EFFECTS OF DEEP BREATHING AND MUSCLE RELAXATION ON BLOOD PRESSURE AND STRESS IN HYPERTENSIVE PATIENTS

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Thesis
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ABSTRACT

This randomized controlled trial aimed to assess the effects of deep breathing and muscle relaxation techniques on systolic blood pressure (SBP), diastolic blood pressure (DBP), and stress in drug-naïve grade 1 hypertensive patients.The study was conducted in 4District Health Promoting HospitalsinKosumPhisai District, MahaSarakham Province. The participants were randomly assigned into either intervention (n=62) or control group (n=62). All participants received 3 sessions of hypertensive education.Participants in intervention group receiveddeep breathing and muscle relaxation training. They were then asked to self-practice at home for eight weeks. The primary outcomes of the study changed in SBP and DBP over the 8-week period.

At 8-week follow-up, BP decreased inboth groups [mean decrease in SBP5.3mmHg (SD10.9)in the intervention group and 3.9mmHg (SD9.8) in the control group,and both groups showed a mean decrease in DBP3.0mmHg (SD8.6) and 2.7mmHg (SD9.5), respectively].The magnitude of BP change was notstatistically significantlydifferent between the two groups (p 0.47 for SBP and 0.82 for DBP).The decrease in stress score was significantly greater in the intervention group [3.1 (SD 4.0)]than in the control group[1.8(SD3.2)] (p 0.045). Deep breathing and muscle relaxation practices is effective in reducing stress symptoms, but not BP, in hypertensive patients.

KEY WORDS:HYPERTENSION / MUSCLE RELAXATION / DEEP BREATHING
93 pages

ผลของการฝึกหายใจแบบลึกร่วมกับการผ่อนคลายกล้ามเนื้อต่อระดับความดันโลหิตและความเครียดในผู้ป่วยความดันโลหิตสูง

EFFECTS OF DEEP BREATHING AND MUSCLE RELAXATION ON BLOOD PRESSURE AND STRESS IN HYPERTENSIVE PATIENTS

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บทคัดย่อ

การศึกษาเชิงทดลอง (Randomized controlled trial) เพื่อวัดผลการฝึกหายใจแบบลึกและการผ่อนคลายกล้ามเนื้อในผู้ป่วยความดันโลหิตสูงที่ยังไม่ได้กินยาลดความดันโลหิต ดำเนินการในโรงพยาบาลส่งเสริมสุขภาพตำบล อำเภอโกสุมพิสัย จังหวัดมหาสารคาม จำนวน 4 แห่ง กลุ่มตัวอย่างถูกสุ่มออกเป็นกลุ่มทดลอง 62 คน กลุ่มควบคุม62 คน ทุกคนได้รับความรู้เกี่ยวกับโรคความดันโลหิตสูง 3 ครั้ง แต่กลุ่มทดลองจะได้รับการฝึกหายใจแบบลึกและผ่อนคลายกล้ามเนื้อจำนวน 3 ครั้ง และฝึกปฏิบัติด้วยตนเองที่บ้านเป็นเวลา 8 สัปดาห์ ตัววัดหลักคือการเปลี่ยนแปลงของค่าเฉลี่ยความดันโลหิตในเวลา 8 สัปดาห์

การศึกษาพบว่า หลังติดตาม 8 สัปดาห์กลุ่มทดลองและกลุ่มควบคุมมีความดันโลหิตช่วงหัวใจบีบ (systolic) ลดลงเฉลี่ย 5.3 มม.ปรอท (SD=10.9) และ 3.9 มม.ปรอท (SD=9.8) ตามลำดับ ความดันช่วงหัวใจคลาย (diastolic) ลดลงเฉลี่ย 3.0มม.ปรอท (SD=8.6) และ 2.7มม.ปรอท (SD = 9.5) ตามลำดับ ค่าเฉลี่ยความดันโลหิตช่วงหัวใจบีบ และคลายของกลุ่มทดลองและกลุ่มควบคุมที่ลดลงไม่แตกต่าง กัน (p = 0.47 และ 0.82 ตามลำดับ) ความเครียดกลุ่มทดลองลดลงเฉลี่ย 3.1คะแนน (SD=4.0) และ กลุ่มควบคุมลดลง 1.8คะแนน (SD = 3.2) ระดับความเครียดของกลุ่มทดลองลดลงมากกว่ากลุ่มอย่างมีนัยสำคัญทางสถิติ -1.3คะแนน (95% CI = -2.6, -0.03, p = 0.045)การฝึกหายใจแบบลึกและผ่อนคลายกล้ามเนื้อทำให้ลดความเครียดได้

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CHAPTER I
INTRODUCTION

1.1 Background and rationale

Hypertension (HT) is an increasingly important medical and public health problem worldwide according to its morbidity, mortality, complications, and health expenditures. It is the highest prevalence among chronic diseases, a major cause of serious diseases and the leading risk factor for mortality. About two-thirds of people over age 65 had high blood pressure (BP) [1-3]. Globally, the overall prevalence of raised blood pressure in adults aged 25 and over was around 40% in 2008 [4]. The number of adults with hypertension in 2025 was projected to increase from 333 million to 413 million in developed countries and from 639 million to 1.15 billion in developing countries. Around the world, the prevalence of hypertension varies between approximately 20% and 60% according to increasing age, gender, ethnic groups, socioeconomic countries and geographical regions [5-7]. Worldwide, in 2004, raised blood pressure is estimated to cause 7.5 million deaths, about 12.8% of all annual deaths. This reported as the third ranked factor for disability-adjusted life years (DALY) [7].

Hypertension is common in Thailand. In 2009, the fourth nationwide health survey reported that the prevalence of hypertension among Thai adults aged ≥15 years was 21.4%. Among men, 23.3% (95%CI = 21.2–25.3%) had hypertension compared with 20.9% in women (95%CI=19.6–22.2%). Among elderly, the prevalence increased to 50–55%. About 40% in men and 60% in women had been diagnosed, and 90% of people with hypertensive patients had received treatment and 14–27% of those treated had controlled blood pressure [8]. High blood pressure ranked the fourth contributor to the leading cause of 5.5% of total DALYs in 2004 [9] and 3.3% of all deaths [10].

High blood pressure is known as the “silent killer” because many patients rarely feel any symptoms. Patients suffer from chronic pain, a condition frequently associated with decreased health related quality of life and high levels of psychological distress[7]. Epidemiological studies have clearly indicated the enormous impact of elevated BP levels on the risks of major cardiovascular disease (CVD), stroke, coronary heart disease, heart failure, and renal failure [1-2, 11]. Severe hypertension, systolic blood pressure (SBP) ≥180 mmHg or diastolic blood pressure (DBP) ≥110 mmHg, have a 20–30% risk of CVD in 10 years [12]. Globally, 51% of stroke and 45% of ischaemic heart disease deaths are attributable to high blood pressure [2]. Hypertension treatment has been shown to reduce these risk [1-2].

Treatment guidelines for hypertension consist of pharmacologic treatment which is mostly used to reduce CVD and renal morbidity and mortality, and correct syndrome output while non-pharmacologic treatment focuses on lifestyle modifications and health promoting behaviors. The treatment goal for individuals with hypertension without other compelling conditions is <140/90 mmHg and for persons with diabetes and/or renal disease is <130/80 mmHg [11-12]. Several reports have recommended that lifestyle modifications such as reducing sodium dietary less than 2.4 gram/day, maintain a healthy weight or weight reduction, increased physical activity at least 150 minutes per week, smoking cessation, limited alcohol intake, and reduce mental stress are more likely to reduce BP, prevent or delay the incidence of hypertension and its complications, and to reduce the amount of antihypertensive drug treatment. Moreover, there are contributing to enhance antihypertensive drug efficacy [12-15].

Complementary and alternative medicine (CAM) is a group of diverse health care and medical systems, practices, and products that are not generally considered part of conventional medicine. Mind and body therapies (MBT), which are one of CAM, focus on the interactions among the brain, mind, the rest of body, and behavior, with the intent to use the mind to affect physical function and promote health. There are several techniques of mind-body interventions such as meditation, muscle relaxation, deep breathing, guided imagery, biofeedback, cognitive behavioral therapy, qigong, yoga, tai chi, and relaxation techniques [16-17]. MBT is the most CAM interventions to be used and can be effective treatment for relief chronic pain,

pain-related disorders, reduce pain after surgery, depression / stress / anxiety management, mental disorder, sleep disorder, headache, migraine, control heart rate, reduced cholesterol levels, and reduce BP. In addition, MBT usually cost effective or low in cost [16-18].

Both deep breathing and muscle relaxation are basically relaxation techniques. Deep breathing technique is to breathe deeply and slowly inhalations through the nose, hold the breath for a few seconds and then slowly and longer exhalations through the mouth, focusing all of your attention on each breath. Let your chest and stomach rise with the breath and fall back on exhalation [16, 19]. Muscle relaxation is a technique that involves tensing specific muscle groups and then relaxing them to create awareness of tension and relaxation. This technique helps to reduce stress, anxiety and fear as part of a process that helps our body preparation for potentially dangerous situations. Both techniques are simple but very effective method of relaxation. When you are physically or emotionally stressed, your body releases stress hormones that can affect all your systems and organs [20-21].

The regular practice of meditation, deep breathing, or relaxation technique initially blunted the sympathetic drive and later on developed control over sympathetic function. Some studies concluded that the sympathetic activity was significant lower in meditators than non-meditators [20]. Deep breathing and muscle relaxation help patients to reduce the effects of psychosocial stress by reducing physiologic arousal and restoring autonomic balance, thereby reducing blood pressure [22] and also decreased heart rate, greater happiness and peace of mind, reduction in acute and chronic anxiety, decreasing depression, and heightened perceptual clarity [23].

Several studies have successfully used deep breathing or muscle relaxation techniques for reducing BP and stress. Grossman, et al. (2001) [24] evaluated the effects of the breathing with interactive music (BIM). Hypertensive patients were randomized into either musically-guided breathing exercises or listening to quiet music played by a Walkman for ten minutes daily for eight weeks. This study found that breathing exercises was an effective to reduce BP. The SBP change was -7.5/-4.0 mmHg in the active treatment group compared with -2.9/-1.5 mmHg in the control group ($p=0.001$). Boonruksa (2005) [25] conducted a quasi-experimental study in adult hypertensive patients to examine the effect of progressive muscle relaxation

(PMR) compared with usual nursing care. The results showed that the intervention group was significantly lower SBP and DBP than control group ($p < 0.05$). After practices, the mean BP reduced 15/23 mmHg in the intervention group ($p < 0.001$). Anderson (2008) [26] conducted a meta-analysis from nine randomized controlled trials (RCT). The finding indicated that Transcendental Meditation (TM), compared to control, was associated with the following changes: -4.7 mmHg (95% CI= -7.4 to -1.9 mmHg) in SBP and -3.2 mmHg (95% CI = -5.4 to -1.3 mmHg) in DBP. Subgroup analyses of hypertensive groups and high-quality studies showed similar reductions. Juttitree (2010) [27] examined the effects of PMR on BP and stress in hypertensive elderly patients. The study found that intervention group significantly reduced mean BP (19/10 mmHg) and stress score ($p<0.05$) after PMR practice. Mars, et al. (2010) [28] conducted a systematic review from 22 randomized controlled trials. The study found that mindfulness meditation practice was significantly improved in spirituality and decreased in depressive relapse, and psychological distress ($p<0.05$). However, the effects of MBT remain controversial. Some studies have argued that the MBT were not significant effect on the BP levels or stress reduction [29-32].

In Thailand, The RCT according to the effects of deep breathing and muscle relaxation on BP and stress in hypertensive patients has been rarely published. Most studies focused on hypertensive patients who had been received treatment and were conducted in the hospitals. Since some antihypertensive drugs can affect BP levels, the results may lead to distort. The finding of those studies should be interpreted cautiously. Deep breathing and muscle relaxation are primary method that is easily learned and practiced. In addition, evident based information had not been sufficient to provide suggestions for using deep breathing and muscle relaxation techniques as a lifestyle modification. Consequently, deep breathing and muscle relaxation practices in hypertensive adults have been promoted by the Department of Mental Health, Ministry of Public Health. This study conducted a RCT to determine the effects of these techniques on BP levels and stress score in hypertensive patients who had not treated with antihypertensive drugs. The study was conducted in four District Health Promoting Hospital (DHPH), Kosum Phisai District, Maha Sarakham Province. The finding might be contributed to apply for hypertension and other chronic diseases.

1.2 Research questions

Did the deep breathing and muscle relaxation practices be able to reduce mean systolic blood pressure (SBP), mean diastolic blood pressure (DBP), or stress scores in hypertensive patients?

1.3 Research objectives

The aim was to examine the effects of the deep breathing and muscle relaxation practices on reduction of mean systolic blood pressure, mean diastolic blood pressure, and stress scores in hypertensive patients.

1.4 Research Hypotheses

The study hypothesize that hypertensive patients who were allocated to receive the eight week deep breathing and muscle relaxation practices had lower mean systolic blood pressure, mean diastolic blood pressure, or mean of stress score less than hypertensive patients who were received only health education.

1.5 Scope of the Study

This randomized control trial was conducted on patients who were diagnosed with grade1 hypertension (SBP=140–159 mmHg and/or DBP=90–99 mmHg) and had aged ≥ 30 years in four District Health Promoting Hospitals (DHPH), Kosum Phisai District, Maha Sarakham Province during August to November 2013.

1.6 Operational definitions

1. Hypertensive patients are defined as the participants who were diagnosed with hypertension, without any severe complications such as cardiovascular disease, stroke, renal disease, heart disease. Those patients have not previously

received antihypertensive treatment, but they are being lifestyle modifications. Their SBP ranges from 140 to159 mmHg and/ or DBP ranges from 90 to 99 mmHg.

2. Stress is defined by using a standard questionnaire of Psychology department, Public health ministry, Thailand. Totally 20 questions, all items related to negative feelings. The answers employ four levels of rating scale as 0) never, 1) sometimes, 2) often, and 3) usually. The stress score ranges from 0 to 60.

3. Deep breathing is defined as deeply and slowly inhalations through the nose, hold the breath for a few seconds and then slowly and longer exhalations through the mouth, focusing all of your attention on each breath. Let your chest and stomach rise with the breath and fall back on the out breath. Participants in intervention group were trained to practice at home, daily morning eight week period, 30 cycles.

4. Muscle relaxation is defined as the technique used to relax muscle tension. Tense and relax each muscle group i.e. forehead, eyes and nose, lips, cheeks and jaw, hands, forearms, upper arms, shoulders, back, stomach, thighs, feet, toes, hips and buttocks.

1.7 Conceptual Framework

The theoretical framework of this study was based on mind-body therapy. Deep breathing and muscle relaxation are the technique of achieving harmony between the physical, mental, and spiritual personalities of man. The conceptual framework are presented in Figure 1.1.

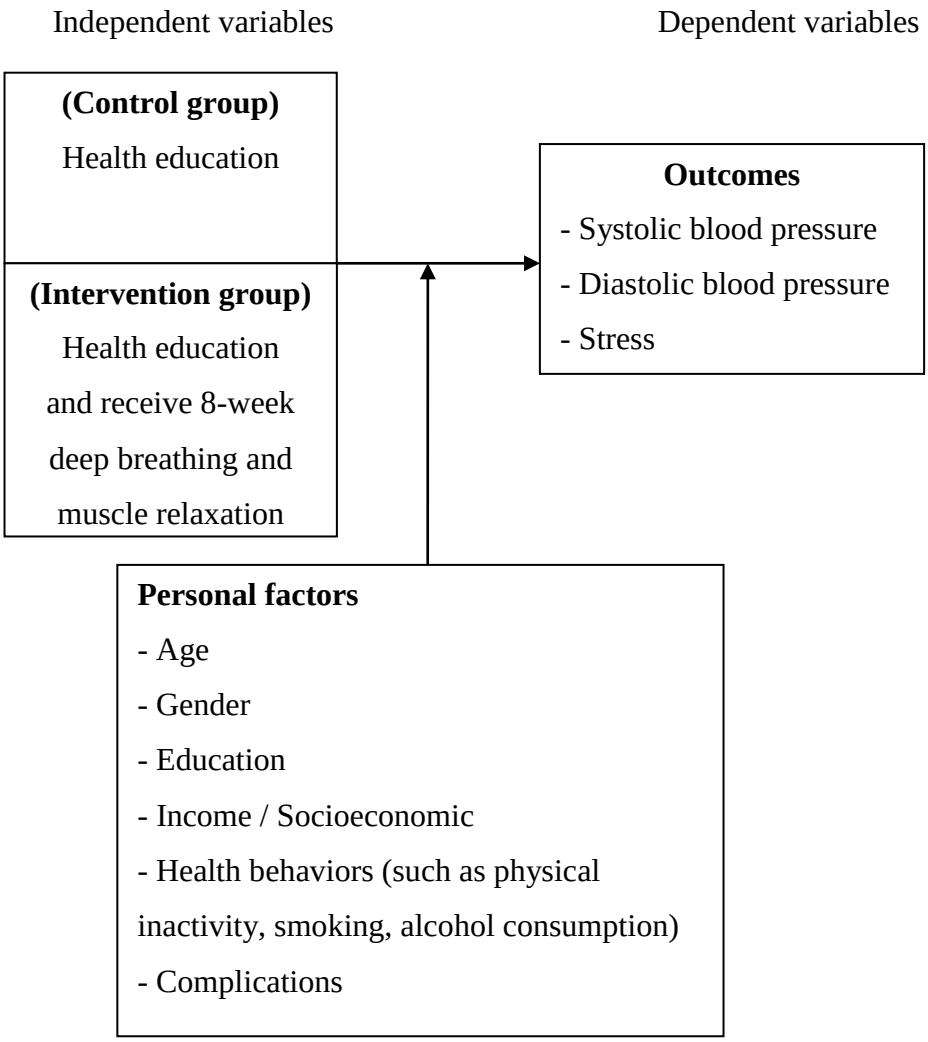

Figure 1.1 Conceptual framework of the study

1.8 Benefits of the study

1. The finding might be contributed as a suggestion for hypertensive patients to receive the appropriate lifestyle modification technique to prevent or reduce high blood pressure and stress management. Such a technique is effective and low in cost.

2. The finding might be contributed to apply for other chronic diseases to prevent or reduce high blood pressure and stress management

CHAPTER II
LITERATURE REVIEW

This chapter covers the related literatures which are the concepts, theories and related researches. The topics were reviewed and presented in sequence as follows.

2.1 Hypertension

2.2 Mind-body therapies

2.3 Deep breathing

2.4 Muscle relaxation

2.5 Related researches

2.1 Hypertension

High blood pressure or hypertension (HT) is an increasingly important medical and public health problem worldwide because of its high prevalence and its association with a major risk factor for other serious diseases [3, 5, 7]. Hypertension is the highest leading global risks for mortality in the world (responsible for 13% of deaths globally) [7]. World Health Organization (WHO) has estimated that high blood pressure causes one in every eight deaths, making hypertension the third leading killer in the world [2]. Hypertension increased risk for developing cardiovascular disease (CVD), stroke, heart enlargement or failure, myocardial infarction, intracranial hemorrhage (bleeding in the brain), and kidney disease [12, 33-34]. For individuals aged 40–70 years, each increment of 20 mmHg in systolic blood pressure (SBP) or 10 mmHg in diastolic blood pressure (DBP) doubles the risk of cardiovascular disease [2]. Chronic high blood pressure is a cause of hypertensive complication and other important organ damages such as heart, brain, renal and vascular. Hypertension treatment and life-style modifications have been shown to reduce this risk [2, 35-36].

