



Assessment of the psychopathological effects of a horticultural therapy program in patients with schizophrenia

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ARTICLE INFO

Keywords:

Complementary and alternative medicine
Consumer horticulture
Gardening
Mental illness
Socio horticulture

ABSTRACT

Objectives: This study assessed the psychopathological effects of participation in a 10-session horticultural therapy program in patients with schizophrenia.

Design: The study design was pre and post test design of experimental and control groups.

Setting: Twenty-eight Korean patients with schizophrenia, recruited from a mental health clinic and two mental health rehabilitation centers in Suwon, South Korea, were voluntarily assigned to either a control group (average age: 33.4 ± 9.4 years) or a horticultural therapy group (average age: 42.1 ± 13.0 years).

Interventions: The participants in the horticultural therapy group participated in a 10-session horticultural therapy program designed around various plant cultivating activities. The horticultural therapy program involved sessions once a week from April 2017 to June 2017.

Main outcome measures: A psychiatrist evaluated the psychopathological symptoms of schizophrenic patients in both groups. To assess the clinical psychopathological effects, the Korean version of the Positive and Negative Syndrome Scale (PANSS) and Brief Psychiatric Rating Scale (BPRS) were used.

Results: The horticultural therapy group significantly improved in terms of positive, negative, and general symptoms on the PANSS after the 10-session horticultural therapy program. Moreover, the horticultural therapy group significantly improved in terms of clinical symptoms of schizophrenia in BPRS after the 10-session horticultural therapy program. However, there was no change in the PANSS and BPRS scores in the control group.

Conclusions: This study showed the potential of horticultural therapy in improving psychopathological symptoms in psychiatric patients. Future studies should investigate the effects of long-term horticultural therapy program on the chronic symptoms of patients with schizophrenia.

1. Introduction

Schizophrenia is a severe psychiatric disorder that leads to chronic symptoms.^{1,2} The positive and negative symptoms of schizophrenic patients induce thinking disorder, blunted affect, attention or memory problems, due to distortion of reality.³ Consequently, patients with schizophrenia lack coping skills, and have social and occupational functioning failings,⁴ resulting in a low level of quality of life.⁵

Although pharmacological treatment has been used to stabilize mental disease symptoms, a combination of pharmacological and non-pharmacological treatments are considered more effective for the treatment of the chronic symptoms of schizophrenia.⁶ It is important that patients with schizophrenia adapt to the community and that relapse is prevented; therefore, various rehabilitation training programs, such as horticultural therapy, music therapy, dance therapy, art

therapy, physical therapy have been applied to improve daily living abilities and social skills.^{7,8}

The therapeutic use of horticulture has been documented as far back as ancient Egypt, when court physicians instructed royalty to walk among the palace gardens as a prescription for mental illness.⁹ The use of horticulture gradually came to be recognized as an acceptable form of therapy for use in mental health institutions by the late 1700s and early 1800s, in the United States and Europe^{10–12} and by the 1980s, in South Korea.¹³

Horticultural therapy is defined as a complementary and alternative treatment that is provided by trained professionals, and involves horticultural activities in a pre-designed intervention with therapeutic goals and objectives for improving or recovering health. A recent review article about horticultural activity interventions reported that most previous related studies focused on the psychological or emotional

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effects of horticultural intervention.¹⁴ In particular, this horticultural intervention led to improved self-esteem and emotional intelligence, and reduced stress and depression.¹⁵

A previous study reported that a 16-session horticultural therapy program improved self-efficacy and reduced psychiatric symptoms in patients with schizophrenia.¹⁶ Cho et al.¹⁷ reported that a 24-session horticultural therapy program improved psychopathological symptom, assertiveness, and interpersonal relationships in patients with schizophrenia. Song and Sim¹⁸ also showed a significant improvement in psychopathologic symptoms of patients with schizophrenia after a 10-session horticultural therapy program. Parvin et al.¹⁹ showed that a 3-month horticultural therapy program significantly improved both positive and negative symptoms in these patients.

However, few studies have assessed the psychopathological effects of a horticultural therapy program on patients with schizophrenia. Therefore, the objective of this study was to assess the psychopathological effects of participation in a 10-session horticultural therapy program, designed around plant cultivating activities, in patients with schizophrenia.

