

Effects of Tai Chi Exercise Program Incorporating Laughter Therapy on Blood Pressure, Stress Response and Depression in Older People with Hypertension

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Abstract

The purpose of this study was to apply a Tai chi Exercise applying Laughter Therapy program as an intervention in consideration of physical activities and psychological factors to hypertensive elderly and examine its effects on systolic blood pressure, diastolic blood pressure, stress response and depression. The Tai chi Exercise applying Laughter Therapy applied in this study combined the Tai Chi exercise program consisting of 21 motions including the Sun style and Yang style developed by Lam (2006) and a laughter therapy developed for hypertension patients by the present researcher. The Program consisted of a total of 16 sessions, 2 session a week, and 90 minutes per session. In each session, this study used the nonequivalent control group pre - posttest design. In order to evaluate the effect of the Tai chi Exercise applying Laughter Therapy was measured by taking systolic blood pressure, diastolic blood pressure, stress response inventory (symptom of stress) and the Geriatric Depression Scale-Short Form (GDSSF-K) at baseline and after 8weeks, respectively. A Total of 74 subjects (38 in the experimental group and 36 in the control group) completed the study. From these results, it was found that the Tai chi Exercise applying Laughter Therapy is effective in blood pressure control and stress management for hypertensive elderly. Thus, nurses in the nursing intervention may utilize the program as a valuable intervention for hypertensive elderly.

Keywords: *Tai chi applying laughter therapy, Hypertensive elderly, Blood pressure, Stress response, Depression*

1. Introduction

As of 2009, the prevalence rate of hypertension among Korean adults ages 30 or older was 27.9% among older people aged 65 and older was 55.7% while rates of hypertension treatment and control were low. For this reason, managing hypertension has become an important goal of the nation's health policy. Hypertension is the most contributing factor for the morbidity and mortality rates of cerebrovascular and heart diseases. Improved hypertension treatment and control rates could greatly contribute to diminishing incidence of cardiovascular disease.

However, more than 95 percent of hypertensive patients have essential hypertension that has no identifiable cause. The important contributing factors for hypertension are known to

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include unhealthy lifestyles such as alcohol consumption, smoking, inadequate dietary intake, insufficient physical activity as well as hereditary factors. Regular physical activity may control blood pressure; regular light-to-moderate aerobic exercise could lower systolic blood pressure and cholesterol levels in the bloodstream, reducing the mortality rate associated with complications.

Light-to-moderate exercise, especially aerobic exercise, has been shown to be effective at reducing blood pressure. Also, patients should have easy access to exercise programs in terms of time and cost. Psychological factors such as stress and depression affect blood pressure directly or indirectly as well as healthy lifestyles and treatment compliance, leading to noncompliance with lifestyle modifications such as drug therapy and exercise. As a result, such factors can worsen hypertension. Thus, we need a comprehensive nursing intervention strategy taking into account exercise and psychological factors such as stress and depression to manage hypertension in the community.

Tai Chi exercises among workout programs for hypertensive patients is a light-to-moderate aerobic exercise and easy to follow; it requires no particular equipment, facility, or attire; it is not bounded by the weather or locations; it can be performed in a narrow space either individually or in a group setting. For these reasons, it is supposed to be good for older patients with hypertension. However, few previous studies of the effect of Tai Chi exercises on hypertensive patients have been conducted to determine socio-psychological effects. Prior research of older people reported high dropout rates and a loss of interest in Tai Chi exercise programs due to lack of confidence in learning Tai Chi movements. Therefore, we need a strategy aimed at overcoming these problems. In recent years, as the link between laughter and health has become known, laughter therapy has been getting a lot of attention as a new complementary and alternative therapy; it reduces negative cognitive responses, mitigates depression and stress, decreases sympathetic nerve activity, and relaxes blood vessels, leading to a drop in blood pressure.

We need a comprehensive nursing intervention strategy taking into account psychological factors as well as physical activities such as exercise to manage hypertension. A Tai Chi exercise program incorporating laughter therapy for older people with hypertension could mitigate psychological effects such as stress and depression, strengthening the exercise effect of Tai Chi and improving mutual dynamics among patients and piquing interest a program that could address high dropout rates and a loss of interest considered problems in previous research.