2.1.1 Definitions [11-12, 36]

1. Blood pressure (BP) is the force of blood against the artery walls as it circulates through the body. High blood pressure or hypertension is the constant pumping of blood through blood vessels with excessive force. Blood pressure is written as two numbers. The first (systolic) number represents the pressure in blood vessels when the heart beats. The second (diastolic) number represents the pressure in the vessels when the heart rests between beats. Blood pressure is measured in millimeters of mercury (mmHg)

2. Hypertension (HT): The diagnosis of hypertension in adults is made when the average of two or more DBP measurements on at least two subsequent visits is ≥90 mmHg, or when the average of multiple SBP readings on two or more subsequent visits is ≥140 mmHg. A lower diagnostic threshold for intervention (SBP of ≥130 mmHg or a DBP ≥80 mmHg) is indicated for persons with diabetes and/or renal disease.

3. Masked hypertension (MH): The condition is the converse of white-coat effect. MH is defined as a clinical condition in which a patient's office BP level is normal (<140/90 mmHg) but ambulatory or home blood pressure readings are in the hypertensive range.

4. 24-hour ambulatory blood pressure monitoring (ABPM) or self-measurement: Blood pressure can also be assessed by the patient at home. This avoids the potential for white-coat effect; a phenomenon described as the increase of a patient’s BP in the presence of a physician and makes the measure of early morning BP more feasible. The best technique for measuring BP is to use an ambulatory monitor, which is typically a small, fully automatic device which can be worn on a belt around the waist. ABPM allows BP to be measured several times an hour over a 24-hours period, and provides an assessment of the patient’s circadian rhythm. Ambulatory BP is usually several mmHg lower than office BP.

5. White-coat effect: The condition is conceived as a measure of the BP response to a clinic visit, the BP rise associated with the presence of a doctor. White-coat effect has also been estimated by the difference between clinic BP and average daytime ambulatory BP.

6. Isolated systolic hypertension (ISH): The condition refers to SBP ≥140 mmHg, but DBP < 90 mmHg. Most hypertension after aged 50 years is ISH.

7. Isolated Diastolic hypertension (IDH): The condition is defined as a DBP >90 mmHg together with a normal SBP (<140 mmHg)

8. Isolated clinical hypertension or white-coat hypertension (WCH): The condition defined as persistently elevated blood pressure (≥140/90 mmHg) in the medical environment while 24-hour ambulatory BP values are normal (<120/80 mmHg). Diagnosis can also be based on home BP mean values <135/85 mmHg, after several days recording. Isolated clinical hypertension is encountered in about 10% of the general population and accounts for a non-negligible population of individuals with hypertension.

9. Pseudo-hypertension: This term refers to the rare situation where blood pressure measurements by the usual indirect sphygmomanometer are much higher than direct intravascular measurements. These differences are usually attributed to very stiff and calcified arteries that are nearly impossible to compress with the bladder in the usual blood pressure cuff.

2.1.2 Guideline of Blood pressure measurement

Hypertension is diagnosed with an accurately measurement. Patients should be clearly informed that a single elevated reading does not constitute a diagnosis of hyper- tension but is a sign that further observation is required [2]. Blood pressure is measured in millimeters of mercury (mmHg), corresponding to the height of a column of mercury that could be supported in a mercury sphygmomanometer, a device which until recently was the standard method of measuring blood pressure. Blood pressure is now frequently measured using accurate electronic devices calibrated in mmHg as the standard unit for BP measurement, but the most common way to measure BP is with a sphygmomanometer (BP cuff) and a stethoscope [1, 37]. Several guidelines recommend that patients should rest 5 minutes prior to measurement and not consume caffeine, smoking or physical activity for at least 30 minutes before BP is measured because these may produce short-term BP increases.

Blood pressure should be measured in both arms at the first visit. The standard BP measurement in the clinic is described as follows [3, 38].

1. Patients should be seated quietly for at least 5 minutes in a chair with their backs supported and their arms bared and supported at heart level.

2. Select an appropriately sized cuff. The cuff bladder should encircle 80% of the arm in adults and 100% of the arm in children younger than 13 years. A different cuff size may be required for obese patients or children. The use of standard sized cuffs in people with large arms can result in artificially high BP readings.

3. Wrap the cuff snugly around the upper arm, with the centre of the cuff bladder positioned over the brachial artery and the lower border of the cuff about two centimeters (cm) above the bend of the elbow. It should fit snugly but should still allow for two fingers to slide under the cuff.

4. Place the bell of the stethoscope over the brachial artery, using sufficient pressure to provide good sound transmission without over-compressing the artery. To avoid extraneous noise during cuff deflation, ensure that the stethoscope is not in contact with the patient's clothing or with the blood-pressure cuff.

5. Determine a rough value for the systolic blood pressure. This can be done by palpating the brachial or radial pulse and inflating the cuff until the pulse can no longer be felt. The reading at this point should be noted and the cuff deflated.

6. Place the diaphragm of stethoscope over the brachial artery and re-inflate the cuff to 20-30 mmHg higher than the estimated value taken before. Then deflate the cuff at 2-3 mmHg per second until you hear the first Korotkoff sound. The systolic BP is recorded at the appearance of Korotkoff sounds (phase I). The diastolic BP is recorded at the disappearance of Korotkoff sounds (phase V) in adults and the muffling of sounds (phase IV) in children.

7. Repeat the procedure in the opposite arm. Average the readings. If the first two readings differ by more than 10 mmHg systolic or 6 mmHg diastolic, or if initial readings are high, have the patient rest quietly for 5 minutes then

take several readings until consecutive readings do not vary by greater than these amounts.

Thai Hypertension Society [11] recommend follow-up of BP in Table 2.1.

Table 2.1 Classification and follow-up of blood pressure levels in adults.

Blood pressure levels (mmHg)*		follow-up
SBP	DBP	
<140	<90	Recheck in 1 year (or earlier as guided by patient's absolute cardiovascular risk).
140-159	90-99	Lifestyle modifications and confirm within 2 months.
160-179	100-109	Reassess or refer within 1 month.
≥ 180	≥ 110	Reassess or refer within 1-7 days as necessary.

*When a patient's systolic and diastolic BP levels fall into different categories, the higher diagnostic category and recommended action/s apply.

Table 2.2 Classification of blood pressure for adults aged 18 years and over.

SBP (mmHg)	**DBP (mmHg)**	**JNC7***	**ESH/ESC 2013****	**Thai Hypertension Society**
< 120	and < 80	Normal	Optimal	Optimal
120 - 129	and/or 80 - 84	Pre-hypertension	Normal	Normal
130 - 139	and/or 85 - 89		High normal	High normal
≥ 140	**and/or ≥ 90**	**Hypertension**	**Hypertension**	**Hypertension**
140 - 159	and/or 90 - 99	Grade 1	Grade 1	Grade 1
160 - 179	and/or 100-109	Grade 2	Grade 2	Grade 2
≥ 180	and/or ≥ 110		Grade 3	Grade 3
≥ 140	and < 90	-	Isolated systolic hypertension	Isolated systolic hypertension

*JNC7: Joint National Committee, 7th report

**ESH/ESC: European Society of Hypertension/ European Society of Cardiology

2.1.3 Classification of hypertension

Hypertension is one of the conditions for which disease-specific guidelines have been generated by different organizations. The Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) [12], European Society of Hypertension/ European Society of Cardiology (ESH/ESC guidelines) [39], and Thai Hypertension Society [11] have been classify hypertension levels as in Table 2.2.

2.1.4 Type of hypertension

Overall, the prevalence of hypertension was proximately 30–45% of the general population [39]. There are two major types of hypertension, consist of primary or essential hypertension and secondary hypertension [36, 39].

1. Primary or essential hypertension

About 90-95% of people with high blood pressure have primary or essential hypertension, which does not have a single cause but may be affected by multiple risk factors. Risk factors for essential hypertension include family history of hypertension, genetic, high dietary salt intake, stress, obesity, cigarette smoking, alcohol use, and physical inactivity. This type of hypertension is difficult to treat because it has multiple causes [36]. Fuentes (2000) conducted a cross-sectional surveys in eastern Finland found that the higher proportion of offspring was significantly related to the highest quartile of SBP when the mother had a history of hypertension (OR = 3.4, 95% CI = 1.4–8.5) [40].

2. Secondary hypertension

Around 5-10% of people with high blood pressure have secondary hypertension. The most common cause being chronic renal disease [1]. Other principal causes are renovascular hypertension, pheochromocytoma, cushing's syndrome, primary aldosteronism, hormonal abnormalities, familial dysautonomia, drug toxicity, endocrine disorders (adrenal, hyperparathyroidism, hypothyroidism/ hyperthyroidism), sleep apnea, and lead poisoning [34, 37, 41]. The clinical history, examination and routine blood and urine tests will also alert the clinician to possible secondary causes of hypertension [1]. However, most of these features are non-specific and, in view of the low frequency of secondary hypertension, the selection of

patients for further evaluation should be based on reasonable and reliable indices such as onset of hypertension before age 25 or after age 55 years, severe hypertension, blood pressure >180/110 mmHg at baseline, sudden severe hypertension, laboratory abnormalities (hyperglycaemia, hypokalaemia, hypercalcaemia), and abnormal bruit over the renal artery with a diastolic component [1-2].

2.1.5 Mechanism of primary hypertension

Blood pressure is the pressure in the circulatory system that is produced when the heart beats. The blood vessels have elastic walls, so if the heart is beating hard, the walls stretch more and the pressure in the system is a bit higher. It is usually split into systolic and diastolic BP to reflect the difference when the heart is and isn't beating, respectively. Blood pressure is the product of cardiac output and peripheral vascular resistance. It follows that patients with arterial hypertension may have an increase in cardiac output, an increase in peripheral resistance, or both [42]. Blood pressure is affected by a range of things, but the equation which determines BP is as follows

BP = cardiac output (CO) x total peripheral resistance (TPR).

Cardiac output is the volume of blood pumped by the heart per minute (ml blood/ min). Maintenance of a normal BP is dependent on the balance between the cardiac output and peripheral vascular resistance. Most patients with essential hypertension have a normal cardiac output but a raised peripheral resistance. Cardiac output is determined by stroke volume and heart rate; stroke volume is related to myocardial contractility and to the size of the vascular compartment. Peripheral resistance is determined by functional and anatomic changes in small arteries and arterioles [36, 42-43]. The renin-angiotensin system is the most important of the endocrine systems that affect the control of BP [43]. The autonomic nervous system also plays an important role in the control of BP [42]. Factors determine mean arterial pressure is described in Figure 2.1.

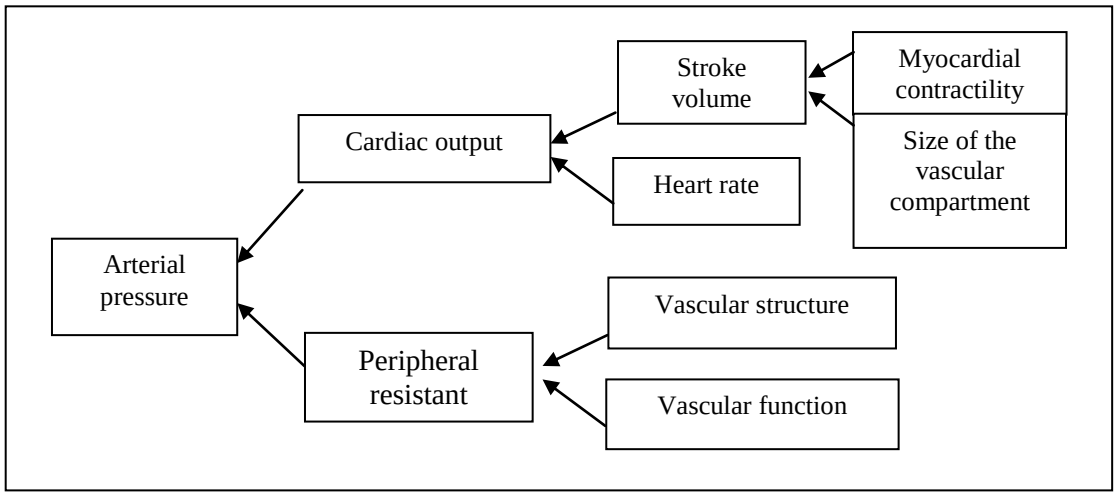

Figure 2.1 Diagram explaining factors affecting arterial pressure.

2.1.6 Risk factors of hypertension

A number of important risk factors for hypertension have been identified, including genetics, excess body weight, excess dietary sodium intake, physical inactivity, stress, inadequate intake of fruits and vegetables, potassium, excess alcohol intake, insulin resistance, endothelial dysfunction (as manifested by changes in endothelin and nitric oxide), low birth weight and intrauterine nutrition, the renin-angiotensin system, and the sympathetic nervous system [34, 43-44].

Longitudinal data from the Framingham Heart Study indicate that excess weight gain may account for 65% to 75% of the risk for essential hypertension [45]. A positive family history is a frequent feature in hypertensive patients, with the heritability estimated to vary between 35–50% in the majority of studies, and heritability has been confirmed for ambulatory BP [39]. Age is strongly associated with increasing BP. The prevalence of HT increases with advancing age to the point where more than half of people 60-69 years of age and approximately three-fourths of those 70 years of age and older are affected [46]. The fourth health examination survey in Thai adults reported that the prevalence of hypertension among aged 30–44, 45–59, 60–69, 70–79, and ≥80 years was 12.7%, 29.5%, 44.0%, 51.7%, and 55.9%, respectively [8]. The results of randomized controlled trial (RCT) in hypertensive patients showed that reducing sodium intake by 4.7-5.8 g per day reduces BP by an average of 4-6 mmHg [46].

2.1.7 Prognosis of hypertension

High blood pressure is called the "silent killer" because it is usually has no warning signs or any symptoms, but could give rise to early-morning headache, nosebleed, irregular heart beats and buzzing in the ears. Symptoms of severe hypertension include tiredness, nausea, vomiting, confusion, anxiety, chest pain, and muscle tremors. The presence of hypertension can be detected by regular blood pressure checks. It is very important to diagnose and treat high BP because it is a major risk factor for other serious diseases and end-organ damages [11, 33-34]. Factors are influencing prognosis of hypertension as follows [2].

1. Risk factors

1.1 Level of systolic and diastolic blood pressure

1.2 Men aged >55 years, Women aged >65 years

1.3 Smoking, Dyslipidaemia

1.4 Family history of premature cardiovascular disease (men aged <55 years, women aged <65 years)

1.5 Abdominal obesity (abdominal circumference ≥90 cm for men, ≥80 cm for women)

1.6 C-reactive protein ≥1 mg/dl

2. Target organ damage

2.1 Left ventricular hypertrophy (LVH mass index >125 g/m^2 in men, >110 g/m^2 in women)

2.2 Carotid intima-media thickness ≥ 0.9 mm or atherosclerotic plaque

2.3 Serum creatinine >1.3 mg/dl in men, >1.2 mg/dl in women

2.4 Microalbuminuria

3. Diabetes mellitus

3.1 Fasting plasma glucose ≥126 mg/dl

3.2 Postprandial plasma glucose ≥200 mg/dl

4. Associated clinical conditions

4.1 Cerebrovascular disease (transient ischaemic attack, stroke, haemorrhage)

4.2 Heart disease (angina, myocardial infarction, heart failure)

4.3 Renal disease (diabetic nephropathy, serum creatinine >1.5 mg in men, >1.4 mg in women, protienuria >300 mg/24 hours)

4.4 Peripheral vascular disease

4.5 Advanced retinopathy (haemorrhage, exudates, papilloedema)

2.1.8 Assessment of cardiovascular risk

Total CV risk is expressed as the absolute risk of dying from cardiovascular disease (CVD) within 10 years based on age, gender, smoking habits, total cholesterol and SBP. The classification in low, moderate, high and very high risk is retained in the current guidelines and refers to the 10-year risk of cardiovascular (CV) mortality as defined by the ESH/ESC (2013) in Table 2.3 [39]. Risk may be higher than indicated in the charts in: [1, 11, 39]

1. Sedentary subjects and those with central obesity; the increased relative risk associated with overweight is greater in younger subjects than older subjects (waist circumference ≥ 90 cm in men and ≥ 80 cm in women).

2. Socially deprived individuals and those from ethnic minorities.

3. Subjects with elevated fasting glucose and/or an abnormal glucose tolerance test, who do not meet the diagnostic criteria for diabetes (FPG=100–125 mg/dl).

4. Individuals with increased triglycerides, fibrinogen, apolipo-protein B, lipoprotein (a) levels and high-sensitivity C–reactive protein.

- Total cholesterol > 200 mg/dl.
- Low-density lipoprotein cholesterol (LDL-C) > 130 mg/dl.
- High-density lipoprotein cholesterol (HDL-C): men<4 mg/dl, women <50 mg/dl.
- Triglycerides >150 mg/dl.

5. Individuals with a family history of premature CVD (before the age of 55 years in men and 65 years in women).

Table 2.3 Stratification of total cardiovascular risk.

Other risk factors, asymptomatic organ damage or disease	Blood pressure (mmHg)			
	High normal SBP 130–139 or DBP 85–89	Grade 1 HT SBP 140–159 or DBP 90–99	Grade 2 HT SBP 160–179 or DBP 100–109	Grade 3 HT SBP ≥180 or DBP ≥110
No other risk factors		Low risk	Moderate risk	High risk
1–2 risk factors	Low risk	Moderate risk	Moderate to high risk	High risk
>3 risk factors	Low to moderate risk	Moderate to high risk	High risk	High risk
OD, CKD stage 3 or diabetes	Moderate to high risk	High risk	High risk	High to very high risk
Symptomatic CVD, CKD stage ≥ 4 or diabetes with OD/risk factors	Very high risk	Very high risk	Very high risk	Very high risk

CKD = chronic kidney disease; CVD = cardiovascular disease; DBP = diastolic blood pressure; SBP = systolic blood pressure; HT = hypertension; OD = organ damage.

2.1.9 Complication of hypertension

Hypertension is a chronic elevation of blood pressure that, in the long-term, causes end-organ damage and results in increased morbidity and mortality [42]. Screening for hypertension allows clinicians to identify affected patients and begin treatment early in the disease course to prevent the serious consequences of high BP, including stroke, coronary artery disease, heart attack, and heart and kidney failure [37]. Higher levels of BP are strongly associated with increasing rates of CVD, cardiovascular events and death. Severe hypertension (that is, SBP ≥180 mmHg or DBP≥110 mmHg) have 20–30% risk of CVD in 10 year [12]. Patients with very

severe hypertension can develop hypertensive heart failure without concomitant myocardial damage from coronary artery disease. Coronary artery atheroma is one of the most common associations of hypertension [45]. The increased risk of death is present in all age groups ranging from 40–89 years old. For every 20 mmHg increase in SBP or 10 mm Hg increase in DBP, a doubling of mortality occurs from ischemic heart disease and stroke [47]. Chronic kidney disease is a common co-morbidity among patients admitted with acute severe hypertension, and acute kidney injury is a frequent form of acute target organ dysfunction [48].

