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# Horticultural Therapy Program Based on Health Care Education

for Stress Reduction of Hypertensive Patients

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## Abstract

This study was conducted to analyze the effects of horticultural therapy program based on health care education on quality of life, stress, depression and anxiety of hypertensive patients, and to find effects on ability to control hypertension by continuing health care education and horticulture education. Subjects were 60 adult hypertension patients aged 30 to 64 at a hospital in K-gu, Seoul, aged 30 to 64. Experimental group of 30 patients received horticultural therapy program and control group of 30 patients did not receive horticultural therapy program. The horticultural therapy program was conducted for 60 minutes per session, twice a week, and total 8 times. This study was performed from 1. Aug. to 31. Oct. in 2015. Each session was based on contents of basic health care education and horticultural education. The programs were verified by 5 specialists in related fields (1 doctor, 2 nurses, 2 horticultural therapists). To prove effects of horticultural therapy program, patients' stress, depression, anxiety, quality of life and knowledge of hypertension and horticulture were estimated 3 times(before, after and 1 month after the experiment). SPSS (Version 22 for Windows) was used for t-test of independent sample, which analyzes demographic information and verifies homogeneity, and for t-test of matching sample which shows different effects between groups. As the results, horticultural therapy program based on health care education made significant positive effects on stress and quality of life of hypertensive patients. Moreover, the horticultural therapy program improved knowledge on horticulture and hypertension. However, there were no significant changes in control group. This result shows that the horticultural therapy program based on health care education made significant positive effects on stress and quality of life of hypertensive patients.

Key words: gardening, human issues in horticulture, hypertension education, socio horticulture

# I. Introduction

Hypertension is one of the major diseases that increases stroke, myocardial infarction, renal failure, congestive heart failure, atherosclerosis, and dementia (Forette et al., 1998). The prevalence of hypertension among adults aged 30 or above in Korea has increased from 24.6% in 2007 to 29.0% in 2012 (Korean National Statistical Office, 2012). Most hypertensive patients do not perceive their state until the complications break out (Kim et al., 2000; Jo et al., 2004), and the level of care also turned out to be low (Nine et al., 2003).

In Korea, the Ministry of Health and Welfare established the Comprehensive Plan for Cardio- and Cerebrovascular Diseases

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in 2011, through which it created and distributed the 9 Rules of Life to Prevent and Manage - and Cerebrovascular Diseases for people to prevent and manage such diseases (Ministry of Health and Welfare in Korea, 2014). However, the national hypertension management program currently focuses only on short-term blood pressure management of hypertensive patients, with limitations that make it difficult to be carried on without the help of medical professionals, such as doctors, nurses, sports curers, and dietitians (Lee, 2004; So and Lee, 2010).

Advanced countries like the US, Canada and Japan have been providing education on sustainable management of diseases that require chronic management such as hypertension, diabetes and metabolic syndrome since the 1980s as part of their health promotion programs.

Meanwhile, according to research data on the characteristics of hypertensive patients, they have more chronic mental issues such as stress, depression and anxiety disorders than ordinary people (Jo et al., 1997). Hypertensive patients suffer from

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higher stress levels than ordinary people (Lee and Han, 2000), and cannot adapt well to stress due to chronic mental conflicts (Jo et al., 1997). Stress is a mental and physical state of tension that occurs when one is exposed to a situation that is difficult to adjust (Lee et al., 2012). In other words, stress affects not only psychiatric diseases such as depressive and anxiety disorders but also physical diseases such as cardiovascular and digestive diseases (Han, 2003).

Hypertensive patients also have mental issues like depressive and anxiety disorders aside from stress, and depression has a negative impact on individual emotions and especially leads to deep sorrow and deprives one of interest or joy in daily life (American Psychiatry Association, 2017). Lukkarinen and Hentinen (1997) stated that patients with cardiovascular diseases including hypertension suffer from mental burden like stress, anxiety and depression due to their diseases, and Ginty et al. (2013), Jeon and Kim (2012), and Saboya et al. (2010) also proved that hypertensive patients have high levels of anxiety and depression.