2. Purpose of the study

This study examines the effect of a Tai Chi exercise program incorporating laughter therapy on older people with hypertension and then determines the effect of Tai Chi exercise on their blood pressure, stress response, and depression. The results of this study will be used as a nursing intervention for older people with hypertension.

3. Hypotheses

Sixteen Tai Chi exercise sessions incorporating laughter therapy for older people with hypertension were held twice a week for eight weeks. Hypotheses to test their effects were as follows:

Hypothesis 1: Those in the experimental group participating in a Tai Chi exercise program incorporating laughter therapy are more likely to have lower blood pressure than are those in the control group.

Hypothesis 2: Those in the experimental group participating in a Tai Chi exercise program incorporating laughter therapy are more likely to experience fewer stress responses than are those in the control group.

Hypothesis 3: Those in the experimental group participating in a Tai Chi exercise program incorporating laughter therapy are more likely to experience less depression than are those in the control group.

4. Methods

4.1. Research design

This study uses a pretest-posttest nonequivalent control group design. It is a quasi-experiment to determine the effect of 8-week Tai Chi exercise sessions incorporating laughter therapy on blood pressure, stress responses, and depression in hypertensive patients (Figure 1).

Group	Pre- Test	Intervention	Post- Test
Experimental Group	E1	X	E2
Control Group	C1		C2

E1: Blood pressure, stress response, depression
 E2: Blood pressure, stress response, depression
 X: Tai-Chi Exercise applying Laughter Therapy (8weeks)
 C1: Blood pressure, stress response, depression
 C2: Blood pressure, stress response, depression

Figure 1. Research design

4.2. Study participants

The participants consisted of patients aged 60 and older who were receiving follow-up care from a public health center in the city of Gwangju after getting a diagnosis of essential hypertension. Among them, those who were eligible for participation in this study and who wanted to participate in a Tai Chi exercise program incorporating laughter therapy were assigned to the experimental group, while those who wanted to fill out only questionnaires and have their blood pressure measured were assigned to the control group.

To be eligible for this study, (1) the individual must understand the purpose of the study and submit written informed consent to participate in this study; (2) the individual must have no history of complications of hypertension; and (3) the individual must have no experience of participating in regular exercise programs in the last six months.

The sample size for this study was calculated using G*Power according to aha Cohen's formular (1988), which is used to determine sample sizes needed when comparing more than two means. Sample sizes needed for a significance level of 0.05, an effect size of 0.6, and a statistical power of 0.8 were 72 people; however, 25% of dropout rates were expected from previous research and pre-test. As a result, the experimental and control group alike were given 44 people. Six people in the experimental group were excluded for the following

reasons: 2 were absent three times or more, 1 changed drug dosages, 1 was hospitalized for diseases other than hypertension, and 2 moved to another area. As a result, 38 people remained in the experimental group. Eight people in the control group were excluded for the

following reasons: 5 declined participation in the program and not responded to posttest measurement, 2 changed types of drugs, and 1 was hospitalized for diseases other than hypertension. As a result, 36 people remained in the control group (Figure 3).