A meta-analysis of nine observational studies examined the relationship between blood pressure level and 843 subsequent strokes and 4,856 coronary events over an average of 7 years follow-up. Reductions in usual diastolic blood pressure of 5, 7.5 and 10 mmHg were associated with reductions in stroke of 34%, 46% and 56% and coronary heart disease of 21%, 29% and 37%, respectively [1]. A cross-sectional survey in Thai hypertensive patients found that common co-morbidities were hypercholesterolemia (66%), metabolic syndrome (36%), diabetes mellitus (35%) and obesity (32%) [49]. About 50% of type 1 patients and 80% of type 2 diabetes mellitus have hypertension. The development of hypertension increases all the microvascular and macrovascular complications of diabetes [2]. Szczech (2010) performed a study from the Treatment of Acute Hypertension (STAT) registry, which enrolled patients admitted to hospital for acute severe hypertension.

2.1.10 Guidelines for hypertension treatment

It is important to detect and treat hypertension because uncontrolled high blood pressure is a risk factor for a number of problems including coronary heart disease (which may lead to heart attack), stroke, atherosclerosis, heart failure, and kidney failure [1, 33-34]. Hypertensive patients or people with high normal BP are able to reduce their blood pressure through lifestyle modification or by taking antihypertensive drugs that have been prescribed by medical guidelines [1, 12, 39]. Pharmacologic treatment is mostly sued to reduce cardiovascular and renal morbidity and mortality, and correct syndrome output. A meta-analysis of four trials involving more than 20,000 patients with hypertension showed that reducing their BP led to a 15% reduction in major cardiovascular events, a 20% reduction in strokes, and a 10%

reduction in coronary heart disease events [50]. Non-pharmacologic treatment focuses on self managements, lifestyle modifications, and health promoting behaviors. The treatment goal for individuals with hypertension and no other compelling conditions is <140/90 mmHg and for diabetes and/or renal disease is <130/80 mmHg. Lifestyle interventions decrease blood pressure, prevent the development of hypertension in normotensive individuals, prevent pre-hypertensive from developing hypertension, enhance antihypertensive drug efficacy, and decrease cardiovascular risk [3, 11, 35].

In 2009, the results of the fourth national health examination survey among Thai adults found that 49.7% of people with hypertension had been diagnosed (39.5% in men and 59.4% in women) and 91.3% treated (90.7% in men and 91.9% in women), and 20.7% of those treated had uncontrolled blood pressure (15.9% in men and 24.0% in women) [8]. Screening, detection, and early treatment can significantly reduce the medical care costs associated with hypertension and the other diseases for which people with hypertension are at increased risk. All patients with hypertension perform clinical assessment in order to identify all CDV risk factors, detect end-organ damage and related or co-morbid clinical conditions, and identify causes of secondary hypertension. If secondary hypertension is suspected, consider specialist referral [3].

1. Pharmacologic Treatment

A large number of drugs are currently available for reducing BP. Clinical trial outcome data indicate that several classes of drugs, including angiotensin-converting enzyme inhibitors, angiotensin-receptor blockers, β-blockers, calcium channel blockers, and thiazide-type diuretics, can reduce blood pressure and its complications [3, 33, 36].

JNC7 (2004) [12], ESH/ESC (2013) [3,39] and Thai Hypertension Society (2012) [11] recommended the use of antihypertensive drugs in patients with grade1 hypertension even in the absence of other risk factors or organ damage, provided that non-pharmacological treatment had proved unsuccessful. Initiate antihypertensive drug treatment immediately in hypertensive patients with any of the following:

- Grade 3 hypertension or isolated systolic hypertension with widened pulse pressure (SBP ≥ 160 mmHg and DBP ≤ 70 mmHg).

- Associated conditions or evidence of end-organ damage

- High absolute risk of cardiovascular disease, based on the presence of markers of high risk or as estimated using a risk calculator.

Hypertension should be managed within a comprehensive management to reduce BP, reduce CV risk and minimize end-organ damage. Guidelines recommendation for each patient to decide about important aspects of treatment is shown in Figure 2.2 [3, 11].

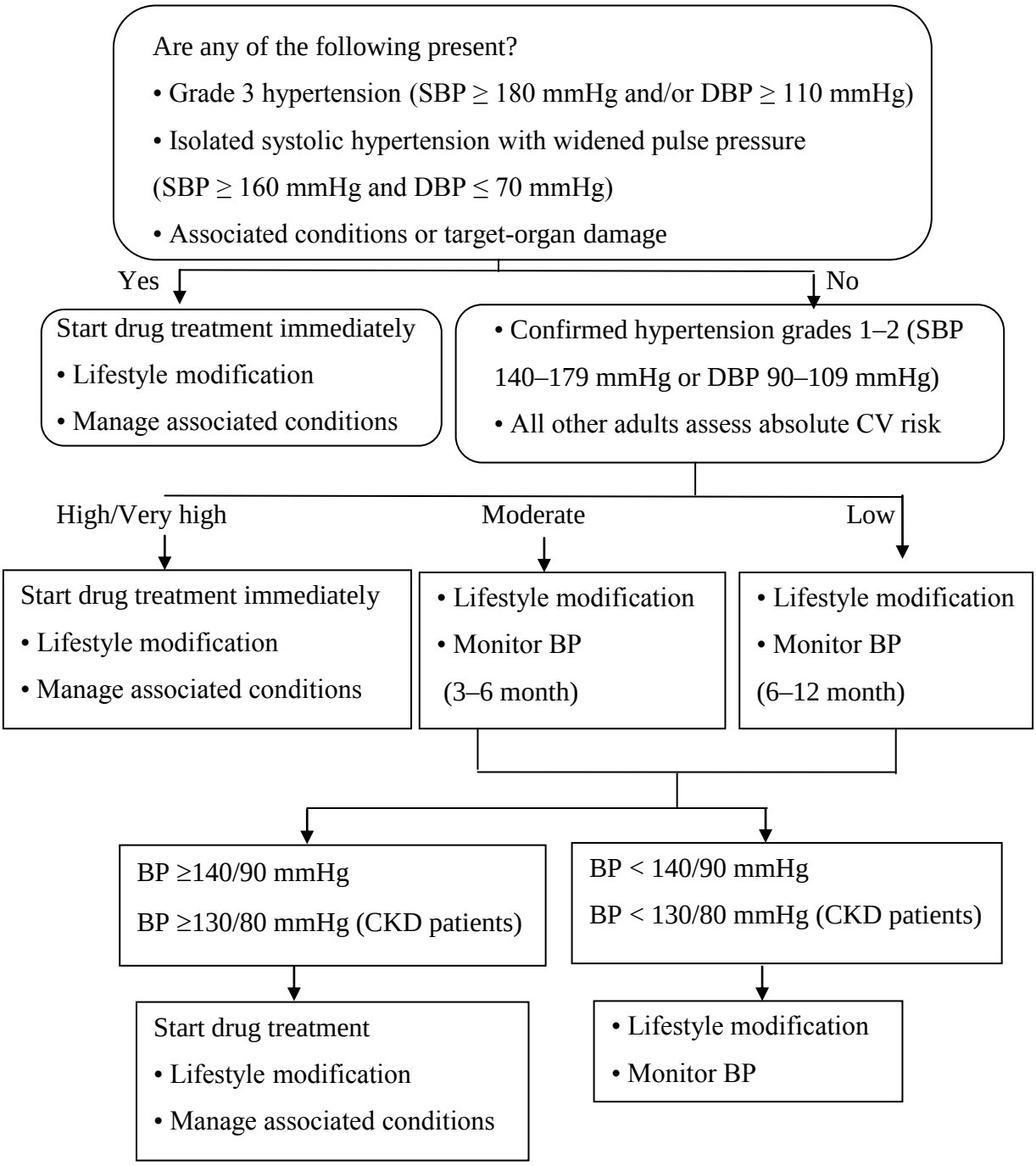

Figure 2.2 Guideline for initiate blood pressure-lowering drug treatment.

2. Lifestyle modifications

The lifestyle modifications are recommended for treating hyper-tension, including weight reduction, decrease in dietary salt intake, frequent aerobic physical activity, moderation of alcohol consumption, diet modifications, and stress management. If lifestyle changes do not achieve blood pressure control, antihypertensive medications are typically used [11, 35-36].

1. Weight reduction: In a meta-analysis of RCT, mean systolic and diastolic BP reductions associated with an average weight loss of 5.1 kg were 4.4 and 3.6 mmHg, respectively [46]. Every 1% reduction in body weight lowers systolic BP by an average of 1 mmHg [3, 51]. Weight reduction by as little as 4.5 kg reduces BP and/or prevents hypertension in a large proportion of overweight people. Weight loss of 10 kg can reduce systolic BP by 6–10 mmHg [3]. The results of the Framingham study, with a follow-up of 44 years, found that the overweight and obesity were highly related to incident hypertension, diabetes mellitus, CVD, and angina pectoris. The risk of HT was largely explained by weight gain with increased BMI≥25kg/m^2. The relative risk was 1.46 for men and 1.75 for women. The composite population attributable risks (PAR) estimates for a BMI ≥ 25kg/m^2 on new hypertension was 26% in men and 28% in women [52].

2. Reduced dietary sodium intake: Clinical trials have demonstrated that reduced dietary sodium intake lowers blood pressure in both normotensive and hypertensive individuals, reduces the incidence of hypertension, and may reduce the CVD in overweight individuals [53]. A meta-analysis of RCT has also shown that sodium reduction decreases blood pressure and prevents hypertensive [51, 54-55]. Graudal (2011) conducted a meta-analysis to estimate the effects of sodium intake on BP found that the effect of sodium reduction in normotensive Asians was SBP -1.27 mmHg (95% CI: -3.07, 0.54; p=0.17), DBP -1.68 mmHg (CI: -3.29, -0.06; p=0.04). The effect of sodium reduction in hypertensive Asians was SBP -10.21 mmHg (CI: -16.98, -3.44; p=0.003), DBP -2.60 mmHg (CI:-4.03,-1.16;p <0.001) [55].

3. Increased physical activity: Aerobic exercise has positive effects on blood pressure whether or not a person has hypertension, producing average reductions of 4 mmHg in systolic BP and 3 mmHg in diastolic BP. It is recommended that patients with pre-hypertension or hypertension exercise for 30 minutes on most

days of the week [56]. Whelton (2002) [57] performed a meta-analysis of 54 RCTs (N = 2419) revealed that aerobic exercise reduced blood pressure in both hypertensive and normotensive persons. Aerobic exercise was associated with a significant reduction in mean systolic and diastolic blood pressure (-3.84 mm Hg (95% CI, -4.97 to -2.72 mm Hg) and -2.58 mm Hg (CI, -3.35 to -1.81 mm Hg), respectively). Regular exercise is associated with an increase in HDL- cholesterol and reductions in blood pressure, body weight, waist circumference, body fat percentage, insulin resistance, systemic vascular resistance, plasma noradrenaline, and plasma renin activity [51, 54].

4. Reduced alcohol intake: low and moderate drinking results in a reduced mortality compared with non-drinkers, while heavy drinkers have a rising death rate [56]. A meta-analysis of 15 RCTs (N=2234) reported a significant decrease in BP of 3.3 mmHg in systolic BP and 2 mmHg in diastolic BP and a dose-response relationship between decreased alcohol and BP levels reduction and prevalence of hypertension in populations [58]. In a meta-analysis, Dickson (2006) examined the effects of multiple lifestyle factors on BP in hypertensive adult patients. The results showed that restrictions in alcohol and salt intake lowered systolic BP by 3.8 mmHg (95% CI: 1.4-6.1), 3.6 mmHg (CI: 2.5-4.6), respectively [59].

5. Consumed fruits, vegetables, and low fat dairy products: The Dietary Approaches to Stop Hypertension (DASH) study demonstrated that blood pressure can be significantly reduced with a diet increased in fruits, vegetables, complex carbohydrates, magnesium intake, potassium intake, and low sodium intake and low fat dairy products [51, 54, 60]. The DASH diet lowered systolic BP by an average 11 mmHg and diastolic BP by about 6 mmHg in hypertensive patients [60]. Some clinical trials have suggested that increasing dietary potassium by approximately 2100 mg/day can reduce systolic BP by 4-8 mmHg in hypertensive patients and by 2 mmHg in normotensive persons [51].

6. Stress management: Longitudinal studies of 3000 European adults found that chronic stress for a period of several years predicts high blood pressure during 3–7 years follow-up. Stress reduction programs reliable decreases in systolic BP about 6–10 mmHg. Therapies such as relaxation, meditation, or biofeedback may help patients to reduce the effects of stress by reducing physiologic arousal and restoring autonomic balance, thereby reducing blood pressure [22]. A

meta-analysis was designed to assess effects of the transcendental meditation on blood pressure. The results found that meditation, compared to control, reduced systolic BP −4.7 mmHg (95% CI: −7.4 to −1.9 mmHg) and diastolic BP −3.2 mmHg (CI: −5.4 to −1.3 mmHg) [26].

7. Smoking cessation: Smoking cessation may not directly reduce BP, but markedly reduces overall CV risk. Smoking injures blood vessels and speeds up the hardening of arteries. The risk of myocardial infarction is 2–6 times higher and the risk of stroke is 3 times higher in people who smoke than in non-smokers [3]. Cigarette use causes a 4 mmHg increase in systolic blood pressure and a 3mmHg increase in diastolic blood pressure compared with placebo [56].

The major lifestyle modifications that have been shown to reduce blood pressure are listed in Table 2.4 [12].

Table 2.4 Lifestyle modifications to prevent and manage hypertension.*

Modification	**Recommendation**	**Approximate SBP Reduction (Range) †**
Weight reduction	Maintain normal body weight (body mass index 18.5–24.9 kg/m^2).	5–20 mmHg/10kg
Adopt DASH eating plan	Consume a diet rich in fruits, vegetables, and low fat dairy products with a reduced content of saturated and total fat.	8–14 mmHg
Dietary sodium reduction	Reduce dietary sodium intake to no more than 100 mmol per day (2.4 g sodium or 6 g sodium chloride).	2–8 mmHg
Physical activity	Engage in regular aerobic physical activity such as brisk walking (at least 30 min per day, most days of the week).	4–9 mmHg
Moderation of alcohol consumption	Limit consumption to no more than 2 drinks (e.g., 24 oz beer, 10 oz wine, or 3 oz 80-proof whiskey) per day in most men, and to no more than 1 drink per day in women and lighter weight persons.	2–4 mmHg

DASH, Dietary Approaches to Stop Hypertension
* For overall cardiovascular risk reduction, stop smoking.
† The effects of implementing these modifications are dose and time dependent, and could be greater for some individuals.

2.2 Mind-body therapies (MBT)

2.2.1 Complementary and alternative medicine (CAM)

The National Center for Complementary and Alternative Medicine (NCCAM) of the National Institutes of Health defined CAM as a group of diverse medical and health care systems, practices, therapies, and products that are not generally considered part of conventional medicine. Complementary medicine is used together with conventional medicine, while alternative medicine is used in place of conventional medicine [16, 61]. NCCAM has classified CAM therapies into five categories as following [61-63].

1. Alternative medical systems: The systems are built upon complete systems of theory and practice. Often, these systems have evolved apart from and earlier than the conventional medical approach used in the United States. Examples of alternative medical systems that have developed in Western cultures include homeopathic medicine and naturopathic medicine.

2. Mind-Body therapies (MBT): The practices use a variety techniques designed to enhance the mind's capacity to affect bodily function and symptoms. MBT focuses on the interconnection between brain, mind, body, and behavior and the ways in which emotions, thoughts, relationships, spirituality and behaviors can affect health. Some techniques of MBT include patient support groups, cognitive-behavioral therapy, meditation, prayer, mental healing, deep breathing, yoga, guided imagery, hypnotherapy, progressive relaxation, qi gong, tai chi, and therapies that use creative outlets such as art, music, or dance.

3. Biologically based therapies: This area of CAM includes use of a variety of herbal medicines (also known as botanicals), dietary supplements, vitamins, minerals, and other "natural products derived from a plant or from parts of a plant such as the leaves, flowers, bark, roots and seeds. Special diets are prescribed to prevent and treat illnesses, and to promote health.

4. Manipulative and body-based methods: The techniques focus primarily on manipulation and/or movement of one or more parts of the body. Two commonly used therapies are spinal manipulation and massage therapy. Spinal manipulation is practiced by health care professionals such as chiropractors,

osteopathic physicians, naturopathic physicians, physical therapists. People use massage for a variety of health-related purpose such as relieve pain, rehabilitate sports injuries, reduce stress, increase relaxation, address anxiety and depression, and aid general well-being.

5. Energy therapies: They are of two types of energy therapies.

5.1 Biofield therapies are intended to affect energy fields that purportedly surround and penetrate the human body. Some forms of energy therapy manipulate biofields by applying pressure and/or manipulating the body by placing the hands in, or through, these fields. Examples include qi gong, reiki, and therapeutic touch.

5.2 Bioelectromagnetic-based therapies involve the unconventional use of electromagnetic fields, such as pulsed fields, magnetic fields, or alternating-current or direct-current fields.

2.2.2 Effects of Mind-body therapies on human body

The nervous system (NS) consists of the brain, spinal cord, and a complex network of neurons. This system can be divided into two parts: the central nervous system (CNS), which is the processing center for the nervous system and the peripheral nervous system (PNS). The CNS consists of the brain and spinal cord, while the PNS comprises all neural pathways to the extremities. The PNS is divided into two major parts: the somatic nervous system (SNS) and the autonomic nervous system (ANS). The SNS is made up of nerves that are connected to skin, muscles, and sensory organs (the eyes, ears, nose, skin, etc.). The ANS is responsible for regulating involuntary body functions and vital organs, such as heart rate, blood vessels, breathing, digestion, reproductive functions temperature regulation, key role in the body's response to stress, and controls smooth muscle of internal organs and glands [23].

There are two branches of the ANS that act to maintain this homeostatic balance, the sympathetic (arousal) nervous system and the parasympathetic (relaxed) nervous system. These are activated by the hypothalamus and typically function in opposition to each other. Most organs are stimulated by nerve fibers of both the sympathetic and the parasympathetic systems. The sympathetic system is responsible

for the responses associated with the fight-or-flight response and concerned especially with preparing the body to react to situations of stress or emergency, rapid metabolic change and physical movement. The major functions of the parasympathetic division are to keep the body's ability to recuperate a normal state (known as "homeostasis") after experiencing pain or stress. The system helps the body to do simple things such as breathing regularly, excreting hormones, eating and digesting food. It also keeps a person alive when sleeping, energy conservation, relaxation, reduction in heart rate, ventilation, dilates blood vessels, and muscle tension [23].