Furthermore, hypertensive patients turned out to have a lower quality of life than people without hypertension (Park et al., 1992; Bardage et al., 2003; Li et al., 2005). For hypertensive patients, quality of life is an indicator that reveals their subjective evaluation to analyze the effects of the disease or treatment on the patients in physical, mental and social aspects (Kim, 1997). Stress and quality of life are closely related (Clark et al., 2011), and in particular, stress management of patients with chronic diseases affects their quality of life (Han, 2003). Li et al. (2005) controlled age, gender, socio-demographic factors and complications in their study on the quality of health-related life of hypertensive patients, and the results showed that hypertensive patients had lower quality of healthrelated life than the normal group in all areas. However, the current health care education focuses only on blood pressure management, with no program to manage stress for hypertensive patients.

In terms of research on horticultural therapy, it turned out that horticultural therapy programs helped lower blood pressure or pulse of people with intellectual disabilities (Doxon et al., 1987) and ordinary people (Owen, 1994; Coleman and Mattson, 1995; Lohr et al., 1996). However, there was no research on horticultural therapy that took an approach to solve mental problems like stress, depression, anxiety and quality of life for hypertensive patients.

Therefore, this study was conducted to determine the effects of horticultural therapy programs applying health care education for hypertensive patients on alleviation of their stress, anxiety and depression and improvement of quality of life.

# II. Research method

## 1. Subjects

This study is conducted on hypertensive patients that are outpatients of Konkuk University Medical Center located in Gwangjin-gu. To recruit participants, a notice including descriptions about the horticultural therapy program was posted on the bulletin board of the outpatient department at the hospital, after which the doctor in charge explained the contents of the program to hypertensive patients. Patients were accepted as participants in order of application. They were hypertensive patients from age 30 to 64, which aged showing high prevalence of hypertension according to the Korea Centers for Disease Control and Prevention (2014). They were to show systolic pressure of 140 mmHg or lower and diastolic pressure of 90 mmHg or lower in resting blood pressure, have received consistent prescriptions of antihypertensive drug in the last 6 months if they take medication, be in self-management such as lifestyle improvement even though they are diagnosed with hypertension by the doctor, and be able to participate in at least 6 of total 8 sessions. Hypertensive patients that are pregnant or nursing, or have complications that restrict their everyday life (e.g. cardiac failure, myocardial infarction, cerebral infarction, etc.) were excluded from this study. Among total 60 hypertensive patients that were ultimately selected, those who picked number one in the draw were assigned to the experimental group participating in the horticultural therapy program, while those who picked number two were assigned to the control group. Before carrying out the first session of the program, they signed the consent that described the objective and method of this program in the orientation, and their demographic data such as age, gender, education level, religion, etc. were collected through a questionnaire (Table 1). To measure blood pressure, the subjects were to relax in a sitting position for about 10

Session	Health care education	Horticulture education	Contents of horticultural therapy program based on health care education		
1	Definition of hypertension	Hydrophilic plants and cardiovascular heart	Cut Victoria with scissors. Explain mechanism of hypertension by comparing phloem and xylem with human vein		
2	Examine for hypertension diagnosis	Process of how plants get energy. Various kinds of hypertension diagnosis tests	By repotting <i>Epipremnum aureum</i> , explain hypertension diagnosis is based on multi tests like plants need both $CO_2$ and light		
3	Complications of hypertension- stroke, cardiac infarction, angina	Breathing roots and diseases occurs when hypertension is not controlled 1 - Stroke, cardiac infarction, angina	By repotting 30 pots of <i>Spathiphyllum</i> with long roots, explain role of roots and its reviving ability. Compare roots with cerebrovascular		
4	Complications of hypertension- cardiac insufficiency, arrhythmia	Plants breeding and hypertension complications 2 - Cardiac insufficiency, arrhythmia	Explain definition and treatment of cardiac insufficiency, arrhythmia while cutting <i>Epipremnum aureum</i> . Emphasis importance of constant treatment like plants' breeding		
5	Hypertension treatment drug	Principle of plants' growth - Principle of hypertension treatment drug	Compare plants with water and no water. Explain right way to water and principle of plant's growth. Compare with mechanism of hypertension		
6	Hypertension and diet	Nutritional supplements for plants. Foods good for hypertension	Explain nutritional supplements for plants by showing calcareous soil and alkali soil. Compare with foods good for hypertension. Give nutritional supplements to <i>Dracaena</i> and <i>Epipremnum aureum</i> planted in session 1, 2		
7	Hypertension and excercise	Photophilic plants, photophobic plants. Exercises good for hypertension	Emphasize importance of proper amount of light for plants by comparing <i>Syngonium</i> with too much light and less light. Explain appropriate exercise for hypertension patients		
8	Management plan	Make plans for management hypertension and horticultural leisure. Assessment	Sow kidney bean seeds. Make plans for further management of hypertension and horticultural leisure by themselves. Bring product after 4 weeks		

