	26.63±4.93	28.17±7.73	-.96	26.67±4.94	28.63±7.83	-1.22
Waist circum.	≤88 cm.	89.11±12.61	85.38±14.81	1.21	85.74±10.60	84.85±15.17	0.28
HDL	45-65 mg/dl (for female)	55.13±9.16	57.87±14.47	-.99	53.41±9.29	56.66±12.32	-1.12
LDL	<150 mg/dl	133.10±47.96	135.93±33.59	-.36	123.48±39.40	130.24±44.55	-.58
Triglyceride	35-160 mg/dl	124.80±66.91	128.37±51.94	-.26	130.00±69.38	126.52±64.77	0.19
Perceived benefit	1-5	4.33±0.46	4.42±0.45	-.73	4.37±0.53	4.52±0.51	-.94
Perceived barrier	1-5	2.67±0.64	2.58±0.53	0.70	2.31±0.71	2.44±0.54	-.78
Self-efficacy	1-5	3.50±0.46	3.55±0.49	-.36	3.70±0.56	3.53±0.35	1.49

Similarly, there was no significant difference at α=0.05 after the experiment in any

Similarly, there was no significant difference at α=0.05 after the experiment in any outcome variables between the experimental and control groups, as shown in Table 2. The results indicated that the self-management program for people with hypertension did not influence changes between groups. No significant difference was found in the variables when comparing the pre-and post-experiment results within the control groups at the 95% confidence level (P-value > 0.05), as shown in Table 2.

3) Program effectiveness

Table 2. Comparisons of outcome variables of the control group and the experimental group between pre-experiment (week-1) and post-experiment (week-10) using paired t-test

Variables	The control group			The experimental group		
	Pre-experiment (N=30) ($\bar{X}$±S.D.)	Post-experiment (N=30) ($\bar{X}$±S.D.)	Paired t-test	Pre-experiment (N=30) ($\bar{X}$±S.D.)	Post-experiment (N=30) ($\bar{X}$±S.D.)	Paired t-test
BP Systolic	136.10±13.91	133.63±17.65	0.78	138.00±15.57	131.13±16.04	2.12*
BP Diastolic	87.50±10.88	88.43±10.19	-.45	87.77±15.70	85.80±13.04	.65
Weight (kg.)	64.46±11.66	65.51±12.07	-1.07	66.71±14.07	67.02±14.02	-.58
BMI	28.17±7.73	28.63±7.83	-1.06	26.63±4.93	26.67±4.94	-.21
Waist circum. (cm.)	85.38±14.81	84.85±15.17	0.44	89.11±12.61	85.75±10.60	2.75*
HDL	57.07±14.04	56.66±12.32	0.28	55.13±9.16	53.40±9.13	1.10
LDL	134.76±33.55	130.24±44.55	0.74	133.10±47.96	125.20±39.84	1.25
Triglyceride	129.17±52.66	126.52±64.77	0.33	124.80±66.91	131.87±68.93	-.94
Perceived benefit	4.34±0.51	4.51±0.48	-1.53	4.33±0.47	4.35±0.54	-1.16
Perceived barrier	2.58±0.53	2.44±0.54	1.42	2.67±0.64	2.31±0.71	2.55*
Self-efficacy	3.54±0.46	3.62±0.41	-.65	3.50±0.46	3.64±0.51	-1.27

* Significance different at $\alpha = 0.05$

For the experimental group, there were significant differences in systolic blood pressure, waist circumference, and perceived barriers regarding lifestyle modifications between the pre- and post-experiment results (P-value < 0.05), as shown in Table 3.

Discussion

After the experiment, the results showed no significant difference in any outcome variables between the experimental and control groups, but it was found that systolic blood pressure, waist circumference, and perceived barriers were significantly different in the experimental group from before and after the experiments (P-value < 0.05). The results indicated that the program effectively facilitated changes at the individual level only but did not influence changes between groups.

The changes in variables from the HPM were in accordance with the theory in that the perceived benefit and perceived self-efficacy were increased, while perceived barriers were decreased after the intervention. However, only perceived barriers were found to be significantly different. An explanation for this result is that perceived benefits were already high before the experiment (4.33 ± 0.46 and 4.42 ± 0.45 for the experimental and control groups, respectively), and the participants might not have had enough

time to gain self-efficacy in practicing all seven aspects of behavioural changes. The quality of the scale might have contributed to the insignificance of the difference since the reliability of the perceived self-efficacy part of the questionnaire was quite low (Cronbach's alpha = 0.66).