2. Materials & methods

2.1. Research subjects

A total of 28 Korean patients with schizophrenia participated in this study. To recruit patients with schizophrenia, a flyer containing the information about the study objective, horticultural therapy program, and health measures was distributed at a mental health clinic and two mental health rehabilitation centers in Suwon, South Korea. A consent form for each patient was obtained from the patients and a person in charge of the facilities before starting the study. All of the participants were adult patients and they had no problems in expressing their opinions. The primary care physician diagnosed that all patients had no problem in their decision making. A questionnaire about demographic information, such as age, sex, number of hospitalizations, and other comorbid mental diseases, was administered to the participants in an orientation session. The 28 participants were voluntarily assigned to either the control group or the horticultural therapy group. The average age of patients in the horticultural therapy group was 42.1 ± 13.0 years, and of those in the control group was 33.4 ± 9.4 years (Table 1). There were more men in the horticultural therapy group than in the control group, as male schizophrenic patients were more interested in participating in the horticultural therapy

Table 1
Demographic characteristics of participants.

Variable	Horticultural therapy group (n = 15)	Control group (n = 13)	Significance
Average (SD)			
Age	42.1 (13.0)	33.4 (9.4)	NS (0.057)
Percent (N)			
Sex			** (0.006)
Male	93.3 (14)	46.2 (6)	
Female	6.7 (1)	53.8 (7)	
Number of hospitalization			
None	20.0 (3)	30.8 (4)	NS (0.497)
1 – 2	53.3 (8)	38.5 (5)	
3 – 5	26.7 (4)	15.4 (2)	
5 – 10	0.0 (0)	7.7 (1)	
Over 10	0.0 (0)	7.7 (1)	
Other mental diseases			
None	60.0 (9)	61.5 (8)	NS (0.724)
Depression	20.0 (3)	15.4 (2)	
disorder			
Anxiety disorder	0.0 (0)	7.7 (1)	
Others	20.0 (3)	15.4 (2)	

Table 2

A 10-session horticultural therapy program for patients with schizophrenia, designed around plant cultivating activities.

Session	Horticultural activities	Horticultural crops
1	Making vegetable garden plot, fertilizing, planting	Potato (<i>Solanum tuberosum</i>) Lettuce (<i>Lactuca sativa</i> , <i>Cidohorium intybus</i>)
2	Hydroponics	Tiny ardisia (<i>Ardisia pusilla</i>)
3	Mulching, planting	Herbs (<i>Mentha</i> species, <i>Anethum graveolens</i> , <i>Matricaria chamomilla</i>) Eggplants (<i>Solanum melongena</i>) Oriental melon (<i>Cucumis melo</i> var. <i>makuwa</i>)
4	Mulching, planting, harvesting	Tomato (<i>Lycopersicon esculentum</i> , <i>Lycopersicon esculentum</i> Mill) Pepper (<i>Staphylea bumalda</i>) Lettuce (<i>Lactuca sativa</i> , <i>Cidohorium intybus</i>)
5	Setting up plant stakes, weeding, harvesting	Tomato (<i>Lycopersicon esculentum</i> , <i>Lycopersicon esculentum</i> Mill) Pepper (<i>Staphylea bumalda</i>) Eggplant (<i>Solanum melongena</i>) Lettuce (<i>Lactuca sativa</i> , <i>Cidohorium intybus</i>)
6	Planting, harvesting	Sweet potato (<i>Ipomoea batatas</i>) Lettuce (<i>Lactuca sativa</i> , <i>Cidohorium intybus</i>)
7	Suckering, weeding, harvesting, packing	Tomato (<i>Lycopersicon esculentum</i> , <i>Lycopersicon esculentum</i> Mill) Pepper (<i>Staphylea bumalda</i>) Eggplant (<i>Solanum melongena</i>) Lettuce (<i>Lactuca sativa</i> , <i>Cidohorium intybus</i>)
8	Suckering, covering up crops with soil, eco-friendly pest control	Tomato (<i>Lycopersicon esculentum</i> , <i>Lycopersicon esculentum</i> Mill) Pepper (<i>Staphylea bumalda</i>) Eggplant (<i>Solanum melongena</i>) Potato (<i>Solanum tuberosum</i>)
9	Harvesting, weeding, making tea	Herbs (<i>Mentha</i> species) Lettuce (<i>Lactuca sativa</i> , <i>Cidohorium intybus</i>)
10	Harvesting, farm party	Potato (<i>Solanum tuberosum</i>)

program than female schizophrenic patients in this study. The participants in the control and horticultural therapy program groups take medication such as aripiprazole which is common medication for schizophrenia patients. The patients did not change the medication during the study period. All patients in the both groups are chronic patient taking the medication for 3 years or more. The participants in both groups participated in leisure activities such as discussion class with various topics or exercise program such as stretching or ball game depending on their preference.