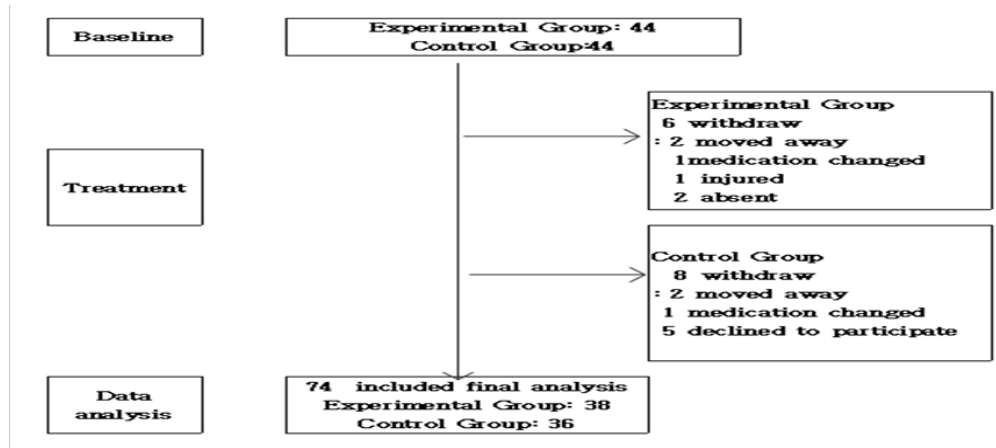


Figure 2. Participant flow sheet

4.3. Research instruments

4.3.1. Stress response

This study used the instrument for stress response that was translated into Korean by Lee (1992). It is a self-report instrument, consisting of 94 items. Each item was rated on a five-point scale. The higher the score, the stronger the stress response. As for the reliability of the instrument, Cronbach's α for this study was .96, while Cronbach's α for Lee's study (1992) was .97.

4.3.2. Depression

This study used the instrument adapted to the needs of older people in Korea from the 15-item condensed version of the Geriatric Depression Scale developed by Sheikh & Yesavage (1986). Each item consisted of questions asking for a Yes/No. One point was assigned for each item; scores ranged from 0 to 15. The higher the score, the more severe the depression. A total score of 5 or higher was defined as depression. Cronbach's α for this study was .73.

4.3.3. Blood pressure measurement

Blood pressure was measured using a blood pressure monitor. The participants were asked to sit and rest in a chair for five minutes or so and then place their upper arm at the same height as the heart with the palm of their hand facing up to have their blood pressure checked. Two readings were taken five minutes apart; the mean value of the two readings was obtained.

4.4. Research process

4.4.1. Participant recruitment for research

Approval to conduct this study was obtained from the institutional review board at the nursing college of Seoul National University. The purpose of the study, the plan for the study, questionnaires and the like were explained to a person in charge of chronic disease working at a public health center in the city of Gwangju. Study participants eligible for inclusion criteria were recruited. For the experimental group, a nurse in charge of chronic disease confirmed the participants' intent to participate in the program by calling them before obtaining written informed consent; those who did not want to participate in the program among those eligible for inclusion criteria were assigned to the control group.

4.4.2. Data collection

(1) Measurement before intervention: Blood pressure, stress response, and levels of depression in the experimental and control group were measured before intervention. When filling out written informed consent and a questionnaire, the participants read the content of the two forms and completed the two forms for themselves. When they could not read the content of the two forms for themselves, however, a research assistant read the instructions and content to them and filled out the two forms based on their responses.

(2) Intervention program for the experimental group: A 90-minute Tai Chi exercise program incorporating laughter therapy was provided twice a week (Monday and Thursday) for eight weeks. During the intervention period, they had their blood pressure checked before/after each intervention. When having their blood pressure checked at each intervention, they were asked to sit and rest in a chair for at least five minutes. Two readings were taken five minutes apart; the mean value of the two readings was used. When having their blood pressure measured, they were asked about changes in medication-taking behavior, changes in their exercise and health; any changes were excluded from the study. In particular, we checked changes in types and volumes of their medications through their prescriptions.

(3) Measurement shortly after intervention: After eight weeks of interventions (16 sessions), the participants had their blood pressure, stress response, and levels of depression checked in the same way as in measurement before intervention. Those in the control group visited the public health center the next day after intervention and had their blood pressure, stress response, and levels of depression checked in the same way as in measurement before intervention

4.5. Data analysis

Collected data were analyzed using SPSS WIN 19.0. Because all data from each group were normally distributed, a parametric test was used. Real number and percentage were calculated for participants' general and disease-related characteristics. To test homogeneity of the experimental and control group, χ^2 -test and t-test were used. The reliability of the measurement instrument was tested using Cronbach's α . Systolic and diastolic blood pressure, stress responses, and levels of depression in the experimental and control group were analyzed using t-test and ANCOVA.

5. Results

5.1. Participants' general characteristics and homogeneity test

The results of the pre-test for homogeneity of the experimental and control group showed that the experimental group and the control group were homogeneous in terms of all items, with the exclusion of the sexes (Table 1). Because the pre-test for homogeneity of the experimental and control group showed that the sexes were not homogeneous, ANCOVA was performed using the sexes as a covariate. Because a significance level of the sexes was greater than a significance level of .05, the sexes did not affect dependence variables at all.