The 2010 CHEP confirmed that changes in cardiovascular morbidity and mortality were the primary outcomes of interest for lifestyle and pharmacological interventions. However, for lifestyle interventions, lowering blood pressure was accepted as a primary outcome given the general lack of long-term morbidity and mortality data in this field.[5] According to the data, average systolic blood pressure was reduced from 138.00 ± 15.57 mmHg before the experiment to 131.13 ± 16.04 at week 10 post-experiment. Thus, systolic blood pressure was reduced by about 7 mmHg within 10 weeks. According to JNC-7 recommendations,[15] lifestyle modifications help reduce blood pressure, delay the onset of hypertension, increase the effectiveness of antihypertensive drugs, and reduce the risks of cardiovascular diseases. Our study offered multicomponent health behavioural changes, but participants could choose what aspects fit them and the extent to which they put them into practice.

There were also statistically significant differences in waist circumference between pre-experiment and post-experiment at week 10. The average waist circumference decreased from 89.11±12.61 to 85.75±10.60 cm, which is in accordance with the meta-analysis by Seo and Niu,[16] who revealed that internet-based interventions produced a significant reduction in waist circumference.

In our previous study on risk factors of cardiovascular diseases,[17] we found positive correlations of BMI, waist-to-hip ratio, cholesterol level, triglycerides, and LDL cholesterol with cardiovascular risk scores, as well as a negative correlation with HDL cholesterol. This study gave more insight that waist circumference is more sensitive to changes in cardiovascular risks than the other variables, which will be beneficial to further studies since waist circumference is a non-invasive measure and is easy for the patient to self-monitor at home.

The results from this study differed from those of previous research, in which decreases in systolic blood pressure were found both within the experimental group before and after experiment and between groups after the experiment. When comparing with other studies,[8,9] three main different factors could be identified. Firstly, our study had a shorter duration (10 weeks as opposed to 6 to 18 months).[8, 9,12,13] Secondly, we did not provide individual visits and support based on individual needs, and thirdly, the study was done in a work setting, where participants had to take time off from work for a few hours to join the sessions.

Because the intervention activities were done with the whole group in one room, individuals might not have been able to concentrate. Moreover, the group was heterogeneous in terms of job characteristics and education level, so they felt comfortable sharing their experiences in small groups rather than in the whole group. Changes in blood pressure were found among those who

followed the guidelines continuously, yielding the significant differences between pre-and post-experiment among the experimental group only.

The lack of individual contact is perhaps another reason participants not adhering to their goals effectively. Funk et al.[8] indicated that individual visits are very helpful for providing advice and assistance based on individual needs and thus improving participants' adherence. Brown, Bartholomew, and Naik[14] found that patients understood the risks associated with hypertension and attempted to set their own goals to manage the conditions independently. However, the goals they set did not have sufficient impacts to change and maintain their behaviours.

Our study differed from previous studies in terms of the program's effectiveness due to the absence of systematic follow-ups, support, and feedback to individuals. Nonetheless, some studies found programs without individual support and feedback to be effective, such as the study by Suksiri et al.[10] One explanation for the significant difference in their results is the discipline among their military participants and interpersonal influences such as support and direct commands from superintendents. In this study, the university personnel have academic freedom but also have time constraints. They had to leave from work to join the session and then return to work. This aspect needs careful consideration when dealing with a health promotion program in the workplace.

Conclusions and recommendations

This study contributed to nursing practices on how to develop an enhancing self-management program for people with hypertension in a work setting. We conclude that recommendations from CHEP and Pender's HPM can be adopted when designing programs to enhance effective self-management among people with hypertension. According to the results, variables that can best be used to measure the effectiveness of the program include systolic blood pressure and waist circumference. However, the recommendations from the CHEP are quite complex, and several behaviours need to be adjusted simultaneously. Programs should focus on one aspect or behaviour at a time so that participants can follow them easily. Additionally, continuous monitoring and individual support should be provided for a longer period of time so that participants can receive the maximum program benefits.

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