Table 1. Horticultural therapy program based on health care education for hypertensive patients.

minutes upon arriving at the laboratory, after which their blood pressure was measured with their arms and heart positioned in parallel. A stethoscope and mercury sphygmomanometer (Speidel and Keller, Germany) were used to put on a cuff on the upper left arm, and the stethoscope was fixated on the brachial artery. The systolic and diastolic blood pressures were measured twice at a five-minute interval, and the average was calculated.

This study was deliberated and approved by the Institutional Review Board of Konkuk University (approval no. 7001355-201406-HR-024).

#### 2. Research environment

This horticultural therapy program was carried out twice a week from August to September 2014 in total 8 sessions (60 minutes on average per session). This program was implemented in a lecture hall (about 20 pyeong) with the average indoor temperature of 20-25°C and relative humidity of 70-80%. In each session, the participants performed the horticultural activities sitting around a rectangular desk in groups of 5-6 members. The program was carried out by one main therapist (Korean Horticultural Therapy Association Level 2 certification, master's program in horticultural therapy) and two assistant therapists (Korean Horticultural Therapy Association Level 2 certification, master's program in horticultural therapy). Patients participating in the program showed a 100% attendance rate.

 Development of horticultural therapy program based on health care education to relieve stress for hypertensive patients

This horticultural therapy program consists of total 8 sessions, which is the commonly used number of sessions for health care education programs with reference to total 28 meta-analysis studies on the effects of hypertension health care education programs analyzed by Lee (2003).

The program consisted of health care education and horticulture education/activities of hypertensive patients in each session (Table 1). The contents of education on the symptom and management of hypertension were selected based on the contents of health care education for hypertensive patients published by Korea Centers for Disease Control and Prevention (2012). Basic contents about hypertension selected such as definition of hypertension, diagnosis, complications, drugs, diet and exercise were provided according to the topic of the program in each session.

Moreover, for horticulture education, basic contents of horticulture based on daily life horticulture such as basic structure of plants, photosynthesis, roots, reproduction, soil and light were provided, along with horticultural activities related to the contents of education on theories. The plants used were those that can be easily obtained year-round: *Dracaena deremensis* N.E.Br. var. *Warneckii* (Dracaena-victoria), *Spathiphyllum cannifolium* (Dryand.) Schott (Peace lily), *Syngonium podophyllum* Schott (Syngonium), *Scindapusus aureus / Epipremnum aureum* (Scindapsus).

The contents of this program were modified and improved with advice from total 5 related experts (1 clinical professor in cardiology, 2 nurses in cardiology, and 2 horticultural therapists with Level 1 certification) (Table 1).

## 4. Assessment and analysis

1) Assessment tool

To verify the effects of this program, this study measured stress, quality of life, anxiety, depression, and knowledge in hypertension, and knowledge in horticulture of the patients that participated in this study (experimental group, control group), before and after the horticultural therapy program as well as 1 month later. The experimental group also assessed their satisfaction in the horticultural therapy program.

# (1) Stress scale

Stress was measured with the Global Assessment of Recent Stress (GARS) designed by Linn in 1985 and standardized by Koh (1988) in Korean. The tool consists of 8 items that can assess the perception of stress in the last week, such as work, pressure about job and school, pressure about personal relations, pressure about changes in personal relations, pressure about non-daily things, and overall pressure during the week. It is rated on a 10-point Likert scale, with higher scores showing higher level of perceiving stress. The reliability of this questionnaire was 0.81 in Cronbach's alpha.