5.2. Participants' disease-related characteristics and homogeneity test

The results of the pre-test for homogeneity of hypertension-related characteristics between the two groups showed that the two groups were homogeneous in terms of all items [Table 2].

5.3. Pre-test for homogeneity of result variables

The results of the pre-test for homogeneity of main variables showed that no statistically significant differences between the two groups were found in systolic and diastolic blood pressure, severity of stress, and depression, showing that the two groups were homogeneous [Table 3].

Table 1. Homogeneity test of sociodemographic characteristics

Characteristics	Categories	Experimental group(n=38) n(%) Mean±SD	Control group(n=36) n(%) Mean±SD	X ² or t	p
Age(yr)	60-65	3(7.9)	4(11.1)	1.909	.060
	66-75	29(76.3)	18(50.0)		
	76-85	6(15.8)	14(38.9)		
		71.24±6.07	74.06±6.62		
Sex	Female	36(94.7)	24(66.7)	9.496	.002
	Male	2(5.3)	12(33.3)		
Marital status	Single	0(0.00)	1(2.8)	2.881	.410
	Married	16(42.1)	19(52.8)		
	Widowed	21(55.3)	16(44.4)		
	Divorce	1(2.6)	0(0.00)		
Education	Uneducated	9(23.7)	5(13.9)	3.345	.502
	Elementary school	12(31.6)	17(47.2)		
	Middle school	8(21.1)	9(25.0)		
	High school above College	8(21.1) 1(2.6)	4(11.1) 1(2.8)		
Employment status	Yes	2(5.3)	4(11.1)	.849	.424
	No	36(94.7)	32(89.9)		
Economic status	High	0(0.00)	0(0.00)	.000	.592
	Middle	19(50.0)	18(50.0)		
	Low	19(50.0)	18(50.0)		
Religion	Yes	32(84.2)	23(63.9)	4.001	.063
	No	6(15.8)	13(36.1)		

Table 2. Homogeneity test of disease-related characteristics

Characteristics	Categories	Experimental group(n=38) n(%) Mean±SD	Control group(n=36) n(%) Mean±SD	X ² or <i>t</i>	<i>p</i>
Years since hypertension (yr)		7.76±8.06	7.06±5.78	-.432	.667
Smoking	Yes	2(5.3)	2(5.6)	.003	.672
	No	36(94.7)	34(94.4)		
Drinking	Yes	6(15.8)	10(27.8)	1.568	.264
	No	32(84.2)	26(72.2)		
Exercise	Regularly	24(63.2)	20(55.6)	.850	.654
	Irregularly	9(23.7)	12(33.3)		
	No	5(13.2)	4(11.1)		
Experience of admission due to hypertension	Yes	4(10.5)	7(19.4)	1.162	.281
	No	34(89.5)	29(80.6)		
Medication	Yes	29(76.3)	31(86.1)	1.156	.282
	No	9(23.7)	5(13.9)		

Table 3. Homogeneity test of dependent variables

variables	Experimental group(n=38)	Control group (n=36)	<i>t</i>	<i>p</i>
SBP(mmHg)	143.68± 8.83	139.72 ± 11.08	-1.706	.092
DBP(mmHg)	85.26± 8.62	83.33 ± 6.33	-1.102	.274
Stress response(total)	84.34±52.71	65.02 ± 36.43	-1.828	.072
Peripheral manifestations	.73 ± .61	.67 ± .62	-.437	.663
Cardiopulmonary symptom	.94 ± .67	.52 ± .49	-3.026	.030
Central-neurological symptom	.99 ± .76	.66 ± .67	-1.973	.052
Gastro- intestinal symptom	.72 ± .64	.56 ± .48	-1.217	.227
Muscle tension	.89 ± .69	.63 ± .56	-1.789	.078
Habitual patterns	.82 ± .56	.76 ± .38	-.479	.633
Depression	.95 ± .90	.85 ± .83	-.509	.612
Anxiety/ Fear	1.12± .71	.85 ± .49	-1.839	.070
Emotional irritability	.77 ±.72	.59 ± .54	-1.343	.183
Cognitive disorganization	1.05±.80	.88 ± .76	-.882	.381
Depression	5.48 ± 3.57	5.17 ± 2.71	-.381	.704

SBP: Systolic Blood pressure

DBP: Diastolic Blood pressure

5.4. Hypothesis testing

The experimental group had a systolic blood pressure of 143.68mmHg before intervention and 124.74mmHg after intervention; the control group had a systolic blood pressure of 139.72mmHg before intervention and 141.67mmHg after intervention. Because the experimental group had a significantly lower systolic blood pressure than the control group did, the first sub-hypothesis was supported.