2.2. Horticultural therapy program

A 10-session horticultural therapy program was designed around various plant cultivating activities, such as making plant beds, planting transplants, watering, weeding, fertilizing, and harvesting (Table 2). Seasonal plants, such as potato (*Solanum tuberosum*), lettuce (*Lactuca sativa*, *Cidohorium intybus*), tomato (*Lycopersicon esculentum*, *Lycopersicon esculentum* Mill), pepper (*Staphylea bumalda*), eggplant (*Solanum melongena*), sweet potato (*Ipomoea batatas*), oriental melon (*Cucumis melo* var. *makuwa*), and herbs (*Mentha* species, *Anethum graveolens*, *Matricaria chamomilla*) were chosen for the horticultural therapy program. A 991.7 m² garden plot on a farm located in Suwon, South Korea, was used for this study. The garden plot was divided into eight sections according to the type of crop, and all participants cultivated it together. The horticultural therapy program was managed from

April 2017 to June 2017. The participants joined in the horticultural therapy program once a week (for an average of 120 min per session). The participants received explanations and demonstrations of the gardening activities in each session from the instructors. Then, a list of work that needed to be done in the garden was provided, and each participant performed the work in every session. For example, in the first session of the 10-session horticultural therapy program (Table 2), the participants took a lesson for how to make garden bed and plant crops such as potato and lettuce by instructors. Moreover, demonstrations were provided to help their understanding for the activities. And then, each participant made a garden bed and planted the crops by themselves. The horticultural therapy program was run by two horticultural therapists certified by the Korean Horticultural Therapy Association, and one volunteer. Three individuals who were in charge of the mental health rehabilitation centers supervised each session.

2.3. Assessments

A psychiatrist evaluated the psychopathological symptoms of patients with schizophrenia in both groups, using two evaluation forms. The psychiatrist visited the centers that the patients were involved in Suwon, South Korea in the pre and post assessment period (each one week). The evaluation time of each patient was completed within an hour.

To assess the positive and negative symptoms of schizophrenia, the Korean version of the Positive and Negative Syndrome Scale (PANSS) was used.²⁰ The PANSS is a 30-item rating scale filled out by clinically trained research staff after completing chart review and a semi-structured interview. It consists of seven questions for the positive symptom scale, seven questions for the negative symptom scale, and 16 questions for the general psychopathology symptom scale. The positive symptom scale measures excessively increased clinical symptoms, such as hallucination, delusion, or hostility, which should not be present in individuals with normal mental status. The negative symptom scale measures clinical symptoms, such as disturbance of thinking or emotional flattening that represent behaviours which should be present in individuals with a normal mental status, but are absent. The general psychopathology symptom scale measures general psychopathologic symptoms, such as anxiety, sense of guilt, depression, motor delay, or lack of judgment. Each item is rated from '1' (Absent) to '7' (Extreme) points according to the degree of symptoms. The higher score of the PANSS indicates a severe psychopathology symptom. The Cronbach's alpha of the Korean version of the PANSS was 0.73 for the positive symptom scale, 0.84 for the negative symptom scale, and 0.74 for the general symptom scale.²¹

To assess the clinical symptoms of schizophrenia, the Brief Psychiatric Rating Scale (BPRS)²² was used. The BPRS was developed from the Lorry Multidimensional Scale for Rating Psychiatric Patients²³ to conduct a rapid assessment of schizophrenic states. The BPRS is an 18-item rating scale filled out by clinically trained research staff. The BPRS is completed after chart review and a semi-structured interview. The items of the BPRS have grouped into categories paralleling those in the PANSS such as positive, negative, and general by Kane et al.²⁴ Each item is rated from '0' (not present) to '4' (extremely severe). The higher score indicates a severe symptom of schizophrenia. The Cronbach's alpha of the BPRS was 0.85.²⁵