## (2) Quality of life scale

Quality of life was measured with the World Health Quality of Life Assessment Instrument-100 (WHOQOL-100) developed by WHO and revised by Min et al. (2000) in Korean. It consists of total 24 items in 4 categories: 8 items in physical health, 6 items in psychological health, 2 items in social relationships, and 8 items in environmental health. Each item is rated on a 5-point scale, with higher scores showing higher quality of life. The reliability of this questionnaire was 0.89 in Cronbach's alpha.

#### (3) Depression scale

Depression was measured with the tool developed by Beck et al. (1961) and adapted by Lee and Song (1991), consisting of total 21 items. It is rated on a 4-point Likert scale, with higher scores showing more severe symptoms of depression. The sum of the scores that is 16 points or higher may indicate depression, but there are limitations in diagnosing someone with depression or determining the severity with this score alone. The scores for depressive state are classified into no depression (0-9 points), mild depression (10-15 points), moderate depression (16-23 points), and severe depression (24-63 points). The reliability of this questionnaire was 0.79 in Cronbach's alpha.

#### (4) Anxiety scale

Anxiety was measured with the State-Trait Anxiety Inventory (STAI) developed by Spielberger et al. (1970) and standardized by Kim (1979) in Korean. It consists of two factors: state anxiety that is currently felt, and trait anxiety that is generally felt by people. There are total 40 items, with 20 items for each of the two sub-factors. It is rated on a 4-point Likert scale, with higher scores indicating higher level of anxiety (Oh et al., 2012).

The reliability of this questionnaire is presented with

Cronbach's alpha of 0.93 for state anxiety and 0.91 for trait anxiety in the study by Kim (2011).

#### (5) Assessment of knowledge in hypertension

Knowledge in hypertension is measured with total 7 items, one each per session, based on the contents learned in the health care education of this study. The items are multiplechoice questions with five choices for the answer, with reference to the textbook on hypertension health care education (basic and advanced) published by Korea Centers for Disease Control and Prevention (2012) and the hypertension knowledge assessment tool by Lee (1998) and Jang (2003). They were supervised by one clinical professor in cardiology at a medical school.

## (6) Assessment of knowledge in horticulture

Knowledge in horticulture is measured with total 7 items, one each per session, based on the contents learned in the horticulture education of this study. The items are multiplechoice questions with five choices for the answer, with reference to the horticultural knowledge assessment survey by Jo (2013) on questions about the basic structure of plants, photosynthesis, roots, unisexual propagation of plants, soil, and light. They were supervised by two professors in horticultural science.

#### (7) Satisfaction for the horticultural therapy program

To assess satisfaction in the horticultural therapy program implementing hypertension health care education, a survey was conducted only among the experimental group after the last session of the program. To survey the satisfaction in this program, items related to this program were modified and improved among those in the studies by Jeong and Huh (2011), Kwon (2012), Park et al. (2016) with regard to general preference of horticulture and morphological preference of horticultural plants. Total 7 items were ultimately used in the questionnaire.

## 2) Analysis method

To compare the demographic data of two groups (experimental and control group) and verify the homogeneity between the groups through preliminary assessment, SPSS (Version 22 for Windows) was used to conduct an independent samples t-test at the p<.05 level. To determine the changes in stress, quality of life, depression, anxiety, knowledge in hypertension, and knowledge in horticulture of the experimental and control group before and after the horticultural therapy program as well as 1 month later, SPSS (Version 22 for Windows) was used to conduct a paired t-test at the p<.05 level. For data analysis of the satisfaction survey on the program, Microsoft Excel (Office 2007; Microsoft Corp., Redmonf, WA) was used for descriptive statistics on the mean, standard deviation and percentage of each collected item.

## I. Results and discussion

1. General characteristics of the control and experimental group and homogeneity testing

The participants in this study are total 60 adult hypertensive patients (30 in the experimental group and 30 in the control group) registered as outpatients of the department of cardiology at Konkuk University Medical Center in Gwangjin-gu. Table 2 shows the general characteristics of the two groups.

The average height of the subjects was  $157.4\pm8.5$  cm for the experimental group and  $158.9\pm5.3$  cm for the control group, and the average weight was  $57.7\pm10.2$  kg for the experimental group and  $58.4\pm6.4$  kg for the control group, showing no significant difference. The average blood pressure was  $126\pm16.42$  mmHg for the experimental group and  $127\pm16.01$  mmHg for the control group in systolic pressure, and  $77\pm10.68$  mmHg for the experimental group and  $76\pm10.46$  mmHg for the control group in diastolic pressure, showing no significant difference and thereby proving that the two groups are homogeneous.