Mind-body therapies have long been known to affect human physiology and neurology through autonomic nervous system. It has been established mental functions operate in corresponding regions of the brain [20, 64-65]. The meditation-induced frontal lobe activation facilitates increases in positive affect as well as enhanced antibody-mediated immune response. Meditation decreased sympathetic nervous activity, important for fight and flight mechanisms, and increased parasympathetic activity, important for relaxation and rest. Use of meditation has been associated with increased rate of autonomic recovery from laboratory induced stressful events, decreased blood pressure in both treated and untreated hypertensive patients [64]. When stress overwhelms your nervous system your body is flooded with chemicals that prepare you for "fight or flight." While the stress response can be lifesaving in emergency situations where you need to act quickly, it wears your body down when constantly activated by the stresses of everyday life. The relaxation response puts the brakes on this heightened state of readiness and brings your body and mind back into a state of equilibrium [21]. Deepak (2012) [20] examined the effects of meditation on sympathetic nervous system found that the regular practice of meditation blunted the sympathetic drive and developed control over sympathetic function of meditators. The sympathetic activity was lower in meditators than non-meditators and especially so with long duration practitioners. The benefits of MBT as follows:

1. Increase relaxation and reverse the negative effects of stress
2. Develop concentration, serenity, & peace of mind
3. Alleviate symptoms of anxiety, depression, trauma, chronic pain

4. Improve a variety of common medical conditions including high blood pressure, heart rate, diabetes, and obesity

5. Develop strength, balance, & flexibility in body and mind

6. Identify and change negative thought patterns & behaviors

7. Cultivate a more open heart & a greater sense of connection

2.2.3 Mind-body therapies

Mind-body medicine uses the power of thoughts and emotions to influence physical health. Most therapies often combine slow breathing and focused attention to calm the mind and the body. According to data from the National Health Interview Survey (NHIS), several mind and body practices top 10 ranked among complementary health approaches used by adults. The MBTs most commonly used included deep breathing (12.7%), meditation (9.4%), chiropractic and osteopathic manipulation (8.5%), massage (8.3%), yoga (6.1%), progressive relaxation (2.9%), and guided imagery (2.2%). American Indian or Alaska Native adults (50.3%) and white adults (43.1%) were more likely to use CAM than Asian adults (39.9%) or black adults (25.5%) [66]. Mind-body therapies not only improve overall health but also have a positive and measurable effect on specific diseases and conditions, including encourage relaxation, improve coping skills, well-being, control breathing, reduce tension and pain, influence attitude or behavior responses, mental, and spiritual benefits, decreases stress, anxiety and blood pressure [17-18, 21].

1. Meditation:

Meditation is essentially a physiological state of demonstrated reduced metabolic activity, different from sleep, which elicits physical and mental relaxation and is reported to enhance psychological balance and emotional stability. The practice of meditation results in similar patterns of sympathetic inhibition and parasympathetic activation [67]. Srivastava (2012) [68] examined the effect of meditation training program on patients with adjustment disorder with anxiety and depression. The results suggested that post-intervention significantly improved all anxiety and depression symptom scales. Sedlmeier (2012) [69] conducted a meta-analysis to assess the effect of psychological on meditation. The study revealed that meditation improved attention control, relaxation, positive thinking, positive changes in relationships, and reducing negative emotions.

2. Deep breathing (DB) or breathing exercises (BE)

Deep breathing is one of the easiest and oldest relaxation techniques that are beneficial for stress reduction, calm, relax, improves both physical and mental health, improve cardiovascular and respiratory functions, and relieve chronic pain. Park (2013) [65] conducted a quasi-experimental in Daejeon, South Korea to examine the effects of relaxation breathing on pain and anxiety levels for burn patients during dressing changes. Over 3 days, the results showed that the pain and anxiety scores were significant improved in relaxation breathing compared to control group ($p=0.01$). Marco (2012) [70] addressed that deep breathing practices increased respiratory regularity and systolic BP also decreased, from 116±12 to 113±11 mmHg ($p <0.005$) in healthy participations.

3. Mindfulness base stress reduction (MBSR)

MBSR was developed by John Kabat-Zinn at the Department of Behavioural Medicine, the University of Massachusetts Medical Centre to address the cognitive and somatic dimensions of unmanaged stress associated with chronic pain and illness [28]. The core of MBSR is intensive training in mindfulness meditation and its applications for daily living and coping with stress, illness, and pain. Two recent meta-analyses of MBSR in patients with chronic medical diseases showed positive effects on depression, anxiety, and psychological distress as well as improvements in spirituality and positive health measures and decreases in depressive relapse, depressive recurrence [28, 71]. After 8 weeks of MBSR practice, the average systolic BP decreased for both groups. Individuals in the MBSR group exhibited a 21.9 mmHg significantly lower systolic BP compared to the social support group ($p=0.020$) [72].

4. Mindful breathing (MB) or mindfulness meditation

Mindfulness meditation originally taught by the Buddha. Concentration on the breath has a positive effect on entire physical and mental state. Long-term practice of this meditation leads to all sorts of insights about mind works, a greater ability to focus in the present moment, less worry, a higher sense of wellbeing, greater emotional balance and a calmer state of mind. Zeidan et al. (2010) [73] assessed the effects of brief mindfulness meditation training on ratings of painful. Our findings indicate that a brief 3-day mindfulness meditation intervention was effective

at reducing pain ratings and anxiety when compared with baseline testing. Mars & Abbey (2010) [28] performed a systematic review of 22 RCTs have demonstrated replicated statistically significant improvements in spirituality and positive health measures and decreases in depressive relapse, depressive recurrence and psychological distress.

5. Mindfulness-based cognitive therapy (MBCT)

MBCT was developed by Segal et al. in 1995. MBCT was originally designed to teach patients in remission from recurrent major depression to become more aware of, and to relate differently to, their thoughts, feelings, and bodily sensations. Increasing evidence suggests the potential usefulness of mindfulness-based interventions for the treatment of a large number of physical and mental disorders as well as for the reduction of stress levels in healthy subjects. MBCT has also been used for other clinical targets including, among the others, the reduction of inter-episodic depression and anxiety levels in patients suffering from bipolar disorder [74].

6. Progressive muscle relaxation

Progressive muscle relaxation involves a two-step process in which you systematically tense and relax different muscle groups in the body. With regular practice, progressive muscle relaxation gives you an intimate familiarity with what tension feels like in different parts of the body. This awareness helps you spot and counteract the first signs of the muscular tension that accompanies stress. And as your body relaxes, so will your mind. You can combine deep breathing with progressive muscle relaxation for an additional level of stress relief. Sheu et al. (2003) [75] addressed that progressive muscle relaxation significant lowered stress and enhanced their perception of health in hypertensive patients.

7. Guided imagery

Guided imagery is focused on pleasant images to replace negative or stressful feelings and relax. Guided imagery may be directed by you or a practitioner through storytelling or descriptions designed to suggest mental images (also called visualization).

8. Biofeedback

Biofeedback is a design of instrumentation to mirror physiological processes. People are trained to control certain bodily processes that

normally occur involuntarily, such as heart rate or blood pressure. These processes can be measured and displayed on a monitor that the person watches. The monitor provides feedback about the internal workings of your body. The individual controls physiological system by self-regulation.

9. Cognitive behavioral therapy (CBT)

This technique is used to help people recognize and change harmful thoughts. For example, people with phobias might deliberately expose themselves, under the direction and guidance of a therapist, to what they are afraid of. People who are depressed can learn to counter negative thoughts and feelings with positive ones.

10. Relaxation response (RR)

Dr. Herbert Benson developed the relaxation response in the 1975. The technique is defined as your personal ability to make your body release chemicals and brain signals that make your muscles and organs slow down and increases blood flow to the brain. The relaxation response is not lying on the couch or sleeping but a mentally active process that leaves the body relaxed, calm, and focused. When your body is relaxed breathing slow, blood pressure and oxygen consumption decreased, and some people report an increased sense of well-being. Learning and putting into practice such techniques can significantly improve your mental, emotional and physical health [21].

11. Yoga

Yoga involves a series of both moving and stationary poses, combined with deep breathing. As well as reducing anxiety and stress, yoga can also improve flexibility, strength, balance, and stamina. Practiced regularly, it can also strengthen the relaxation response in your daily life. Since injuries can happen when yoga is practiced incorrectly, it's best to learn by attending group classes, hiring a private teacher, or at least following video instructions. A recent meta-analysis was conducted of 17 trials of yoga and hypertension. Results showed that at yoga had a modest effect on both SBP (–4.17 mmHg 95% CI = – 6.35 to –1.99, $p< 0.001$) and DBP (−3.62 mmHg 95% CI = –4.92 to –1.60, $p<0.001$) [76].

12. Tai chi

Tai chi is a self-paced, non-competitive series of slow, flowing body movements. These movements emphasize concentration, relaxation, and the

conscious circulation of vital energy throughout the body. Though tai chi has its roots in martial arts, today it is primarily practiced as a way of calming the mind, conditioning the body, and reducing stress. As meditation, tai chi practitioners focus on their breathing and keeping their attention in the present moment.

2.3 Deep breathing

Deep breathing is one of the easiest and oldest relaxation techniques that are beneficial for stress-related events. Deep breathing practice allows people to breathe more efficiently, reduce physiological tension and arousal, reduce pain and anxiety, decrease blood pressure, control heartbeat, enhances brain function, sufficient air flow through the nasal passages, and increases CO_2 changes [65, 77]. Deep breathing and meditation are each associated with psychological benefits such as enhanced coping, self-efficacy, and positive mood. In addition, they provide spiritual benefits of compassionate understanding and mindful awareness. The key to deep breathing is to breathe deeply from the abdomen, getting as much fresh air as possible in your lungs. When you take deep breaths from the abdomen, rather than shallow breaths from your upper chest, you inhale more oxygen. The more oxygen you get, the less tense, short of breath, and anxious you feel [16, 21]. Practicing deep breathing are follows [19].

1. Lie down or sit in a comfortable chair. Sit comfortably with your back straight, maintaining good posture. Your body should be as relaxed as possible, scan your body for tension.

2. Trainees can practice with eyes closed or with them open. Closing your eyes can help reduce distractions and make focusing easier. If you open your eyes, let your gaze be soft, not grasping on anything you see, and let yourself be with life as it unfolds before you.

3. Place both hands on your abdomen that seems to rise and fall the most with each breath. Pay attention to your breathing and follows your breathing, noticing how your abdomen rises and falls.

4. Breathe through your nose. Notice if your chest is moving in harmony with your abdomen.

5. Inhale deeply and slowly through your nose into your abdomen. You should feel your abdomen rise with this inhalation and your chest should move only a little. Count slowly as you inhale, 1…2…3…4…5…6…7…8.

6. Hold your breath for a moment (3–5 seconds). Count slowly 1 to 4.

7. Exhale through your mouth, pushing out as much air as you can while contracting your abdominal muscles. The hand on your abdomen should move in as you exhale. Keeping your mouth, tongue, and jaw relaxed. Count slowly as you exhale, 1…2…3…4…5…6…7…8

8. Relax as you focus on the sound and feeling of long, slow, and deep breaths. Let your body continue to breathe naturally. There is no need to control the breath in any way. This is an awareness practice, not a breathing exercise.

9. Continue to breathe in through your nose and out through your mouth. Try to inhale enough so that your lower abdomen rises and falls. Just breathe regularly and lightly.

10. Continue practicing in 30-breath cycles daily.

2.4 Muscle relaxation

In 1938, Dr. Edmund Jacobson was first to develop the progressive muscle relaxation (PMR). The PMR is a technique that involves tensing specific muscle groups and then relaxing them to create awareness of tension and relaxation. It is termed progressive because it proceeds through all major muscle groups, relaxing them one at a time, and eventually leads to total muscle relaxation. Before practicing Progressive Muscle Relaxation, consult with your doctor if you have a history of muscle spasms, back problems, or other serious injuries that may be aggravated by tensing muscles. Practicing deep breathing are follows [19].

Step I: Preparation

1. Loosen your clothing; take off your shoes and be quiet.

2. Make yourself as comfortable as possible in a seated position with your back straight with your hands resting in your lap.

3. Take a few minutes to relax, breathing in and out in slow, deep breaths. Focus on yourself and on achieving relaxation in specific body muscles. Tense and relax each muscle group as follows:

Step II: Tensing and Relaxing Specific Muscle Groups

In this step is divided into two steps. First step is applying muscle tension to a specific part of the body. The step is essentially the same regardless of which muscle group you are targeting. First, focus on the target muscle group, for example, your left hand. Next, take a slow, deep breath and squeeze the muscles as hard as you can for about 5 seconds. Second step involves quickly relaxing the tensed muscles. After about 5 seconds, let all the tightness flow out of the tensed muscles. Exhale as you do this step. You should feel the muscles become loose and limp, as the tension flows out [19]. Remain in this relaxed state for about 15 seconds, and then move on to the next muscle group. Repeat the tension-relaxation steps. After completing all of the muscle groups, take some time to enjoy the deep state of relaxation. The different muscle groups are as follows.

1. Forehead: Wrinkle your forehead; try to make your eyebrows touch your hairline for five seconds. Relax.

2. Eyes and nose: Close your eyes as tightly as you can for five seconds. Relax.

3. Lips, cheeks and jaw: Draw the centers of your mouth back and grimace for five seconds. Relax. Feel the warmth and calmness in your face.

4. Hands: Extend your arms in front of you. Clench your fists tightly for five seconds. Relax. Feel the warmth and calmness in your hands.

5. Forearms: Extend your arms out against an invisible wall and push forward with your hands for five seconds. Relax.

6. Upper arms: Bend your elbows. Tense your biceps for five seconds. Relax. Feel the tension leave your arms.

7. Shoulders: Shrug your shoulders up to your ears for five seconds. Relax.

8. Back: Arch your back off the floor for five seconds. Relax. Feel the anxiety and tension disappearing.

9. Stomach: Tighten your stomach muscles for five seconds. Relax.

10. Hips and buttocks: Tighten your hip and buttock muscles for five seconds. Relax.

11. Thighs: Tighten your thigh muscles by pressing your legs together as tightly as you can for five seconds. Relax.

12. Feet: Bend your ankles toward your body as far as you can for five seconds. Relax.

13. Toes: Curl your toes as tightly as you can for five seconds. Relax.

Step III: Focus on any muscles which may still be tense.

If any muscle remains tense, tighten and relax those specific muscle three or four times. Fix the feeling of relaxation in your mind. Resolve to repeat the process again. Remember, people respond differently to various activities. Some feel pleasant or refreshed, and others feel calm and relaxed after an activity like this one. Some people notice little change the first time, but with practice, their control increases - as well as the benefits. If you practice this activity, your relaxation should increase.

2.5 Related researches

Mori et al (2005) [78] studied the relationship between deep breathing and blood pressure in the clinics and hospitals of Japanese Medical and Dental Practitioners for the Improvement of Medical Care (JMDPIMC). The study found that systolic BP, diastolic BP and pulse rate were significantly reduced after deep breathing compared with the baseline measurements ($p<0.001$). Systolic BP reductions were greater in the deep breathing group than in the 30-minute rest group (normotensive: –6.4± 8.3 vs –3.0±7.4 mmHg, $p<0.001$; untreated hypertension: –9.6±10.2 vs –5.9±9.1 mmHg, $p<0.001$; treated hypertensions: –8.3 ± 9.6 vs. –4.4 ± 8.3 mmHg, $p<0.001$).

Kaushik et al. (2006) [79] conducted a RCT to examine the effects of either mental relaxation or slow breathing treatment in essential hypertensive patients on blood pressure and other autonomic parameters such as heart rate, respiratory rate, and peripheral skin temperature. Patients were selected randomly among the patients visiting the Medical Out Patient Department of the Himalayan Institute Hospital, Dehradun, India. A total of 100 patients were recruited in the study. After practiced,

the slow breathing technique resulted in significantly decreased in systolic blood pressure (−8.98 ± 12.32, p<0.001), diastolic blood pressure (−3.53 ± 9.10, p <0.05), heart rate (−3.36 ± 8.53, p< 0.05), and respiratory rate (−5.50 ± 4.59, p< 0.001), Mental relaxation led to a significant decreased in systolic blood pressure (−5.67 ± 11.63, p < 0.02), and respiratory rate (−1.56±3.38, p < 0.02) and a significant increase in peripheral skin temperature (1.77±2.42, p< 0.01). The slow breathing technique was higher decreased in systolic blood pressure and diastolic blood pressure compared with mental relaxation technique.

Vutiso (2007) [80] determined the effects of progressive muscle relaxation technique (PPMR) compared with usual care on post-operative abdominal surgery pain in elderly patients. The study revealed that after receiving PPMR the mean score of pain level between the experimental group and the control group were significantly different (p<0.05). Moreover, the mean score of pain level between different time points were significantly different (p<0.01).

A meta-analysis was conducted by Rainforth et al. (2007)[22] to examined the effects of stress reduction programs in patients with elevated blood pressure. Seventeen trials with 23 treatment comparisons and 960 participants with elevated BP met criteria for well-designed RCTs and were replicated within intervention categories. Meta-analysis was used to calculate BP changes for Transcendental Meditation program. The mean BP reductions across these trials were −5.0 mmHg SBP (95% CI= −7.6 to −2.3, p<0.001), and −2.8 mmHg DBP (95% CI = −5.0 to −0.5, p=0.02). Biofeedback, (−0.8/−2.0 mmHg); relaxation-assisted biofeedback (4.3/2.4 mmHg); progressive muscle relaxation (−1.9/−1.4 mmHg); and stress management training (−2.3/−1.3 mmHg) were not statistically significant (all, p>0.05). Available evidence indicates that among stress reduction approaches, the Transcendental Meditation program is associated with significant reductions in BP. Related data suggest improvements in other CVD risk factors and clinical outcomes.

Jones et al. (2010) [81] performed a RCT in Srinagarind Hospital, Khon Kaen Province. Participants in intervention group were trained slow deep breathing for 30 min, twice daily throughout 8 weeks. A control group continued with normal activities. The finding showed that systolic and diastolic BP in intervention group decreased significantly with unloaded breathing by means of 7.0 mmHg (95% CI = 5.5

to 8.5) and 13.5 mmHg (95%CI = 11.3 to 15.7), respectively compared to the control group. With loaded breathing, the reductions were greater at 18.8 mmHg (95% CI = 16.1 to 21.5) and 8.6 mmHg (95% CI = 6.8 to 10.4), respectively. The improvement in systolic BP was 5.3 mmHg (95% CI =1.0 to 9.6) greater than with unloaded breathing. The authors concluded that controlled breathing using this novel and simple device for eight weeks is well tolerated by patients for home-based training and provides clinically valuable reductions in blood pressure.

Chatree Jutitree (2010) [27] conducted a quasi-experimental study to determine the effects of muscle relaxation on blood pressure and stress in hypertensive elderly patients. Participants in intervention group (n = 20) received muscle relaxation while control group (n = 20) received conventional nursing care. The findings addressed that the mean of systolic BP, diastolic BP, and stress scores after 5 weeks of practices were significantly lower than that before received the program. Blood pressure and stress were significantly improved in intervention group than control group (all, $p<0.05$). The researcher concluded that muscle relaxation technique was beneficial to reduce systolic BP, diastolic BP, and stress.