2.4. Data analysis

To analyse the differences between before and after the horticultural therapy program, a paired *t*-test was conducted in SPSS (version 24.0; IBM Corp., Armonk, NY) because the results of normal distribution of pre-test values were 0.210 for PANSS and 0.474 for BPRS. Demographic information was analysed by chi-square test using SPSS software. A probability value, $P < 0.05$, was considered to indicate statistical significance. The mean and SD of PANSS and BPRS scores

Table 3

Effects of a horticultural therapy program on the positive–negative symptoms of patients with schizophrenia, as evaluated using the Positive and Negative Syndrome Scale (PANSS)^a

Variable		Horticultural therapy group (n = 15)	Control group (n = 13)
		Mean (SD)	Mean (SD)
Positive	Pre-test	23.07 (7.56)	19.92 (10.59)
	Post test	20.80 (8.13)	20.15 (10.46)
	Significance	**(0.009)	
Negative	Pre-test	26.53 (7.39)	21.69 (8.54)
	Post test	20.67 (6.86)	21.62 (8.65)
	Significance	*** (0.000)	
General	Pre-test	50.40 (14.52)	47.85 (15.98)
	Post test	42.87 (14.63)	47.69 (16.73)
	Significance	*** (0.000)	
Total	Pre-test	102.00 (27.69)	89.46 (32.10)
	Post test	84.33 (27.63)	89.46 (32.90)
	Significance	*** (0.000)	

^a A 30-item rating scale filled out by clinically trained research staff. Each item is rated '1' (Absent) to '7' (Extreme) points according to the degree of symptom. Higher scores on the PANSS indicate more severe symptoms.

were analysed in Excel (MS Office 2016; Microsoft Corp., Redmond, WA).

3. Results and discussion

3.1. Positive and negative syndrome scale (PANSS)

The schizophrenic patients in the horticultural therapy group significantly improved in terms of positive, negative, and general symptoms after the 10-session horticultural therapy program (Table 3). On the other hand, there was no change in the positive, negative, or general symptoms of the PANSS in the control group. There was no difference between the groups for the pre-values of PANSS (data not shown).

Although the effects of a horticultural therapy program on patients with schizophrenia have not been studied in depth previously, the findings of this study correspond with the results of previous studies. Eum and Kim¹⁶ reported that a 16-session horticultural therapy program with outdoor gardening activities significantly improved self-efficacy, stress response, and psychiatric symptoms in terms of positive, negative, and general symptoms in the PANSS. Cho et al.¹⁷ reported that a 24-session horticultural therapy program significantly decreased the negative symptoms on the PANSS in patients with schizophrenia. Parvin et al.¹⁹ showed that a 3-month horticultural therapy program significantly improved the positive and negative symptoms in measures such as the Andreasen scale for assessment of negative symptoms and positive symptoms.²⁶

3.2. Brief psychiatric rating scale (BPRS)

There was no difference between the groups for the pre-values of BPRS (data not shown). The schizophrenic patients in the horticultural therapy group showed significantly improved clinical symptoms of schizophrenia after the 10-session horticultural therapy program (Table 4). However, there was no change in the clinical symptoms of schizophrenia in the control group. There are very few studies on the effects of horticultural therapies on BPRS scores in patients with schizophrenia. Rui yi²⁷ reported that garden therapy was effective in rehabilitation of patients with chronic schizophrenia as compared to drug therapy alone.

Table 4

Psychopathological effects of a horticultural therapy program on the clinical symptoms of patients with schizophrenia as evaluated using the Brief Psychiatric Rating Scale (BPRS)^a

Variable		Horticultural therapy group (n = 15)	Control group (n = 13)
		Mean (SD)	Mean (SD)
BPRS	Pre-test	26.40 (9.83)	20.77 (11.79)
	Post test	19.53 (11.12)	19.77 (11.56)
	Significance	*** (0.000)	NS (0.084)

^aAn 18-item scale filled out by clinically trained research staff. Each item is rated from '0' (not present) to '4' (extremely severe). Higher scores indicate more severe schizophrenia symptoms.