To determine the basic level of information about hypertension and knowledge in health care education of the participants, this study compared the time passed after being diagnosed with hypertension, and experience in health care education related to hypertension. The result showed that there was no significant difference between the two groups (p<.05, Table 2). Most subjects were diagnosed with hypertension in less than a year, and they generally had none or one experience receiving health care education about hypertension. For the question about experience in horticultural activities, both groups turned out to have experience.

			a	<u> </u>
Variables		HT (n=30) Control (n=30)		Probability
Unight (am)		Avera	157 4 (5 2)	0.4
ricigin (CIII) Weight (kg)		130.9 (8.3) 58 / (10 2)	137.4 (3.3) 57.7 (6.4)	0.4
The number of times about hypertension education	n	0.5 (1.0)	03(08)	0.7
Systolic pressure		127 (16.4)	127 (16 0)	1.0
Blood pressure Diastolic pressure		77 (10.7)	76 (10.5)	0.9
Diastone pressure		N	(%)	0.9
	Female	26 (86.7)	(, 0)	
Gender	Male	4 (13.3)		29 (96.7)
	30-39	0 (0)		
	40-49	2 (6.7)		
Age	50-59	9 (30.0)		2 (6.7)
	60-65	19 (63.3)		
	Less than 1	13 (43.3)	18 (60.0)	
Diagnosis of period (vegt)	1-4	10 (33.3)	6 (20.0)	0.6
Jiagnosis of period (year)	5-9	4 (13.3)	4 (13.3)	0.0
	More than 10	3 (10.0)	2 (6.7)	
Experience of hypertension education	Yes	5 (16.7)	8 (26.7)	0.5
	No	Average (SD)   158.9 (8.5) 157.4 (5.3)   58.4 (10.2) 57.7 (6.4)   0.5 (1.0) 0.3 (0.8)   127 (16.4) 127 (16.0)   77 (10.7) 76 (10.5)   N (%) 26 (86.7)   4 (13.3) 0 (0)   2 (6.7) 9 (30.0)   19 (63.3) 18 (60.0)   10 (33.3) 6 (20.0)   4 (13.3) 4 (13.3)   3 (10.0) 2 (6.7)   5 (16.7) 8 (26.7)   7 (23.3) 8 (26.7)   7 (23.3) 9 (30.0)   1 (3.3) 2 (6.7)   7 (23.3) 9 (30.0)   1 (3.3) 2 (6.7)   7 (23.3) 9 (30.0)   1 (3.3) 2 (6.7)   6 (20.0) 5 (16.7)   2 (6.7) 0 (0)   2 (6.7) 9 (30.0)   1 (3.3) 2 (6.7)   4 (13.3) 3 (10.0)   8 (26.7) 9 (30.0)   1 (3.3) 0 (0)   1 (3.3) 0 (0)	0.3	
	Most	13 (43.3)	8 (26.7)	
nterest of hypertension	More	7 (23.3)	8 (26.7)	
nanagement	a little	7 (23.3)	9 (30.0)	0.7
	No	1 (3.3)	2 (6.7)	
	Absolutely no	2 (6.7)	3 (10.0)	
	Both of all	2 (6.7)	0 (0)	
Smoking, alcohol	Only smoking	0 (0)	2 (6.7)	0.3
	Only alcohol	6 (20.0)	5 (16.7)	
	Both of nothing	22 (73.3)	23 (76.7)	
Experience of plant-growing activity	ence of plant-growing activity Yes 27 (90.)		26 (86.7)	0.7
perionee of plant growing activity	No	3 (10.0)	4 (13.3)	
	Botanical garden	1(3.3)	2(6.7)	
nformation gamma of horizontrum advantion	TV an internet	4 (15.5) 8 (26.7)	3(10.0)	0.8
mornation source of norticultural education	I V OF Internet	8 (20.7) 1 (2.2)	9 (30.0)	0.8
	Self study	1 (3.3)	U (U) 16 (53 3)	
	Middle school	5(166)	6 (20 0)	
	High school	10 (33 3)	9 (30 0)	
Education	University	14 (46 7)	15 (50.0)	0.8
	Graduate school	1 (3 3)	0(0)	
	Unmarried	0(0)	4(133)	
	Married	23 (76.7)	23 (76.7)	
Aarıt status	Remarried	1 (3.3)	0 (0)	0.1
	Others	6 (20.0)	3 (10.0)	
	Buddist	8 (26.7)	7 (23.3)	
	Christian	8 (26.7)	4 (13.3)	
Religion	Roman catholic	11 (36.7)	18 (60.0)	0.4
	Atheist	2 (6.7)	1 (3.3)	
	Others	1 (3.3)	0 (0)	
	Yes	11 (36.7)	15 (50.0)	0.4
mpioyment	No	19 (63.3)	15 (50.0)	0.4
	Less than 1,000,000	2 (6.7)	3 (10.0)	
	1,000,000-1,999,999	13 (43.3)	12 (40.0)	
Monthly income (Won)	2,000,000-2,999,999	2 (6.7)	7 (23.3)	0.3
	3,000,000-3,999,999	5 (16.7)	5 (16.7)	
	More than 4,000,000	8 (26.7)	2 (6.7)	
	Apartment building	24 (80.0)	22 (73.3)	