Hayama & Inoue (2012) [82] assessed the effect of deep breathing on 'tension-anxiety' and fatigue in Japanese women with gynaecological cancer undergoing adjuvant chemotherapy. A total of 23 patients were randomly allocated to intervention (n=11) and control (n=12) groups. Deep breathing comprised a 10-min breathing program comprising abdominal breathing, thoracic breathing and breathing with arms raised. Using the Profile of Mood States-Short Form (Japanese version) and the Cancer Fatigue Scale, the effects were assessed pre- and post-chemotherapy. Both groups showed a significant reduction in the 'tension-anxiety' scores (both, $p<0.001$). The post-chemotherapy Fatigue scores differed significantly between the intervention and the control groups ($p=0.01$). The post-chemotherapy physical and total fatigue of the intervention group were significantly lower than those of the control group (physical, $p=0.04$; total $p=0.04$). The findings indicated that deep breathing was likely to ameliorate the 'tension-anxiety' and fatigue in gynaecological cancer patients.

CHAPTER III
MATERIALS AND METHODS

In this chapter, the methodology of the study was described as follows.

3.1 Study design

The study was a randomized controlled trial (RCT), without blinding in order to examine the effects of deep breathing and muscle relaxation on blood pressure and stress in hypertensive patients.

3.2 Population and sampling

This study was performed in District Health Promoting Hospitals (DHPH), Kosum Phisai District, Maha Sarakham Province during August to November 2013. The population who was diagnosed with grade 1 essential hypertension (SBP = 140 – 159 mmHg and/or DBP = 90–99 mmHg) and had never receiving treatment with any antihypertensive drugs, but those participants were recommended lifestyle modifycations.

3.2.1 Sample size

The sample size of this study was calculated by Lemeshow (1990) [83]. The effect size was used in the study based on the study by Juttitree (2010) [27].

$$\text{n/ group} = \frac{(Z_{\alpha/2} + Z_{\beta})^2(\sigma_1^2+\sigma_2^2)}{d^2}$$

σ_1 = Standard deviation of mean difference of diastolic BP in the intervention group was 9.4 mmHg.

σ_2 = Standard deviation of mean difference of diastolic BP in the control group was 12.5 mmHg.

d = Expected difference in mean of blood pressure between intervention and control group was 6 mmHg.

$Z_{\alpha/2}$ = A standard value under a standard normal distribution given a significant level = 0.05 for two-sided, $Z_{\alpha/2} = Z_{0.025} = 1.96$

Z_{β} = A standard value under a standard normal distribution given a significant level = 0.2 (80% power to detect a difference in mean change), $Z_{\beta} = 0.842$

Thus, sample size per group $= ((1.96 + 0.842)^2 \times (9.42 + 12.52)) / 6^2$

$= 53.3$

= 54 participants per group

A drop-out rate of 10% was expected, so the sample had to be recruited at least 120 participants (60 in intervention group and 60 in control group).

3.2.2 Participant recruitment

The researcher invited participants from District Health Promoting Hospitals of Kosum Phisai District, Maha Sarakham Province to cooperate in this study. Four DHPHs (Khuean**,** Yang Tha Chaeng, Nong Phue, and Yang Yai) were randomly selected in the study. The participants in each DHPH were randomly assigned into either control or intervention group by block randomization. The participants in intervention group received 8 weeks-deep breathing and muscle relaxation practices while control group had not. The eligible participants in each DHPH who met the following inclusion and exclusion criteria were recruited.

1. Inclusion criteria

1.1 Participants diagnosed with grad 1 essential hypertension (systolic BP = 140–159 mmHg and/or diastolic BP = 90–99 mmHg).

1.2 Participants were not receiving treatment with any anti-hypertensive drugs, but having recommend lifestyle modifications.

1.3 Aged 30 years or older at the time of recruitment.

1.4 Participants were willing to participate in the study.

1.5 Participants were able to communicate in Thai.

2. Exclusion criteria

2.1 Participants with severe co-morbidities, which made them unable to participate in the study such as renal diseases, heart, stroke, cardiovascular system or admit in inpatient department (IPD).

2.2 Disability of hearing, travel, or movement.

2.3 Participants have a history of muscle spasms, muscle pain, back problems, other serious injuries, or after surgery.

2.4 Psychiatric patients or taking mental disorder drugs such as antidepressants, antipsychotic, antianxiety.

2.5 Participants practiced meditation regularly.

3.2.3 Sampling procedure

1. The researcher invited District Health Promoting Hospitals of Kosum Phisai District, Maha Sarakham Province to cooperate in this study.

2. The simple random sampling was used to select four DHPHs of those willing to participate including Khuean**,** Yang Tha Chaeng, Nong Phue, and Yang Yai District Health Promoting Hospitals

3. Each DHPH recruited the 30 eligible participants who met inclusion and exclusion criteria. Those participants were simple random allocated into either the intervention (deep breathing and muscle relaxation practices) or the control group by block randomization.

4. Block randomization with a block size of four is shown in Table 3.1. There are six different possible ways randomized four participants equally to two groups. The researcher randomly selected one of the six types of block at the time when the first participant is randomized and this determines the treatments received by the first four participants. A second block is randomly selected when participant 5 is registered in order to create allocations for participant number 5 to 8. These procedures were performed until complete 30 participants.

5. Thus, Each DHPH recruited 15 participants in the intervention group and 15 participants in the control group.

Table 3.1 Block randomization with a block size of four

Block 1	Block 2	Block 3	Block 4	Block 5	Block 6
T	T	T	C	C	C
T	C	C	C	T	T
C	T	C	T	C	T
C	C	T	T	T	C

T = treatment, C = control

3.3 Variables

The independent variable is deep breathing and muscle relaxation practices at home daily, 25 minutes per day throughout eight weeks of the intervention phase. The primary outcomes of interest are systolic blood pressure and diastolic blood pressure. The secondary outcome is stress.

3.4 Intervention and control group procedures

Both the intervention and the control groups received group health education separately. Hypertensive educational sessions to help patients understand the disease process and self-care comprised of: (i) knowledge of hypertension; (ii) risk factors of hypertension; (iii) prevention and self-care of hypertension.

In addition, all participants in the intervention group were also trained the deep breathing and the muscle relaxation techniques. They were then encouraged to practice these techniques at their home 25 minutes daily morning throughout eight weeks of the study.

3.4.1 Intervention group

The deep breathing and the muscle relaxation techniques were provided by the research team. These techniques were developed by the Department of Mental Health, Ministry of Public Health [19]. The researcher delivered group educational sessions for the intervention group. The sessions consisted of two parts: (i)

hypertensive education, and (ii) the deep breathing and the muscle relaxation techniques. The monthly sessions with three hours each were described as follows.

1. Group educational session I

1.1 All participants were interviewed for general demographic and stress test. Anthropometry and blood pressure also measured by researcher and well trained assistants

1.2 Researcher and trained assistants welcomed to participate in the study, introduced researcher, and then researcher explained purposes of the study, research procedures, data collection, outcome evaluations, benefits of the study, and follow-up schedules.

1.3 All participants introduced themselves in order to build their relationships and discussed about their health problems and lifestyle.

1.4 Education consisted of: (i) causes of hypertension; (ii) signs and symptoms; (iii) risk groups and risk factors of hypertension; (iii) prevention and self-care were provided.

1.5 Participants were trained the deep breathing and the muscle relaxation techniques, 40 minutes each session.

- Practicing deep breathing: Lie down or sit comfortably with back straight, maintaining good posture. Your body should be as relaxed as possible. Place both hands on your abdomen. Pay attention to your breathing. Inhale deeply and slowly through your nose into your abdomen. You should feel your abdomen rise with this inhalation and your chest should move only a little. Count slowly as you inhale, 1…2…3…4…5…6…7…8. Exhale through your mouth, pushing out as much air as you can while contracting your abdominal muscles. The hand on your abdomen should move in as you exhale. Keeping your mouth, tongue, and jaw relaxed. Count slowly as you exhale, 1…2…3…4…5…6…7…8. Continue to breathe in through your nose and out through your mouth. Try to inhale enough so that your lower abdomen rises and falls. Continue practicing in 30-breath cycles daily.

-Practicing muscle relaxation: Loosen your clothing, take off your shoes, and get comfortable. Take a few minutes to relax, breathing in and out in slow, deep breaths. Tense and relax each muscle group i.e. forehead, eyes and nose, lips, cheeks and jaw, hands, forearms, upper arms, shoulders,

back, stomach, thighs, feet, toes, hips and buttocks. If any muscle remains tense, tighten and relax those specific muscle three or four times. Continue practicing each muscle group 5 times cycles.

1.6 All participants in intervention group received the program manual and were encouraged to practice these techniques at their home 25 minutes, each day during an eight-week period.

1.7 The Researcher concluded the activities, thanked you for participation in the study, and appointed for the next session.

2. Group educational session II (week 3)

2.1 Participants were invited for blood pressure measurement, after four weeks of practices.

2.2 The research team welcomed to participate in the study

2.3. Education consisted of: (i) prognosis of hypertension; (ii) treatment and control of hypertension; (iii) prevention and lifestyle modification were provided.

2.4 Participants were followed-up for their behavior change, and the deep breathing and the muscle relaxation practices

2.5 Participants were trained the deep breathing and the muscle relaxation techniques, 40 minutes each session.

2.6 The research team encouraged participants to practice these techniques at their home 25 minutes, each day during an eight-week period.

2.7 The Researcher concluded the activities, thanked you for participation in the study, and appointed for the next session.

3. Group educational session III (week 6)

3.1 Participants were invited for stress test and blood pressures measurement, after eight weeks of practices.

3.2 Participants were followed-up for their deep breathing and the muscle relaxation practices.

3.3. Education consisted of: (i) goal of blood pressure control (ii) diagnosis and treatment; (iii) prevention and lifestyle modification were provided.

3.4 The researcher team declared blood pressure measurements. Participants who not achieved blood pressure control were referred to physician for consultation and appropriate treatment.

3.5 Participants were encouraged to practice the deep breathing and the muscle relaxation techniques at their home at least 20 minutes daily as well as the lifestyle modification.

3.6 The research team and participants discussed about the benefits, flexibility, barriers to practice, participants' satisfaction with the program, concluded the activities, and thanked you for participation in the study.

3.4.2 Control group

Participants in control group received group educational sessions. Duration and contents of the sessions were trained in the same way as the intervention group. The three monthly sessions with three hours each were described as follows.

1. Group educational session I

1.1 All participants were interviewed for general demographic and stress test. Anthropometry and blood pressure also measured by researcher and trained assistants

1.2 Researcher and trained assistants welcomed to participate in the study, introduced researcher, and then researcher explained purposes of the study, research procedures, data collection, outcome evaluations, benefits of the study, and follow-up schedules.

1.3 All participants introduced themselves in order to build their relationships and discussed about their health problems and lifestyle.

1.4 Education consisted of: (i) causes of hypertension; (ii) signs and symptoms; (iii) risk groups and risk factors of hypertension; (iii) prevention and self-care were provided.

1.5 The Researcher concluded the activities, thanked you for participation in the study, and appointed for the next session.

2. Group educational session II (week 3)

2.1 Participants were invited for blood pressure measurement, after four weeks of practices and welcomed to participate in the study.

2.2 Participants were solved about barriers to self-care and lifestyle modification.

2.3. Education consisted of: (i) prognosis of hypertension; (ii) treatment and control of hypertension; (iii) prevention and lifestyle modification were provided.

2.4 The Researcher concluded the activities, thanked you for participation in the study, and appointed for the next session.

3. Group educational session III (week 6)

3.1 Participants were invited for stress test and blood pressures measurement, after eight weeks of practices.

3.2 Participants were followed-up for their behavior change, and lifestyle modification

3.3. Education consisted of: (i) goal of blood pressure control (ii) diagnosis and treatment; (iii) prevention and lifestyle modification were provided.

3.4 The researcher team declared blood pressure measurements. Participants who not achieved blood pressure control were referred to physician for consultation and appropriate treatment.

3.5 The research team concluded the activities, and thanked you for participation in the study.

3.5 Instrument development

The instruments were used for data collection consist of (i) a questionnaire; (ii) blood pressure measurement; (iii) anthropometry measurement (weight, height, and waist circumference); and (iv) deep breathing and muscle relaxation manual.

1. A questionnaire was comprised of two parts including personal demographic information and stress evaluation.

1.1 Personal demographic information included gender, age, religion, marital status, education level, occupation, household income, personal and family medical histories, smoking and alcohol drinking status, and co-morbidities.

1.2 Thai-stress test which was developed by the Department of Mental Health, Ministry of Public Health was used in the study. It consists of 20 items that measure the degree to which experiences in someone's life are deemed stressful. Stress test had sufficient screening quality with the sensitivity of 70.4%, specificity of 64.6% and the Cronbach's alpha Coefficient (internal consistency) of 0.86 [84]. Each item of the stress test ranges from 0–3 point. The following are the description of the responses.

- Never	Means the statement does not represent symptom, behavior or feeling. (0 Point)
- Sometimes	Means only part of the statement represent the symptom, behavior or feeling. (1 point)
- Usually	Means that much of the statement represent the symptom, behavior or feeling. (2 points)
- Always	Means that most of the statement is represent the symptom, behavior or feeling. (3 points)

The interpretation of the result used the standard of evaluation of stress level of the Department of Mental Health, Ministry of Public Health as follows:

Points	Stress level
< 17	Normal level
18 – 25	Low stress level
26 – 29	Moderate stress level
30 – 60	High stress level

2. Blood pressure (systolic and Diastolic BP) was measured at the DHPH using an automatic sphygmomanometers in which were calibrated at Kosum Phisai Hospital. Blood pressures were obtained with the participant in a seated position after each subject had rested for at least five minutes. The average of the first and second systolic and diastolic BP readings separated by five minutes was used in the analyses.

3. Anthropometric measurements were using standard procedures. Standing height was determined without shoes and measured to the nearest 0.5 centimeter (cm). Weight was determined without shoes and with participants lightly clothed. Weight was measured using an automatic electronic scale to the nearest kilograms. Waist circumference was measured at the approximate midpoint between the lower margin of the last palpable rib and the top of the iliac crest. The waist circumference with a cut-off point for Asian populations (≥90 cm in men and ≥80 cm in women) was classified as abdominal obesity. Body mass index (BMI) was calculated as the body weight (kilograms) divided by the square of the height (meters). It is classified by the Ministry of Public Health of Thailand, according to Asia-Pacific perspective as follows:

< 18.5	underweight
18.5 – 22.9	normal
23.0 – 24.9	risk to overweight or pre-obesity
25.0 – 29.9	obesity class I
≥ 30	obesity class II

4. The deep breathing and muscle relaxation manual, and two pamphlets entitled “Deep Breathing” and “Muscle Relaxation” adapted from the Department of Mental Health, Ministry of Public Health [19] were developed by The research team. The contents included of (i) principle of deep breathing and muscle relaxation program (ii) benefits of deep breathing and muscle relaxation (iii) step-by-step approach for self-practices.

3.6 Data collection

1. Having approved research ethical consideration, the research team began to conduct this study.

2. Two research assistants were trained for group educational sessions and data collection.

3. Data were gathered through a questionnaire, anthropometry (weight, height, and waist circumference), pulse, blood pressure measurement (systolic and

diastolic), and stress test which were conducted by researcher, research assistants and nurses in each DHPH. Participants provided information about their personal demographic information, personal and family medical histories, smoking and alcohol drinking, and stress measurement.

3. All participants were invited to participate in each educational session and outcome evaluations by letters.

4. During three months of the study, each participant visited the DHPH three times. The first visits were devoted to baseline measurements, group education, and the deep breathing and the muscle relaxation practice in the intervention group.

5. Participants were invited for BP measurement at the DHPH at baseline, after four and eight week follow-ups. Stress test was measured at baseline and eight week follow-ups.

6. The study was terminated on the last visit, after 8 weeks of follow-ups.

3.7 Data analyses

1. Descriptive statistics were computed to summarize the participants' general characteristics, anthropometry, and stress data. The descriptive data were presented by range, frequency, percentage, mean, standard deviation, median, and inter quartile range (IQR).

2. To determine the effects on blood pressure and stress as follows:

2.1 At baseline, comparing the mean differences between control and intervention groups were examined by using the student's t-test if the variables are normally distributed within each of the two groups. If the variables are not normally distributed, Mann–Whitney U test were used instead. Comparison of categorical variables was performed by Chi-square (χ^2) test or Fisher exact test, where appropriate.

2.2 Paired t-test was used to compare the mean differences of systolic BP and diastolic BP for the related data within each of the two groups.

2.3 Analysis of covariance (ANCOVA) was used to assess the mean difference of stress between baseline and eight week follow-ups controlled for possible confounding factors.

$p<0.05$ was considered statistically significant. All of the statistical analyses were performed with STATA software, version 11.0 (Stata, College Station, TX).

3.8 Ethical consideration

The study was approved by the Institutional Review Board of the Faculty of Medicine Siriraj Hospital, Mahidol University, Thailand. The data collection began after the ethical committee had approved the study. The researcher asked for permission to make initial contact with participants who met the inclusion and exclusion criteria. All participants were then advised the right to participate or withdraw from the study at any time without any consequences to health care services. Participants were informed about: (i) the purposed of this study; (ii) a description of the intervention and the control group procedures; (iii) potential benefits and risks in the study; (iv) data collection and follow-ups schedules; and (v) contact information on whom they could contact for questions, comments, or complains. Participants who were willing to participate in the study then signed their name on the consent form. Personal information will be treated as confidential. Any identifying information is not made available to, or accessed by anyone but only the program coordinators. Such identifying information is excluded from any reports or published documents.

CHAPTER IV
RESULTS

The purpose of this study was to assess the effects of deep breathing and muscle relaxation practices on blood pressure and stress in hypertensive participants. This chapter presents the results of the study as follows.

4.1 Characteristics of the participants

Initially, a total of 124 eligible participants who met criteria were recruited from four DHPHs and agreed to participate in this study after giving written informed consent. Participants were then randomized into both deep breathing and muscle relaxation practices (n=62) or control group (n=62). At eight week follow-ups, one participant in control group lost to follow-up. All of randomization, participants, and follow-ups in the intervention and the control group throughout the study were illustrated in Figure 4.1.

Of 124 eligible participants, 80 (64.5%) were women and 44 (35.5%) were men. The age of participants ranged from 32 to 78 years, and the mean age was 56.9 years (SD=8.3). Nearly all participants (85.9%) finished primary school and married (77.4%). The median household income was 5,000 baht/month. About 97 (78.2%) had household income <10,000 baht/month. Twenty–four participants had at least one family member or direct relative with hypertension. Twenty–three (18.5%) were current smoker and 22 (17.7%) participants were current alcohol drinking. Out of 23 current smokers, 14 (60.9%) were smoking ≥10 cigarettes a day. More than half of them (54.0%) were obesity.

A total of 62 participants in intervention group, nearly two-thirds (66.1%) were women. The mean age was 56.9 years (SD=11.2), ranged from 32–78 years. Around 77.4% had low household income <10,000 baht/month. Twelve participants (19.3%) had family history of hypertension. Eleven (17.7%) was current smokers and

12 (19.4%) was current drinkers. Thirty–nine participants (62.9%) were abdominal obesity, 32 participants (51.6%) were obesity. The mean of systolic BP was 142.5 mmHg (SD=8.4) and diastolic BP was 86.9 mmHg (SD=10.0). Nearly all of them (93.6%) were assessed as normal level of stress**.** Data were shown in Table 4.1.