The experimental group had a diastolic blood pressure of 85.26mmHg before intervention

and 75.53mmHg after intervention; the control group had a diastolic blood pressure of 83.33mmHg before intervention and 82.78mmHg after intervention. Because the experimental group had a significantly lower diastolic blood pressure than the control group did, the second sub-hypothesis was supported.

The experimental group had stress response scores of 84.34 ± 52.71 before intervention and 73.11 ± 51.46 after intervention; the control group had stress response scores of 65.02 ± 36.43 before intervention and 76.19 ± 43.77 after intervention. Because the experimental group had a significantly lower stress response score than the control group did, the second hypothesis was supported.

The experimental group had a depression score of 5.48 before intervention and 4.63 after intervention; the control group had a depression score of 5.17 before intervention and 5.36 after intervention. Because there were no significant differences between the two groups, the third hypothesis was not supported.

6. Conclusions

The current study was conducted based on previous studies showing that the Tai Chi exercises did not lower blood pressure and reduce stress consistently and that combined several lifestyle modifications was more effective than one lifestyle modification alone to manage hypertension [7].

The hypothesis was supported that a Tai Chi exercise program incorporating laughter therapy is more likely to lower systolic and diastolic blood pressure in older people with hypertension. These results are line with those of a study looking at hypertensive patients who completed a six-week Tai Chi exercise program [6], and those of a study looking at hypertensive patients who saw their systolic and diastolic blood pressure decrease after completing a 12-week Tai Chi exercise program [2], The findings of this study are also consistent with those of a study looking at older people with hypertension who saw their systolic and diastolic blood pressure decrease after completing a 4-week laughter therapy [11]. Compared with previous research looking at hypertensive patients who underwent either Tai Chi exercises or laughter therapy, this study suggests that Tai Chi exercises incorporating laughter therapy may be effective at reducing the activity of the sympathetic nervous system and stress [2]. In addition, it could be that laughter therapy increases the effects of reduced sympathetic nervous system activities by regulating the autonomic nervous system, leading to a noticeable drop in blood pressure. This study found that an 8-week Tai Chi exercise program incorporating laughter therapy led to a drop in stress response, depression, anxiety, cognitive stress symptoms among hypertensive patients.

These findings are not consistent with those of a study of hypertensive patients who saw no significant changes in cortisol after undergoing Tai Chi exercise [6], and those of a study of hypertensive patients who saw a little but not noticeable drop in their levels of stress after undergoing laughter therapy [11]. The results of this study are also inconsistent with those of a study of hypertensive patients who abdominal breathing technique did not lead to a noticeable drop in stress response. Therefore, this study suggests that Tai Chi exercises and laughter therapy reduce stress response among hypertensive patients, regulating blood pressure. Although depression scores were not significantly lowered after intervention in the current study, we classified levels of depression in the experimental and control groups as ‘no depression’, ‘mild’, ‘moderate-to-severe’, and ‘severe’ based on their depression scores and then analyzed the difference between the two groups. As a result, there were no differences in depression between the two groups before intervention ($\chi^2=2.572$, $p=.276$), but there were

significant differences in depression between the two groups after intervention ($\chi^2=7.845$, $p=.020$). The number of participants with depression in the experimental group decreased to 11(28.9%) after intervention, down from 22(57.9%) before intervention, whereas the number of participants with depression in the control group increased to 24(71.7%) after intervention, up from 23(63.9%) before intervention—a proof that the Tai Chi exercise program incorporating laughter therapy contributed to decreased depression.

A Tai Chi exercise program incorporating laughter therapy for hypertensive patients can be used as a safe and low-cost independent nursing intervention program for nurses caring for older people. Given the low participation rates in existing Tai Chi exercise programs, it is worthwhile to note that a Tai Chi exercise program incorporating laughter therapy laid the basis for enabling increased participation in Tai Chi exercise programs.

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