Detached house

Tenement house

6 (20.0)

2 (6.7)

5 (16.7) 1 (3.3) 0.8

Table 2. Demographic characteristics of the hypertension patients who participated in the study about horticultural therapy (HT) program based on health care education for stress reduction of hypertension patients.

Housing

- 2. Effects of the horticultural therapy program
  - 1) Psychological changes in hypertensive patients

## (1) Stress

The results of this study showed that the experimental group had a significant decrease in the stress levels after the horticultural therapy program and 1 month later (Fig. 1). But the control group showed no significant difference (Fig. 1). This horticultural therapy program provided hypertensive patients with information on understanding and managing hypertension and increased the level of knowledge in hypertension, thereby reducing stress (Jang, 2016). Moreover, plants used in this program were green foliage plants, and activities using such green plants gave mental security to humans (Kaplan, 1973; Moore, 1989), and brought stability to the autonomic nervous system, thereby reducing stress (Choi et al., 2016).

Table 3. Comparisons of stress, quality of life, knowledge for hypertension and horticulture for the horticultural therapy (HT) group and control group before the treatments in the study about horticultural therapy (HT) program based on health care education for stress reduction of hypertensive patients.

	HT (n=30)	Control (n=30)	
variables	Mean (stand	Probability	
Stress	49.6 (3.6)	49.3 (3.9)	0.8
Depression	27.9 (2.5)	28.0 (2.9)	0.9
Anxiety	18.7 (2.9)	18.5 (4.2)	0.8
Quality of life	83.9 (3.1)	83.8 (2.1)	0.9
Knowledge for hypertension	1.8 (1.8)	1.5 (1.5)	0.5
Knowledge for horticulture	2.1 (1.1)	1.9 (1.1)	0.6

<sup>NS</sup>Non-significant at p < .05 by independent t-test.



■ Pre-test Mean ≫ post-test Mean ≥ post-test after 1 month Mean

Fig. 1. Comparisons of stress and quality of life for the horticultural therapy group and control group after the treatments in the study about horticultural therapy program based on health care education for stress reduction of hypertensive patients.

## (2) Quality of life

The quality of life for the participants after the program and 1 month after improved significantly (Fig. 1). This indicates that this horticultural therapy program alleviates stress of hypertensive patients, and their participation in the leisure activity of horticulture improved their quality of life (Eom, 2009). Raising and tending plants cultivates positive thinking through constant communion with plants, and improve quality of life by giving composure and pleasure in life (Ulrich, 1986).

## (3) Depression, and anxiety

The participants in this study showed an average of 27.87 and 27.97 points for the experimental and control group, respectively, when their depression was measured in the pretest, which exceeds 26 points that indicates no depression, thereby implying that changes in depression could not be measured through the experiment (data not shown). Cankurtaran et al. (2005) argued that depressed people show higher prevalence of hypertension, and depressive symptoms deteriorate hypertension.