3.3. Overall discussion

The therapeutic effects of horticultural activity and natural environments have been reported previously. Ulrich²⁸ reported that natural environments reduce emotional stress and activate the sympathetic nervous system. Patients could recover more quickly from surgery in natural environments than in conditions without a natural environment.²⁹ Humans recovered more rapidly in the setting of green or nature environments than in urban settings.³⁰ Park et al.¹⁴ reported that even short exposures of viewing plant foliage in an indoor environment led to physiological and psychological relaxation effects, as measured by prefrontal cortex activity and subjective emotional evaluations. Viewing green plants in an indoor environment led to relaxation of the autonomic nervous system by activation of the parasympathetic nervous system³¹. Moreover, Park et al.³² reported that performing tasks with plants with foliage led to greater physiological and psychological relaxation than doing so without such plants, as based on measurements of prefrontal cortex activity, heart rate variability, and subjective emotional evaluations. From these previous studies, it can be expected that horticultural activity or green nature is applicable for patients with mental disorders.

Previous studies have shown that patients with mental disorders, such as schizophrenia, had more delta wave activity in the frontal region and less alpha wave activity, particularly in the parieto-occipital region^{33–37}. Viewing indoor plants by persons without schizophrenia significantly decreased delta waves in the frontal and temporal lobe regions, and significantly increased alpha waves.^{38,39} Interestingly, in a previous study, 24 patients with schizophrenia showed significantly reduced delta waves in the frontal lobe region and increased alpha waves in the occipital region after viewing plants with foliage, as compared to viewing an ivory wall.³⁷

Additionally, in the horticultural therapy sessions, patients typically participate in various physical activities that promote health while performing horticultural activities.^{40,41} Park et al.⁴⁰ determined that various gardening activities performed by adults involve moderate to high levels of physical activity, which provides physical and psychological health benefits. Moreover, horticultural activities in an outdoor garden provide a nature-friendly environment, instead of a clinically controlled indoor patient care room, which may lead to passivity or insensitivity in the patients.¹⁶ Earlier studies have reported that physical activity may improve the symptoms of schizophrenia. A 10-week aerobic exercise program with mild and moderate intensity resulted in significantly decreased psychiatric symptoms in patients with schizophrenia.⁴² Scheewe et al.⁴³ reported that a 6-month exercise therapy, involving sessions once to twice a week, resulted in significantly reduced symptoms of schizophrenia and depression in patients with schizophrenia, as compared to occupational therapy.

Furthermore, working together with others in the garden may provide an opportunity for developing personal relationships, cooperation, responsibility, and communication.^{44–46} Horticultural therapy provides positive re-appraisal and social support, which are

important predictors for positive quality of life in Asian patients suffering from schizophrenia.⁴⁷ Skills for cultivating crops and harvesting may lead to improved confidence and achievement of goals, so that patients can improve their self-efficacy.^{48,49} In this respect, horticulture has been used for vocational training of individuals with mental illness.⁵⁰ Vocational rehabilitation training programs utilize the work for the improvement of symptoms, interpersonal relationships, and cognitive functioning.⁵¹ Vocational training has been shown to improve employment rates for individuals with schizophrenia.^{52–54} Horticulture encompasses all aspects of the intensive cultivation of plants in a relatively limited space, such as a greenhouse, or indoor or outdoor gardens.⁵⁵ The knowledge and skills that were acquired by attending horticultural therapy can ultimately lead to employment in the field of horticulture.⁹ Such 'green' work, including horticultural activities, has positive value as pre-vocational training for patients with psychological illness.⁵⁶

In conclusion, the horticultural therapy program led to positive effects for patients with schizophrenia in terms of psychopathological symptoms. This study showed the potential of horticultural therapy for improving psychopathologic symptoms of psychiatric patients. Future studies need to have a larger number of subjects to generalize the results and to investigate the long-term effects of a horticultural therapy program for patients with schizophrenia with chronic symptoms. Moreover, it is necessary to compare the difference between age range and gender. It would be interesting to apply a caring farming program involving activities that combine horticultural activity and animal care activity for patients with various types of psychiatric conditions.

Acknowledgements

This paper was supported by the KU Research Professor Program of Konkuk University.

This work was carried out with the support of "Cooperative Research Program for Agriculture Science & Technology Development (Project title: Design and Strategy Plan of Agro-Healing Service Considering Life Cycle, Project No. PJ012564012017)" Rural Development Administration, Republic of Korea.

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