A total of 62 participants in control group, nearly two-thirds (62.9%) were women. The mean age was 56.8 years (SD=8.3). Around 79.0% had low household income <10,000 baht/month, 12 (19.3%) was current smokers, and 10 (16.1%) was current drinkers. More than half of them were obesity (56.4%). The mean of systolic BP was 144.8 mmHg (SD=8.8) and diastolic BP was 88.1 mmHg (SD=10.3). Fifty–seven (92.0%) were normal level of stress.

All characteristics of both intervention and control groups at baseline were well similar. Data are shown in Table 4.1.

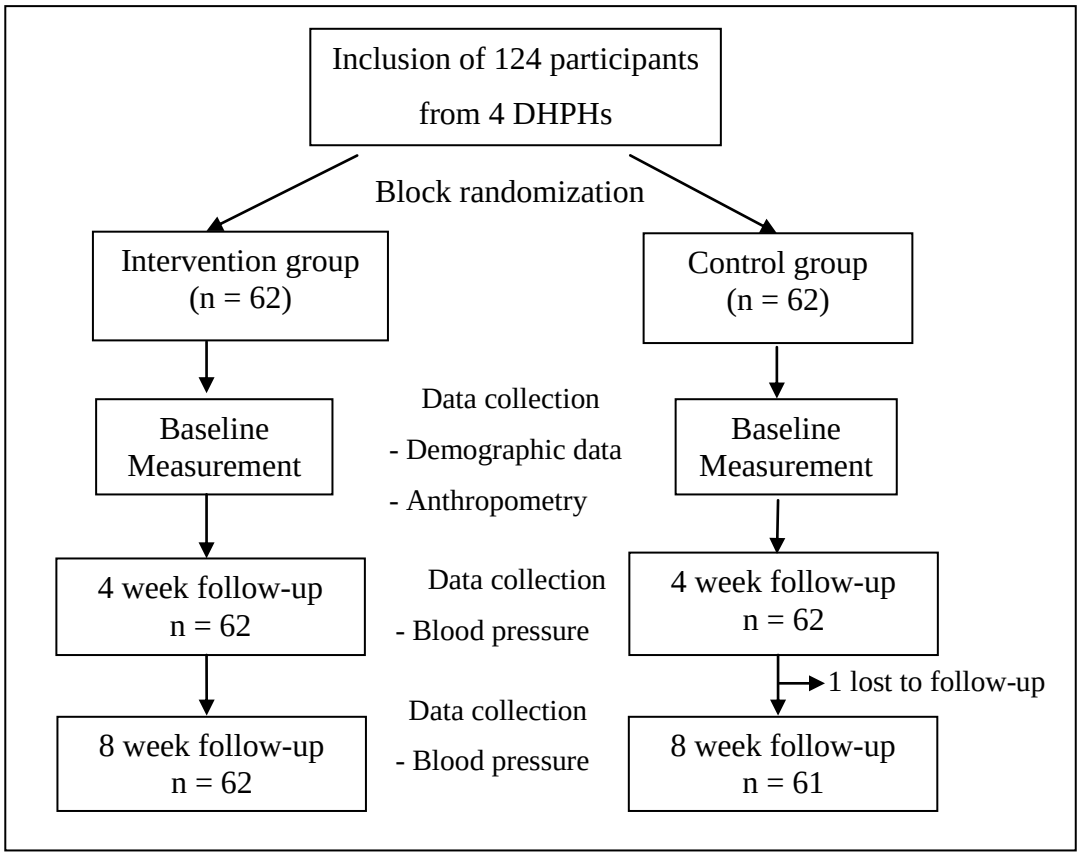

Figure 4.1 Trial profile illustrates randomization, participants, and follow-ups in the intervention and the control group throughout the trial.

Table 4.1 Baseline of participant characteristics.

Characteristics	Intervention group (n = 62)		Control group (n = 62)		p-value
	n	(%)	n	(%)	
Gender					
women	41	(66.1)	39	(62.9)	0.707
men	21	(33.9)	23	(37.1)	
Age (years)					
mean ± SD	56.9 ± 11.2		56.8 ± 8.3		0.913[a]
range	32 – 78		42 – 77		
30-49	16	(25.8)	13	(20.9)	0.535
50-60	21	(33.9)	27	(43.6)	
> 60	25	(40.3)	22	(35.5)	
Marital status					
single	5	(8.1)	3	(4.8)	0.540[b]
married	49	(79.0)	47	(75.8)	
widowed/separated	8	(12.9)	12	(19.4)	
Education					
primary school	52	(83.9)	54	(87.1)	0.610
higher than primary school	10	(16.1)	8	(12.9)	
Occupation					
agriculturist	49	(79.0)	50	(80.7)	0.823
others	13	(21.0)	12	(19.3)	
Household income (baht/month)					
median (IQR)	5,000 (3,500–8,000)		5,000 (3,000–8,000)		0.998[c]
<10,000	48	(77.4)	49	(79.0)	0.966
10,000 – 15,000	9	(14.5)	8	(12.9)	
>15,000	5	(8.1)	5	(8.1)	

Table 4.1 Baseline of participant characteristics (cont.)

Characteristics	Intervention group (n = 62)		Control group (n = 62)		p-value
	n	(%)	n	(%)	
Family history of hypertension					
no	50	(80.7)	50	(80.7)	1.00
yes	12	(19.3)	12	(19.3)	
Smoking status					
never smoker	43	(69.4)	46	(74.2)	0.478
former smoker	8	(12.9)	4	(6.5)	
current smoker	11	(17.7)	12	(19.3)	
amounts of smoking per day (cigarettes)					
mean ± SD	9.3 ± 6.7		8.8 ± 4.2		0.824 [a]
range	1 - 20		1 – 15		
<10 cigarettes/day	5	(45.4)	4	(33.3)	0.680 [b]
≥10 cigarettes/day	6	(54.6)	8	(66.7)	
Alcohol drinking					
never drinker	41	(66.1)	46	(74.2)	0.586
former drinker	9	(14.5)	6	(9.7)	
current drinker	12	(19.4)	10	(16.1)	
amounts of drinking (glass/month)					
mean ± SD	4.3 ± 3.3		3.2 ± 2.7		0.426 [a]
range	1 – 10		1 – 10		
Waist circumference; WC (centimeter)					
mean ± SD	88.5 ± 11.1		86.2 ± 8.8		0.198 [a]
normal	23	(37.1)	24	(38.7)	0.853
abdominal obesity [d]	39	(62.9)	38	(61.3)	

Table 4.1 Baseline of participant characteristics (cont.)

Characteristics	Intervention group (n = 62)	Control group (n = 62)	p-value [a]
	n (%)	n (%)	
Body mass index; BMI (kg/m^2)			
mean ± SD	25.6 ± 4.8	25.4 ± 3.1	0.767 [a]
range	17.6 – 39.5	17.1 – 33.3	
BMI level classification[e]			
≤ 22.9 (normal)	19 (30.7)	13 (21.0)	0.445
23.0–24.9 (overweight)	11 (17.7)	14 (22.6)	
≥25 (obesity)	32 (51.6)	35 (56.4)	
Systolic BP (mmHg)			
mean ± SD	142.5 ± 8.4	144.8 ± 8.8	0.146 [a]
Diastolic BP (mmHg)			
mean ± SD	86.9 ± 10.0	88.1 ± 10.3	0.541 [a]
Stress scores			
mean ± SD	6.6 ± 5.6	7.3 ± 6.6	0.530 [a]
range	0 – 26	0 – 28	
0 – 17 (normal)	58 (93.6)	57 (91.9)	0.729
>17 (stress)	4 (6.4)	5 (8.1)	

Abbreviation: n = number; SD = standard deviation; IQR = Inter quartile range

χ^2 test for categorical variable; [a]Student t-test; [b]Fisher's exact test; [c]Mann-Whitney U test

[d]Abdominal obesity was defined as ≥ 90 cm in men or ≥ 80 cm in women.

[e]BMI level classification was defined as Asia-Pacific perspective.

4.2 Health behaviors

Data were compared on health behaviors at baseline between intervention and control groups. All health behaviors of both two groups were not significantly different except for vegetables consumption. The Fisher's exact test indicated that control group consumed vegetables more frequency than intervention group (59.7% consumed always and 40.3%, respectively, p = 0.006) as shown in Table 4.2.

Table 4.2 Baseline of participant health behaviors

Health behaviors*	**Intervention group (n = 62)**		**Control Group (n = 62)**		**p-value** [a]
	n	**(%)**	**n**	**(%)**	
More dietary salt intake (day/week)					
never	18	(29.0)	15	(24.2)	0.058
Sometimes	25	(40.3)	15	(24.2)	
usually	4	(6.5)	12	(19.4)	
always	15	(24.2)	20	(32.2)	
Consume caffeine products					
never	25	(40.3)	32	(51.6)	0.465
sometimes	15	(24.2)	19	(14.5)	
usually	3	(4.8)	2	(3.2)	
always	19	(30.7)	19	(30.7)	
Consume vegetables ≥ 4 servings/day					
never	3	(4.8)	0	(0)	0.006[b]
sometimes	15	(24.2)	4	(6.5)	
usually	19	(30.7)	21	(33.9)	
always	25	(40.3)	37	(59.7)	
Consume content of high fat products					
never	19	(30.7)	20	(32.3)	0.269[b]
sometimes	23	(53.2)	37	(59.7)	
usually	8	(12.9)	2	(3.2)	
always	2	(3.2)	3	(4.8)	

Table 4.2 Baseline of participant health behaviors (cont.)

Health behaviors*	Intervention group (n = 62)		Control Group (n = 62)		p-value
	n	(%)	n	(%)	
Consume content of high sugar products					
never	13	(21.0)	13	(21.0)	0.104
sometimes	23	(37.1)	26	(41.9)	
usually	18	(29.0)	8	(12.9)	
always	8	(12.9)	15	(24.2)	
Physical activity at least 30 minutes per day					
never	5	(8.1)	2	(3.2)	0.165[b]
sometimes	8	(12.9)	5	(8.1)	
usually	16	(25.8)	10	(16.1)	
always	33	(53.2)	45	(72.6)	

[a]Sometimes, 1–2 day/week; usually, 3–5 day/week; always, ≥ 6 day/week

[b]Fisher's exact test

4.3 Effects of deep breathing and muscle relaxation on blood pressure

4.3.1 Comparison of blood pressure between two groups

The mean and standard deviations (SD) of blood pressure at baseline, 4 and 8 week follows-up among intervention and control groups are presented in Table 4.3. The results show mean trend of systolic BP and diastolic BP were decreased in both two groups.

Table 4.3 The mean of blood pressure at baseline, 4 and 8 week follows-up.

Blood pressure	**baseline**	**4 weeks**	**8 weeks**
(mmHg)	**mean (SD)**	**mean (SD)**	**mean (SD)**
Intervention group	n = 62	n = 62	n = 62
systolic BP	142.5 (8.4)	137.6 (11.9)	137.3 (13.2)
diastolic BP	86.9 (10.0)	83.9 (9.6)	83.5 (9.5)
Control group	n = 62	n = 62	n = 61
systolic BP	144.8 (8.8)	142.4 (10.2)	140.8 (10.7)
diastolic BP	88.1 (10.3)	85.7 (10.0)	85.6 (9.3)

At baseline, the mean of systolic BP and diastolic BP were higher in control group than intervention group. However, the means were not significantly different between two groups. The mean difference of systolic BP was 2.3 mmHg (95% CI: -0.8 to 5.3, p = 0.146), diastolic BP was 1.1 mmHg (95% CI: -2.5 to 4.7, p = 0.541). Data are presented in Table 4.4.

At four week follows-up, the mean change of systolic BP was higher in intervention group compared with control group (4.9 ± 8.9 versus 2.3 ± 9.3). The mean difference of mean change was -2.5 mmHg (95% CI: -5.8 to 0.7, p = 0.124). The mean change of diastolic BP was higher in intervention group compared with control group (3.0 ± 9.2 versus 2.3 ± 8.4). The mean difference of mean change was -0.7 mmHg (95% CI: -3.8 to 2.4, p = 0.658). Data are presented in Table 4.4.

At eight week follows-up, the mean change of systolic BP and diastolic BP were higher in intervention group compared with control group. The mean differences of mean changes were not significant between two groups (p=0.469 and 0.823, respectively). Data are presented in Table 4.4.

Table 4.5 was showed the results of ANCOVA analysis. The finding persisted that the adjusted mean difference of SBP and DBP were not significant between intervention and control groups.

Table 4.4 Comparison of blood pressure between intervention and control groups.

Blood pressure (mmHg)	Intervention group		Control group		Mean difference		p-value*
	mean	(SD)	mean	(SD)	mean	(95% CI)	
Systolic BP							
baseline	142.5	(8.4)	144.8	(8.8)	2.3	(-0.8, 5.3)	0.146
4 weeks	137.6	(11.9)	142.4	(10.2)	4.8	(0.9, 8.6)	0.018
8 weeks	137.3	(13.2)	140.8	(10.7)	3.6	(-0.7, 7.9)	0.102
baseline – 4 weeks	4.9	(8.9)	2.3	(9.3)	-2.5	(-5.8, 0.7)	0.124
baseline – 8 weeks	5.3	(10.9)	3.9	(9.8)	-1.4	(-5.1, 2.3)	0.469
Diastolic BP							
baseline	86.9	(10.0)	88.1	(10.3)	1.1	(-2.5, 4.7)	0.541
4 weeks	83.9	(9.6)	85.7	(10.0)	1.8	(-1.7, 5.3)	0.303
8 weeks	83.9	(9.6)	85.6	(9.3)	1.7	(-1.6, 5.1)	0.313
baseline – 4 weeks	3.0	(9.2)	2.3	(8.4)	-0.7	(-3.8, 2.4)	0.658
baseline – 8 weeks	3.0	(8.6)	2.7	(9.5)	-0.4	(-3.6, 2.9)	0.823

* Independent t-test

Table 4.5 Adjusted mean difference of blood pressure between intervention and control groups.

Blood pressure (mmHg)	Adjusted mean difference		p-value*
	mean	(95% CI)	
Systolic BP			
4 weeks	4.2	(0.6, 7.8)	0.058
8 weeks	3.1	(-0.6, 7.4)	0.128
baseline – 4 weeks	-2.2	(-5.2, 0.9)	0.198
baseline – 8 weeks	-1.3	(-4.8, 2.2)	0.368
Diastolic BP			
4 weeks	1.5	(-1.6, 5.2)	0.610
8 weeks	1.7	(-1.5, 5.3)	0.380
baseline – 4 weeks	-0.8	(-3.1, 2.2)	0.793
baseline – 8 weeks	-0.6	(-3.4, 2.7)	0.611

*ANCOVA analysis adjusted for frequency of consume vegetables >4 servings/day

4.3.2 Comparison blood pressure within groups

1. The results of four week follow-up

A paired t-test was used to compare two related means (baseline and each follow-up). Data in Table 4.6 are presented the results of 4 week follow-up. Among intervention group, the mean systolic BP and diastolic BP were significantly lower compared with baseline. The mean difference of systolic BP was 4.9 mmHg (95% CI: 2.6 to 7.2, p<0.001). The mean difference of diastolic BP was 3.0 mmHg (95% CI: 0.7 to 5.4, p=0.011).

Among control group, the mean systolic BP and diastolic BP at 4 week follow-up were slightly decreased than baseline. The mean difference of systolic BP was 2.3 mmHg (95%CI: -0.02 to 4.7, p = 0.052). The mean difference of diastolic BP was 2.3 mmHg (95% CI: 0.2 to 4.5, p = 0.032).

Table 4.6 Comparisons of blood pressure within intervention and control groups after 4 week follows-up.

Blood pressure (mmHg)	**baseline (n = 62)**		**4 weeks (n = 62)**		**Different**		**p-value***
	mean	(SD)	mean	(SD)	mean	(95% CI)	
Intervention							
systolic BP	142.5	(8.4)	137.6	(11.9)	4.9	(2.6, 7.2)	<0.001
diastolic BP	86.9	(10.0)	83.9	(9.6)	3.0	(0.7, 5.4)	0.011
Control							
systolic BP	144.8	(8.8)	142.4	(10.2)	2.3	(-0.02, 4.7)	0.052
diastolic BP	88.1	(10.3)	85.7	(10.0)	2.3	(0.2, 4.5)	0.032

*Paired t-test was used to assess the mean difference between baseline and 4 week follows-up within group.

2. The results of eight week follow-up

Among intervention group, the mean systolic BP and diastolic BP at 8 week follow-up were significantly decreased compare with baseline. The mean difference of systolic BP was 5.3 mmHg (95% CI: 2.5 to 8.0, p<0.001). The mean difference of diastolic BP was 3.0 mmHg (95% CI: 0.8 to 5.2, p = 0.008). Data are shown in Table 4.7.

Among control group, the mean systolic BP and diastolic BP at 8 week follow-up were slightly decreased than baseline. The mean difference of systolic BP was 3.9 mmHg (95% CI: 1.4 to 6.4, p = 0.003). The mean difference of diastolic BP was 2.7 mmHg (95% CI: 0.2 to 5.1, p = 0.032). Data are shown in Table 4.7.

Table 4.7 Comparison of blood pressure within intervention and control groups after 8 week follow-up.

Blood pressure	**baseline**		**8 weeks**		**Different**		**p-**
(mmHg)	mean	(SD)	mean	(SD)	mean	(95% CI)	**value***
Intervention (n = 62)							
systolic BP	142.5	(8.4)	137.3	(13.2)	5.3	(2.5, 8.0)	<0.001
diastolic BP	86.9	(10.0)	83.9	(9.6)	3.0	(0.8, 5.2)	0.008
Control (n = 61)							
systolic BP	144.7	(8.0)	140.8	(10.7)	3.9	(1.4, 6.4)	0.003
diastolic BP	88.3	(10.2)	85.6	(9.3)	2.7	(0.2, 5.1)	0.032

*Paired t-test was used to assess the mean difference between baseline and 8 week follows-up within group.

4.4 Effects of deep breathing and muscle relaxation on stress

At baseline, the mean of stress was higher in control group than intervention group. Stress scores ranged from 0–26 in intervention group and 0–28 in control group. However, the mean was not significantly different between two groups (p= 0.530)

At eight week follow-up, the mean of stress score was decreased 3.1 scores and 1.8 scores compared with baseline in intervention group and control group, respectively. The mean change of stress in intervention group was significantly decreased compared with control group. The mean change difference was -1.3 (95% CI = -2.6 to -0.03, p = 0.045). Data are presented in Table 4.8.

Table 4.8 Comparison of stress between intervention and control groups

Stress scores	**Intervention group**		**Control group**		**difference**		**p-value***
	mean	**(SD)**	**mean**	**(SD)**	**mean**	**(95% CI)**	
baseline	6.6	(5.6)	7.3	(6.6)	0.7	(-1.5, 2.9)	0.530
8 weeks	3.5	(3.1)	5.4	(5.2)	-1.6	(-2.5, -0.7)	0.015
baseline –8 weeks	3.1	(4.0)	1.8	(3.2)	-1.3	(-2.6,-0.03)	0.045

*Independent t-test

CHAPTER V
DISCUSSION

This randomized controlled trial was to examine the effects of deep breathing and muscle relaxation on blood pressure and stress in hypertensive patients. The research findings were discussed including characteristics of the participants, the effects of deep breathing and muscle relaxation on blood pressure and stress. In additional, theoretical aspects and methodological issues were discussed.