Previous studies on hypertension and anxiety show that patients with cardiovascular diseases including hypertension face restraints in overall life and daily activities, and suffer from mental burden like psychological anxiety and depression (Lukkarinen and Hentinen, 1997). However, the participants in this study showed an average of 18.70 and 18.50 points (data not shown) for the experimental and control group, respectively, when their anxiety was measured in the pre-test. This is lower than the score obtained when Kim (1979) applied the STAI by Spielberger to Koreans, indicating that the participants showed no anxiety. Therefore, the effects could not be measured in this study.

2) Changes in knowledge of hypertension and horticulture among hypertensive patients

To measure the changes in knowledge of hypertension and horticulture among the participants in this study, questionnaires on a scale of 7 points were drawn up. In the pre-test, the experimental group scored 1.8 points for knowledge in hypertension and 2.1 points for knowledge in horticulture, whereas in the post-test, they scored 6.8 points for knowledge in hypertension and 6.6 points for knowledge in horticulture (data not shown). Furthermore, this level was maintained even 1 month after the program.

For example, in Session 1, the participants were asked to cut the stems of the plants and compare them to blood vessels, which enabled them to easily understand that hypertension is a vascular disease. Moreover, as they watched the cut-off plants, it was explained that their blood vessels can also be cut and injured if hypertension is neglected. Photosynthesis of plants is also explained to the participants as well as the complicated diagnosis of hypertension. They could better understand hypertension that is characterized by its lack of symptoms by showing the symptoms that may occur when plants are not tended properly. Furthermore, after the program, the subjects discovered that new shoots grew from the cut-off area of the stems from the plants used in Session 1, which changed their perception on managing hypertension through the regenerative power of plants.

 Satisfaction survey on the horticultural therapy program based on health care education

For the overall satisfaction in the horticultural therapy program, 80% was very satisfied and 20% was satisfied, indicating that the participants showed high satisfaction in the program. For interest in activities, 100% was very interested, indicating that they showed high interest in the program based on health care education. This can be the baseline data for implementing horticulture in the current health care education programs. While subjects receiving only health care education may lack interest due to the dull learning structure of taking only health care materials, whereas those participating in the horticultural activity program can take the plants, which are outputs of horticultural activities, with them and constantly come up with feedback for the plants they planted themselves, which increased the level of interest in this program.

For the assessment of difficulty of health care education, 52% said it was slightly easy, 43% said it was average, 5% said it was slightly difficult. This shows that 95% said it was slightly easy or average, indicating that the difficulty of the health care education is average or higher. This supports the fact that it is suitable to use as the educational material for the horticultural therapy program implementing health care education on hypertension later. For difficulty of horticulture

education, 23.3% said it was slightly easy, 65% said it was average, and 7.7% said it was slightly difficult. Thus, total 88.3% said it was slightly easy or average.

For preference of plants, *Spathiphyllum* was 36%, *Syngonium* 25%, *Epipremnum aureum* 25%, and *Dracaena* 14%, showing that the preference was around 25%, which was an overall average. This indicated that the participants were satisfied with the horticultural activities in this program without one plant in particular having a biased effect on the entire program.

For preference of horticultural activities, planting flowers was 68%, planting seeds 18%, and cutting 14%. Considering that the flower planting was done 5 times, seed planting 1 time and cutting 1 time out of total 7 sessions of horticultural activities, it could be found that the participants were generally satisfied with the horticultural activities in this program.

Lastly, for sustainability of horticultural leisure activities, 90% of the participants responded that they 'continue to participate in horticultural activities,' which proves that constant hypertension management can be made possible through horticultural leisure activities.

# IV. Conclusion

This study examined the effects of the horticultural therapy program applying health care education on stress, anxiety, depression and quality of life of hypertensive patients. After total 8 sessions of the horticultural therapy program, the stress levels of the hypertensive patients that participated in the program showed a decrease after the program and one month later, and their quality of life also improved. However, there was no significant difference in depression and anxiety of hypertensive patients in both the horticultural therapy group and the control group. Meanwhile, hypertensive patients that participated in the horticultural therapy program based on health care education showed an increase in the knowledge levels about horticulture and hypertension. The results of this study verified the potential for expanding the scope of application of the horticultural therapy program based on health care education, to help hypertensive patients manage stress and improve quality of life.

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