5.1 Characteristics of the participants

Overall, 124 eligible participants were recruited in the study. Participants were randomly assigned into either intervention group (n=62) or control group (n=62). More than half of participants were women (64.5%). Forty-eight (38.7%) were aged 50–60 years. Nearly all participants were agriculturist (79.8%), low household income (78.2%). Those characteristics were similar as previous RCTs which were conducted in rural, Thailand [25, 27, 85]. This was partly because women, older adults, low or moderate income, unemployed, agriculturist, were more likely to participate in the studies. Such characteristics might have enough time, not tied up with work, and willing to cooperate in the study. This finding is consistent with data of the fourth nationwide survey in Thai adults reported more than half of adult aged 60 years older had hypertension. Among elderly, the prevalence increased to 50–55% [8]. The prevalence of hypertension is increased according to increasing age [8, 86]. Thus, elderly women were more recruited in the study than those men. The proportion of abdominal obesity was significantly higher in women than men (77.5% and 31.8%, respectively, $p<0.001$). Half of participants were obesity (54.0%). These results were similar to findings in other reports. The prevalence of abdominal obesity or overweight was common in women adults than men [8, 87].

5.2 The effects on blood pressure

Throughout eight-weeks of intervention phase, the mean SBP and DBP in both intervention and control groups was statistically significant decreased. After four-week follow-up, the mean difference of SBP in intervention group was significant decreased 4.8 mmHg (95% CI=0.9 to 8.6 mmHg, p=0.018) compared with control group. However, after eight-week follow-up, the mean SBP and DBP were not clinical significant difference between the two groups.

The findings of this study were differed from several studies. Anderson et al. (2012) [88] revealed that hypertensive patients practiced slow breathing 15-minutes daily for six-weeks were significantly lower SBP than control group. Mourya et al. (2009) [89] reported that slow breathing had decreased than fast breathing over a 3-month period. Patel et al. (2012) [90] reported that at 3 months of muscle relaxation practice, SBP was significantly lower in intervention group compared with control group (137.9±5.0 vs 142.3±7.6 mmHg, $p<0.05$) while DBP shows no significant change with relaxation practice. Boonruksa (2005) [25] reported that the mean BP significantly reduced 15/23 mmHg in the progressive muscle relaxation group ($p <0.001$). However, most studies have reported significant effects on SBP, but have not effected on DBP. Several studies revealed that 15–20 minutes of daily slow deep breathing for eight consecutive weeks significantly lower blood pressure in individuals with hypertension [24, 79, 81, 90]. However, long term effects need to be determined.

As mentioned above, the discrepant findings were partly due to a difference in the participants that were included in the study, frequency of practices, and participant's compliance. Most studies included hypertensive patients who were taking antihypertensive drugs. Antihypertensive drugs could be an important confounding variable to blood pressure levels. In the present study, the magnitude of decrease in SBP the intervention group (−5.3 mmHg) was similar to the previous short term study [22, 79, 88] It has been estimated that a 5 mmHg reduction of SBP in the population would result in a 14% overall reduction in mortality due to stroke, 9% reduction in mortality due to CHD, and 7% decrease in all-cause mortality [91]. Accordingly, the reduction of mean SBP in the present study might be clinically importance.

5.3 Effects on stress

The results of the present study showed that the mean change of stress in intervention group was significantly decreased compared with control group. Several studies have also confirmed to be beneficial effects of deep breathing and muscle relaxation techniques on stress. Sheu et al. (2003) [75] revealed that muscle relaxation significant lowered stress and enhanced their perception of health. It was beneficial for patients with hypertension. Chung et al. (2010) [92] assessed the effect of a 30-minute home-based deep breathing on depressive symptoms compared with telephone support in patients with coronary heart disease. After 4 weeks, the mean difference of pre-post change scores was significantly greater in the intervention group compared with the control group (–3.3 score, 95%CI = –5.59 to –0.092, p=0.007). Achara (2005) [93] conducted a quasi-experimental study in patients with coronary artery bypass graft (CABG). The findings showed that the patients used the relaxation treatment requested fewer analgesic drugs than the group that did not receive the treatment.

However, some studies have argued that deep breathing and relaxation are not significant effect on blood pressure levels or stress reduction. Lolak et al (2008) [31] examined the effects of the 8-week muscle relaxation program on anxiety and depression. There was no significant difference between two groups (p=0.22), although the mean scores was decreased for every follow-up time in the intervention group. Chonsaringkarl (2010) [29] indicated that there was no significant difference of the mean SBP and DBP between 15-minute slow breathing and sitting groups in hypertensive patients. The inconsistent finding may be due to difference in eligible subjects, duration and process of intervention. The relaxation techniques should be regularly practiced. Thus, short period of practices might be not appeared the outcome effects. Mars & Abbey (2010) [28] suggested that further research using improved methodology and utilizing specific mindfulness outcome measures in trials with long-term follow-up, larger populations and a wider demographic is need to evaluation.

5.4 The mechanisms relaxation techniques on human body

The mechanisms have been proposed to explain the effects of deep or slow breathing and muscle relaxation on BP and stress. Several relaxation techniques such as meditation, deep breathing, mindfulness meditation, relaxation response, and muscle relaxation decreased sympathetic nervous activity, important for fight–flight mechanisms, and increased parasympathetic activity, important for relaxation and rest [20-21, 77]. The study of Deepak et al. (2012) concluded that the regular practice of meditation initially blunted the sympathetic drive and later on developed control over sympathetic function [53]. Pal (2004) [94] reported that increased parasympathetic activity and decreased sympathetic activity were observed in slow breathing group in healthy volunteers. The mind and voluntary muscles work together in an integrated way. Keeping the mind calm allows muscles to relax, freeing the body of tension reduces sympathetic activity and anxiety, and an increased sense of well-being [18, 64, 77]. Deep breathing and muscle relaxation practices are basically relaxation technique. Both techniques have the potential to be ideal adjuncts to other forms of psychotherapy [16-18]. However, large-scale studies should compare deep breathing and muscle relaxation techniques to other relaxation programs to clarify any specific treatment effects.

5.5 Implementation of deep breathing and muscle relaxation practices

People with grade 1 hypertension (SBP = 140–159 mmHg and/or DBP = 90–99 mmHg) recommend adopting healthy lifestyles. Lifestyle modifications reduce BP, prevent or delay the incidence of hypertension. Combinations of two or more lifestyle modifications can achieve even better results [12]. Based on the findings of the present study, Deep breathing and muscle relaxation techniques should be recommended adopting one of the lifestyle modifications to reduce high blood pressure and stress symptom. Both techniques are simple, easy to learn and implement for daily practice at home, as well as don't need any special tools or equipments. People can self-practice these techniques in any quiet space or posture. Primary health care setting should be offered the techniques in usual care. Nurses or health care workers should be trained a short course to enhance their practice correctly. However,

several instruments have been developed for self-practice such as video, manual guideline, pamphlet, and brochure.

Throughout 8 weeks of study period, 44 participants (70.9%) in intervention group were practices as study protocol regularly (6–7 days/week), 10 were practices 4–5 days/week. Nearly all participants addressed that self-practice in the morning was appropriate time. They feel relaxing, fresh, and peaceful when they first wake up in the morning. They have enough time to practice more than other periods; moreover, relaxation practices reduce their morning anxiety. Consequently, the strategies for enhancing the adoption and continuing self-practice need to be further developed.

5.6 Strengths and limitations of the study

5.6.1 Strengths of the study

This study was a randomized controlled trial. Although it is rarely possible to blind those delivering components of the intervention to individual participants, such a study is the best design to determine the effects of interventions. The present study demonstrated that characteristics of the participants at baseline in intervention and control groups were well balanced and the sufficient sample size can also be considered a marker of internal validity.

5.6.2 Limitations of the study

However, the results of the present study should be interpreted cautiously because of limitations.

1. Errors in blood pressure measurement include improper technique, observer bias, and faulty equipment. Blood pressure varies throughout a day according to activities and differs between in office and out-of office measurements. Office BP is usually higher than BP measured out of the office, which has been ascribed to the alerting response, anxiety and/or a conditional response to the unusual situation. White-coat-effect’ or ‘isolated clinic hypertension’ refers to the condition in which blood pressure is elevated in the office at repeated visits and

normal out of the office [39, 95]. In the present study, the researchers intended to protect any errors including: (i) patients have to rest 5 minutes prior to measurement and not consume caffeine, smoking or physical activity for at least 30 minutes before BP measurement; (ii) The instruments of BP measurement were the same model in which were calibrated at Kosum Phisai Hospital; (iii) the average of two times BP measurement was used in the analyses.

2. Although the researchers encouraged participations to record their practices, it was difficult to control and assess the duration and process of the subjects during deep breathing and muscle relaxation practices as real life setting. These techniques were assessed by interviews and let the participants demonstrate.

3. Many instruments were developed to evaluate stress symptoms such as. Thai-stress test questionnaire developed by the Department of Mental Health, Ministry of Public Health was used to assess in the present study. The instruments commonly used in the primary care settings for screening stress. Such measures may differ from other studies. However, this stress test had sufficient screening quality with the sensitivity of 70.4%, specificity of 64.6% and the Cronbach's alpha Coefficient (internal consistency) of 0.86 [84].

CHAPTER VI
CONCLUSION

This chapter presents conclusion of the study including methodology, results, implications and recommendations for further study as follows.

6.1 Methodology

The presents study was randomized controlled trial, without blinding to examine the effects of deep breathing and muscle relaxation practices on blood pressure and stress in hypertensive participants. This study was performed in District Health Promoting Hospitals (DHPH), Kosum Phisai District, Maha Sarakham Province, Thailand during August to November 2013. The researcher invited DHPHs to cooperate in the study. Four DHPHs (Khuean, Yang Tha Chaeng, Nong Phue, and Yang Yai) were randomly selected in this study. Each DHPH recruited eligible participants who met inclusion and exclusion criteria. The inclusion criteria consisted of: (i) aged ≥30 years; (ii) diagnosed with grade1 hypertension (SBP=140–159 mmHg and/or DBP=90–99 mmHg) and were not taking antihypertensive drugs; (iii) willing to participate; and (iv) were able to communicate in Thai. Exclusion criteria consisted of: (i) severe co-morbidities; (ii) disability of hearing, movement, or travel; (iii) muscle problems, serious injuries, or after surgical; (iv) taking mental disorder drugs; and (v) practiced meditation regularly.

The participants were randomly assigned into either intervention or control group by block randomization. The intervention group received deep breathing and muscle relaxation practices at home daily, 25 minutes per day throughout eight weeks while control group had not. Outcome variables were systolic BP, diastolic BP, and stress. The average of the first and second systolic and diastolic BP readings separated by five minutes was used in the analyses. The stress test was used in the study developed by the Department of Mental Health, Ministry of Public Health.

6.2 Results

6.2.1 Characteristics of the participants

Overall, 124 eligible participants (62 interventions versus 62 controls) were recruited and agreed to participate in this study after giving written informed consent. Among 124 participants, 80 (64.5%) were women and 44 (35.5%) were men. The mean age was 56.9 years (SD=8.3), finished primary school (85.9%) and married (77.4%). About 97 (78.2%) participants had household income<10,000 baht/month. Twenty–three (18.5%) were current smoker and 22 (17.7%) participants were current alcohol drinking. Out of 23 current smokers, 14 (60.9%) were smoking ≥ 10 cigarettes a day. The proportion of abdominal obesity was 61.3% (62.9% in intervention group versus 61.3% in control group). Half of them was obesity (54.0%) found in both intervention (51.6%) and control group (56.4%). According to stress measurement, nearly all of participants were normal level (92.7%). All characteristics of intervention and control groups were similar (p> 0.05).

6.2.2 The effects on blood pressure and stress

At baseline, the mean of systolic BP, diastolic BP and stress scores were not significantly different between the intervention and the control groups (all, p >0.05). At four weeks, the mean changes of both systolic BP and diastolic BP were not significantly difference between two groups (p=0.124 and 0.658, respectively). The eight-week deep breathing and muscle relaxation technique was statistically significant effect on stress score. The mean change difference in intervention group compared with control group was -1.3 (95% CI: -2.6 to -0.03, p = 0.045). The findings of the study suggested that deep breathing and muscle relaxation technique was significantly reduced stress.

6.3 Implications and recommendations

Deep breathing and muscle relaxation are basically relaxation technique. Participants can easily learn in a short time, and practice on their own. These techniques can conveniently be added to other therapeutic interventions. The findings

of the presents study suggest that deep breathing and muscle relaxation should be offered as routine care to patients with high blood pressure. It is possible that a suitable combination of these techniques can further bring down the levels of systolic BP and stress. However, further studies are needed to assess the long-term effect on this practice in subjects with essential hypertension or other chronic diseases.

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APPENDICES

APPENDIX A
PRACTICING OF DEEP BREATHING AND MUSCLE RELAXATION

เทคนิคการฝึกหายใจแบบลึก

ตามปกติคนทั่วไปจะหายใจตื้น ๆ โดยใช้กล้ามเนื้อหน้าอกเป็นหลัก ทำให้ได้ออกซิเจนไปเลี้ยงร่างกายน้อยกว่าที่ควร โดยเฉพาะอย่างยิ่งในเวลาเครียดคนเราจะยิ่งหายใจถี่และตื้นมากขึ้นกว่าเดิม ทำให้เกิดอาการถอนใจเป็นระยะ ๆ เพื่อให้ได้ออกซิเจนมากขึ้น การฝึกหายใจช้า ๆ ลึก ๆ โดยใช้กล้ามเนื้อกระบังลมบริเวณท้องจะช่วยให้ร่างกายได้อากาศเข้าสู่ปอดมากขึ้น เพิ่มปริมาณออกซิเจนในเลือดและยังช่วยเพิ่มความแข็งแรงแก่กล้ามเนื้อหน้าท้องและลำไส้ด้วย

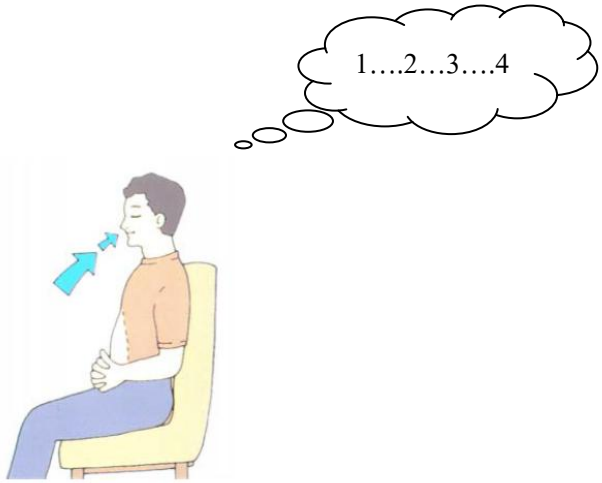
ประโยชน์ของการฝึกหายใจแบบลึก

1. ช่วยให้ร่างกายได้รับออกซิเจนมากเพียงพอ ออกซิเจนจะช่วยควบคุมการทำงานของร่างกายอย่างเป็นระบบ และขับก๊าซคาร์บอนไดออกไซด์ออกจากร่างกายได้ดี
2. ความดันโลหิตลดลง ชีพจรและอัตราการเต้นของหัวใจช้าลง
3. ทำให้จิตใจเกิดความสงบ ใจเย็นขึ้น มีสมาธิ
4. ลดความอ่อนหล้า ช่วยให้กล้ามเนื้อและร่างกายรู้สึกผ่อนคลาย ทำให้นอนหลับได้ดีขึ้น

หลักการฝึกหายใจแบบลึก

1. ผู้ฝึกนั่งในท่าทางที่สบายๆ วางมือทั้งสองข้างไว้บนหน้าท้อง จะหลับตาหรือไม่หลับตาก็ได้

2. หายใจเข้าลึกๆ ช้าๆ โดยหายใจเข้าทางจมูกให้หน้าท้องดันมือขึ้นให้มากที่สุด จนท้องป่อง จะเป็นการยกกระบังลมขึ้น และรู้สึกถึงการเคลื่อนไหวของกระบังลม



ค่อยๆหายใจเข้าพร้อมๆ กับนับเลขในใจ 1…..... 2…… 3……. 4

3. กลั้นลมหายใจไว้สักครู่ประมาณ 3 – 5 วินาที (นับเลขในใจ 1…..... 2…… 3……. 4 เหมือนตอนหายใจเข้า)

4. ผ่อนลมหายใจออกทางปาก โดยเป่าลมหายใจออกจากปากช้าๆคล้ายผิวปาก ห่อริมฝีปากเล็กน้อย หน้าท้องค่อยๆยุบลง ค่อยๆไล่ลมหายใจออกให้หมด จะทำให้แรงดันในหลอดลมเพิ่มขึ้น ช่วยให้ถุงลมแฟบช้ากว่าปกติ อากาศอยู่ในปอดนานขึ้น

ขณะผ่อนลมหายใจออก นับเลขในใจ 1….2….3…..4…..5….6….7….. 8 จนลมหายใจออกจนสุดพอดี

5. หายใจเข้า และออกเป็นจังหวะ สม่ำเสมอ ทำซ้ำๆ เช่นนี้ 10 ครั้ง

อ้างอิงจาก กรมสุขภาพจิต กระทรวงสาธารณสุข. 2546. คู่มือคลายเครียด. พิมพ์ครั้งที่ 4. กรุงเทพฯ: โรงพิมพ์ชุมนุมสหกรณ์การเกษตรแห่งประเทศไทย จำกัด.

เทคนิคการฝึกผ่อนคลายกล้ามเนื้อ

ความเครียดมีผลทำให้กล้ามเนื้อหดตัว สังเกตได้จากอาการหน้านิ่วคิ้วขมวด การเกร็งตัวของกล้ามเนื้อทำให้เกิดอาการปวดตึง เช่น ต้นคอ หลัง ไหล่ ใบหน้า ขมับ เป็นต้น การฝึกคลายกล้ามเนื้อทำให้รู้สึกสบายตัวขึ้นและเมื่อร่างกายสบาย จิตใจก็จะผ่อนคลายความเครียดลง ในขณะฝึกจิตใจจะจดจ่ออยู่กับการคลายกล้ามเนื้อส่วนต่างๆ ทำให้ลดการคิดฟุ้งซ่านและวิตกกังวล จิตใจจะมีสมาธิมากขึ้นกว่าเดิม

อาการที่แสดงว่าคุณเครียดแล้ว

ทางร่างกาย ปวดศีรษะ หัวใจเต้นแรงและเร็ว ใจสั่น ถอนหายใจบ่อยๆ นอนไม่หลับ เบื่ออาหารหรือกินมากกว่าปกติ ระบบย่อยอาหารผิดปกติ ท้องเสีย ผิวหนังเป็นผื่นคัน เสื่อมสมรรถภาพทางเพศ เป็นหวัด แพ้อากาศง่าย กล้ามเนื้อตึงเครียดและปวดเมื่อย โดยเฉพาะบริเวณศีรษะ ต้นคอ หลัง และไหล่

ทางจิตใจ อารมณ์เปลี่ยนแปลงง่าย หงุดหงิด วิตกกังวล คิดมาก คิดฟุ้งซ่าน ลืมง่าย ขาดสมาธิ ตัดสินใจลาบาก หวั่นไหว ใจน้อย ว้าเหว่ สิ้นหวัง มองโลกในแง่ร้าย ขาดความเชื่อมั่นในตนเอง

ทางพฤติกรรม ดื่มจัด สูบบุหรี่จัด ใช้สารเสพติด ใช้ยานอนหลับ มีการกระตุกของกล้ามเนื้อ ตาขยิบ ดึงผม กัดเล็บ ผุดลุกผุดนั่ง จู้จี้ขี้บ่น ชวนทะเลาะ มีเรื่องขัดแย้งกับผู้อื่นบ่อย ติฉินนินทา หรือเงียบขรึมเก็บตัว

ประโยชน์ของการฝึกผ่อนคลายกล้ามเนื้อ

1. ลดความเครียดและความกังวลทางจิตใจ
2. ลดอาการปวดเมื่อย ตึงเครียดของกล้ามเนื้อ
3. จิตใจสงบ แจ่มใส
4. ระบบประสาทอัตโนมัติทำงานกลับเป็นปกติ
5. นอนหลับได้ดี
6. เป็นพื้นฐานสำหรับการฝึกสติและสมาธิ

หลักการฝึกผ่อนคลายกล้ามเนื้อ

1. เลือกสถานที่ที่สงบปราศจากเสียงรบกวน นั่งในท่าที่สบายคลายเสื้อผ้าให้หลวม ถอดรองเท้า หลับตาทำใจให้ว่าง ตั้งสมาธิอยู่ที่กล้าเนื้อส่วนต่างๆ

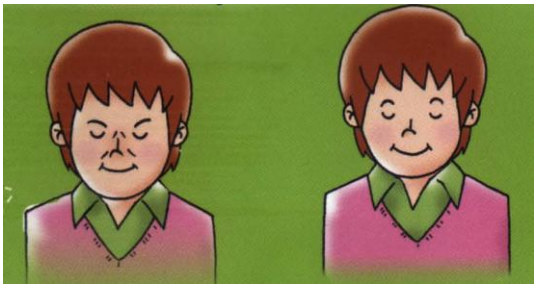
ฝึกเกร็งและคลายกล้ามเนื้อ 10 กลุ่ม ปฏิบัติท่าละ 5 ครั้ง ดังนี้

1. มือและแขนขวา กำมือเกร็งแขนแล้วคลาย
2. มือและแขนซ้าย กำมือเกร็งแขนแล้วคลาย

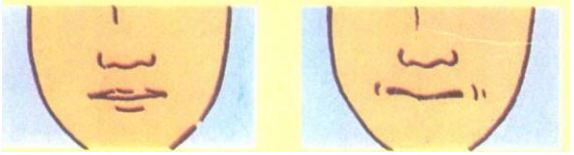
3. หน้าผาก เลิกคิ้วสูงแล้วคลาย ขมวดคิ้วแล้วคลาย

เลิกคิ้วสูงแล้วคลาย ขมวดคิ้วแล้วคลาย

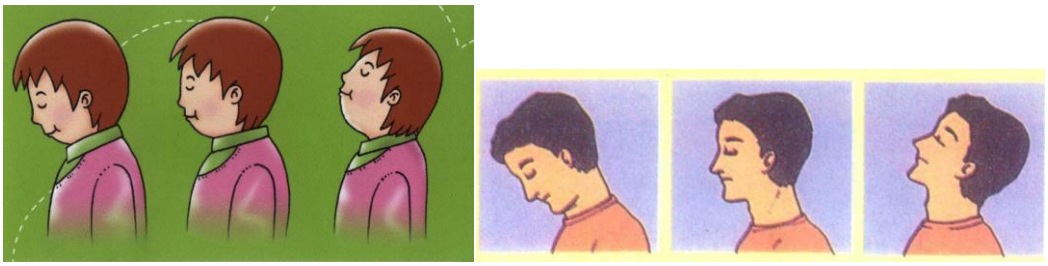
4. ตา แก้ม จมูก: หลับตาให้แน่น ย่นจมูก แล้วคลาย



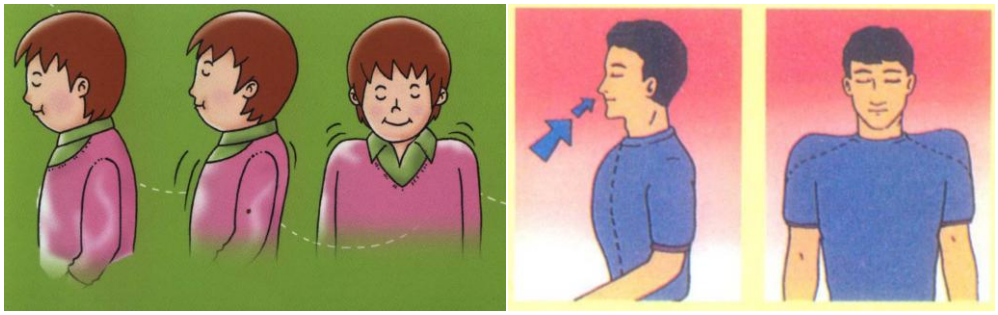
5. ขากรรไกร ลิ้น ริมฝีปาก: กัดฟัน ใช้ลิ้นดันเพดานปากแล้วคลาย เม้มปากแน่น แล้วคลาย



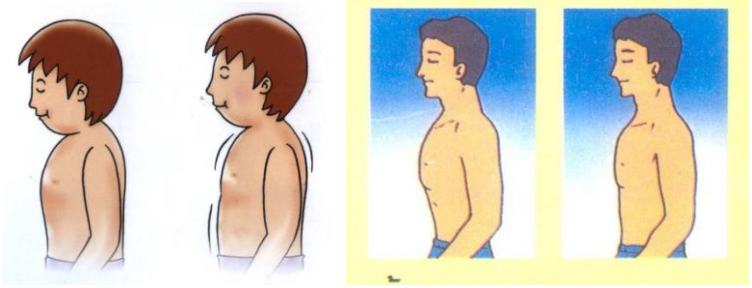
6. คอ: ก้มหน้าให้คางจรดคอ แล้วคลาย เงยหน้าจนสุดแล้วคลาย



7. อก ไหล่ และหลัง: หายใจเข้าลึกๆ กลั้นไว้ แล้วคลาย ยกไหล่สูงแล้วคลาย

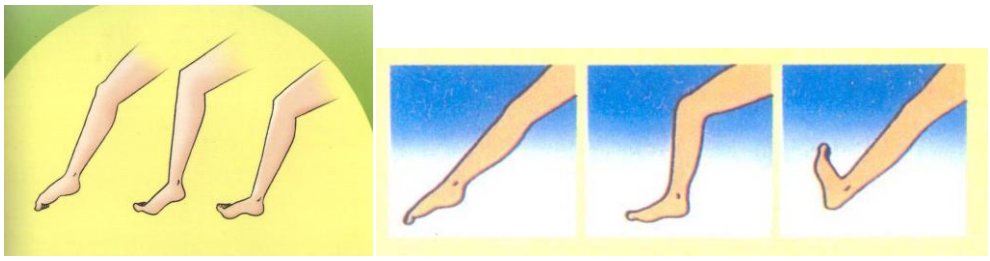


8. หน้าท้องและก้น: แขม่วท้องแล้วคลาย ขมิบก้นแล้วคลาย



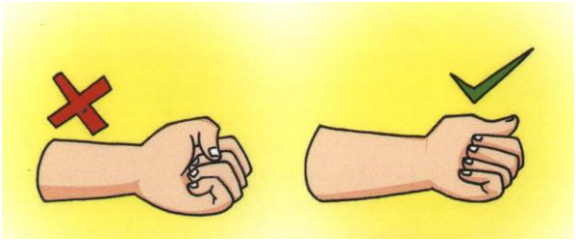
9. เท้าและขาขวา: เหยียดขา งอนิ้วเท้าแล้วคลาย เหยียดขากระดกปลายเท้าแล้วคลาย

10. เท้าและขาซ้าย: เหยียดขา งอนิ้วเท้าแล้วคลาย เหยียดขากระดกปลายเท้าแล้วคลาย



ข้อแนะนำ

1. ระยะเวลาที่เกร็งกล้ามเนื้อ ให้น้อยกว่าระยะเวลาที่ผ่อนคลาย เช่น เกร็ง 3-5 วินาที ผ่อนคลาย 10-15 วินาที ฝึกท่าละ 5 ครั้ง
2. เวลากำมือ ระวังอย่าให้เล็บจิกเนื้อตัวเอง



3. เมื่อคุ้นเคยกับการผ่อนคลายแล้ว ให้ฝึกคลายกล้ามเนื้อได้เลย โดยไม่จำเป็นต้องเกร็งก่อน
4. อาจเลือกคลายกล้ามเนื้อเฉพาะส่วนที่เป็นปัญหา เท่านั้นก็ได้ เช่น บริเวณใบหน้า ต้นคอ หลัง ไหล่ ไม่จำเป็นต้องคลายกล้ามเนื้อทั้งตัวจะช่วยให้ใช้เวลาน้อยลง และสะดวกมากขึ้น

อ้างอิงจาก

กรมสุขภาพจิต กระทรวงสาธารณสุข. 2546. คู่มือคลายเครียด. พิมพ์ครั้งที่ 4. กรุงเทพฯ: โรงพิมพ์ชุมนุมสหกรณ์การเกษตรแห่งประเทศไทย จำกัด.

APPENDIX B QUESTIONNAIRE

เลขที่แบบสอบถาม

.....

วันที่ □□/□□/□□

วันที่ เดือน ปี

เก็บข้อมูลครั้งที่ .....

รหัสอาสาสมัคร.....

ชื่อสถานบริการ.....

การวิจัยเรื่อง

ผลของการฝึกหายใจแบบลึกร่วมกับการผ่อนคลายกล้ามเนื้อ ต่อความดันโลหิต และความเครียด ของผู้ป่วยความดันโลหิตสง

คำชี้แจงในการตอบแบบสอบถาม

1. แบบสอบถามชุดนี้จัดทำขึ้นเพื่อประเมินผลการฝึกหายใจร่วมกับการผ่อนคลายกล้ามเนื้อ ผู้วิจัยขอ รับรองว่าข้อมูลที่ท่านตอบนั้นจะปกปิดเป็นความลับ และจะนำเสนอผลการศึกษาในภาพรวมเท่านั้น

2. แบบสอบถามชุดนี้มีทั้งหมด 3 ส่วน ประกอบด้วย

ส่วนที่ 1	ข้อมูลทั่วไปของผู้ตอบแบบสอบถาม	จำนวน 14 ข้อ
ส่วนที่ 2	พฤติกรรมสุขภาพ จำนวน	7 ข้อ
ส่วนที่ 3	การประเมินความเครียด	จำนวน 20 ข้อ

3. การตอบแบบสอบถาม

3.1 โปรดเติมข้อความหรือให้ข้อมูล ที่ตรงกับความเป็นจริงใน.....ที่เว้นไว้ให้ตอบ

3.2 สำหรับข้อให้เลือกตอบ ให้ขีดเครื่องหมายถูก (✓) ที่ตรงกับข้อความ หรือ ระดับความคิดเห็นของท่านตามความเป็นจริง

ลงชื่อ.....ผู้สัมภาษณ์

ส่วนที่ 1 ข้อมูลทั่วไปของผู้ตอบแบบสอบถาม		
โปรดเติมข้อความ หรือ ขีดเครื่องหมายถูก (✓) หน้าข้อความที่ท่านเลือก		
คำถาม		**คำตอบ**
P1	เพศ	❑[1] หญิง ❑[2] ชาย
P2	อายุ	.....ปี
P3	สถานภาพสมรส	❑[1] โสด ❑[2] สมรส/อยู่ด้วยกัน ❑[3] หย่าร้าง/หม้าย ❑[4] สมรส/แยกกันอยู่
P4	ท่านนับถือศาสนา	❑1. พุทธ ❑2. อิสลาม ❑3. คริสต์ ❑4. อื่น ๆ
P5	ระดับการศึกษาสูงสุดของท่าน	❑[1] ประถมศึกษา ❑[2] มัธยม/ ปวช./ ปวส. ❑[3] อนุปริญญา ❑[4] ปริญญาตรี ❑[5] ปริญญาโท/เอก ❑[6] ไม่ได้เรียนหนังสือ
P6	อาชีพ	❑[1] รับจ้างทั่วไป ❑[2] เกษตรกรรม ❑[3]พนักงานบริษัทเอกชน ❑[4] แม่บ้าน/พ่อบ้าน ❑[5] ค้าขาย/ธุรกิจส่วนตัว ❑[6] ข้าราชการ/รัฐวิสาหกิจ/พนักงานของรัฐ ❑[7] อาชีพอื่นๆ โปรดระบุ…… ❑[8] ไม่ได้ทำงาน/ ว่างงาน
P7	รายได้ครอบครัวเฉลี่ยต่อเดือน	.....บาท/เดือน
P8	สิทธิ์ที่ใช้ในการรักษาพยาบาล	❑[1] ข้าราชการ/รัฐวิสาหกิจ ❑[2] ประกันสังคม ❑[3] บัตรทอง ❑[4] จ่ายเงินเอง ❑[5] เบิกประกันชีวิต ❑[6] อื่นๆ ระบุ.....
P9	ท่านสูบบุหรี่หรือไม่	❑[0] ไม่สูบ ❑[2] เคยสูบ แต่เลิกแล้ว ❑[1] ปัจจุบันสูบ วันละ.....มวน หรือ สัปดาห์ละ.....มวน หรือ เดือนละ.....มวน
P10	ท่านดื่มเหล้า เบียร์ เครื่องดื่มที่มีแอลกอฮอล์หรือไม่	❑[0] ไม่ดื่ม ❑[2] เคยดื่ม แต่เลิกแล้ว ❑[1] ปัจจุบันดื่ม วันละ..... ....แก้ว/กระป๋อง หรือ สัปดาห์ละ.....แก้ว/กระป๋อง หรือ เดือนละ.....แก้ว/กระป๋อง

ส่วนที่ 1 ข้อมูลทั่วไปของผู้ตอบแบบสอบถาม (ต่อ)		
P11	นอกจากท่าน มีญาติสายตรงเป็นโรคความดันโลหิตสูงหรือไม่	❑0 ไม่มี ❑1 มี คือ ……..... พ่อ แม่ ……ปู่ ย่า ตา ยาย .....พี่ น้อง .....บุตร
P12	ท่านได้กินยาโรคความดันโลหิตสูง หรือไม่	❑0 ไม่ได้กิน ❑1 กิน
P13	ท่านมีโรคประจำตัว หรือไม่ ❑0 ไม่มี ❑1 มี ได้แก่ 1……เป็นมานาน.....ปี ……..เดือน 2……เป็นมานาน.....ปี ……..เดือน 3……เป็นมานาน.....ปี ……..เดือน	
P14	ตรวจร่างกายเบื้องต้น น้ำหนัก.....กก. ส่วนสูง.....ซม. เส้นรอบเอว.....ซม. ชีพจร.....ครั้ง/นาที ความดันโลหิต ครั้งที่ 1……มม.ปรอท ความดันโลหิต ครั้งที่ 2……มม.ปรอท	

ส่วนที่ 2 พฤติกรรมสุขภาพ					
การปฏิบัติตัว		**การปฏิบัติ / สัปดาห์**			
		ไม่เคยเลย	**บางครั้ง (1-2 วัน)**	**บ่อยครั้ง (3-5 วัน)**	**ประจำ (6-7 วัน)**
P15	ท่านรับประทานอาหารรสเค็ม หรือ เติมน้ำปลาเกลือ ซีอิ้ว หรือซอส ปรุงเพิ่มในอาหาร หรือไม่				
P16	ท่านดื่มชา กาแฟ เครื่องดื่มชูกำลัง เช่น เอ็ม-150 กระทิงแดง สปอนเซอร์ แรงเยอร์ หรือไม่				
P17	กินผักอย่างน้อย **วันละ 4 ทัพพี**				
P18	กินอาหารไขมันสูง เช่น หนังเป็ด หนังไก่ มันหมู ปลาหมึก อาหารใส่กะทิ หมูสามชั้น เนย ครีม				

การปฏิบัติตัว		การปฏิบัติ / สัปดาห์			
		ไม่เคยเลย	บางครั้ง (1-2 วัน)	บ่อยครั้ง (3-5 วัน)	ประจำ (6-7 วัน)
P19	กินของหวาน ขนมหวาน ขนมขบเคี้ยว				
P20	ท่านทำงาน หรือทำกิจกรรมที่ต้องออกแรง เช่น ยกของ ถูบ้าน ซักผ้า ตัดหญ้า ขุดดิน ทำไร่ ทำสวน อย่างน้อยครั้งละ 10 นาที				
P21	ท่านออกกำลังกาย อย่างน้อยครั้งละ 10 นาที				

ส่วนที่ 3 การประเมินความเครียด

ในระยะเวลา 1 เดือนที่ผ่านมานี้ ท่านมีอาการ หรือความรู้สึกต่อไปนี้มากน้อยเพียงใด โปรดกาเครื่องหมาย “✓” ลงในช่องระดับอาการที่เกิดขึ้นกับตัวท่าน ตามความเป็นจริงมากที่สุด

รายการประเมิน	ระดับอาการ			
	ไม่มีเลย	เป็นครั้งคราว	เป็นบ่อย	ประจำ/เกือบทุกวัน
คะแนน	0	1	2	3
1. นอนไม่หลับเพราะคิดมากหรือกังวลใจ				
2. รู้สึกหงุดหงิด รำคาญใจ				
3. ทำอะไรไม่ได้เลยเพราะประสาทตึงเครียด				
4. มีความวุ่นวายใจ				
5. ไม่อยากพบปะผู้คน				
6. ปวดหัวข้างเดียว หรือปวดบริเวณขมับทั้ง 2 ข้าง				
7. รู้สึกไม่มีความสุขและเศร้าหมอง				
8. รู้สึกหมดหวังในชีวิต				
9. รู้สึกว่าชีวิตของตนไม่มีคุณค่า				
10. กระวนกระวายอยู่ตลอดเวลา				

รายการประเมิน	ระดับอาการ			
	ไม่มีเลย	เป็นครั้งคราว	เป็นบ่อย	ประจำ/เกือบทุกวัน
คะแนน	0	1	2	3
11. รู้สึกว่าตนเองไม่มีสมาธิ				
12. รู้สึกเพลียไม่มีแรงจะทำอะไร				
13. รู้สึกเหนื่อยไม่อยากทำอะไร				
14. มีอาการหัวใจเต้นแรง				
15. เสียงสั่น ปากสั่น หรือมือสั่นเวลาไม่พอใจ				
16. รู้สึกกลัวผิดพลาดในการทำสิ่งต่างๆ				
17. ปวด หรือเกร็งกล้ามเนื้อบริเวณท้ายทอยหลังหรือไหล่				
18. ตื่นเต้นง่ายกับเหตุการณ์ไม่คุ้นเคย				
19. มึนงงหรือเวียนศีรษะ				
20. ความสุขทางเพศลดลง				

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จบแบบสอบถาม

ขอบคุณที่ให้ความร่วมมือในการตอบแบบสอบถาม

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