Original Article
Food Science and Technology

ISSN 0101-2061 (Print)
ISSN 1678-457X (Online)

DOI: https://doi.org/10.1590/fst.53022

Value of edible horticultural therapy for schizophrenic

Tao LIU[1#], Mingchao LI[2#], Qiuming JI[1*], Yu CHEN[1*], Chi LI[1*], Fan ZHOU[1#], Cairong WANG[1], Haiying CHEN[1], Hui HE[3]

Abstract

To investigate the value of edible horticultural therapy (EHT) for long-term-hospitalized (LTH) female patients who suffered from schizophrenia. 60 female schizophrenic patients hospitalized in our hospital were randomly divided into EHT group and control group, with 30 cases in each group. The EHT group was combined with EHT on the basis of drug treatment, and the control group was only treated with drug treatment. The Brief Psychiatric Rating Scale (BPRS), the Chinese version Scale of Social Functioning for Psychotic Inpatients (SSFPI), and the Life Satisfaction Index A (LSIA) were compared and analyzed between two groups. After 6 weeks of treatment**,** the SSFPI score of EHT group increased and was significantly higher than that of the control group. After treatment, the LSIA index of EHT group was higher than that of the control group, and the difference between the two groups was statistically significant ($P < 0.05$). The BPRS index of EHT group was significantly lower than that before treatment, but there was little change in the control group. There was significant difference between the two groups ($P < 0.05$). EHT maybe valuable for improving clinical symptoms of schizophrenia and recovery of social function. Clinical registration number:researchregistry7590

Keywords: edible horticultural therapy; schizophrenia; social function; life satisfaction; psychological and social disorder.

Practical Application: To investigate the value of edible horticultural therapy (EHT) for long-term-hospitalized (LTH) female patients who suffered from schizophrenia.

1 Introduction

Schizophrenia is a chronic disease with high disability rate, which mainly shows the inconsistency of emotion, behavior, thinking and mental activities (Burns & Patrick, 2007; van Os & Kapur, 2009; Zhu et al., 2016). Drug treatment can control and alleviate the psychological symptoms of patients to a certain extent, but it is difficult to improve the mental and behavioral decline.Antipsychotics play an irreplaceable role in the treatment of schizophrenia, but drug treatment is still not ideal in improving patients' negative symptoms, especially in improving patients' social function. This makes us have to study new treatments (Naoki et al., 2003; Gaszner, 2009; Liu et al., 2014; Kurtz et al., 2019).

Horticultural therapy is used in different health care and hospital environments around the world, such as nursing homes, rehabilitation centers, psychiatric hospitals and prisons. Research shows that it has a positive impact on mental diseases such as schizophrenia, depression and neurological diseases such as Alzheimer's disease and stroke. As one of the auxiliary rehabilitation therapies for schizophrenia, horticultural therapy has been proved to reduce psychopathological symptoms, improve schizophrenia, reduce anxiety and depression, and improve social function (Wichrowski et al., 2005; Gonzalez et al., 2011; Mochizuki-Kawai et al., 2018).

Edible horticultural therapy (EHT) is a type of horticultural therapy that uses edible plants and includes watching plants, touching plants, tasting plants, smelling plants, and listening to the natural growth of plants, to stimulate the patient's five senses (vision, touch, taste smell and hearing) and exploit the healing power of nature. Relevant studies have shown that EHT, as a means of mental rehabilitation, can effectively improve the social function and daily living ability of schizophrenic patients, enable patients to give full play to their residual functions and potential ability, improve the quality of life, and promote their comprehensive rehabilitation (Yanagida et al., 2017; Oh et al., 2018; Zhang, 2018; Zhang & Han, 2021).

However, the value of EHT in schizophrenia is unclear. The purpose of this study was to investigate the effect of EHT on rehabilitation and quality of life of long-term hospitalized female schizophrenic patients.

2 Materials and methods

2.1 Participants

60 female schizophrenic patients were randomly divided into eht group (30 cases) and control group (30 cases). The average age of EHT group was 44.20 ± 13.70 years, and that of control

Received 27 Apr., 2022
Accepted 16 June, 2022
[1]*Department of Psychiatry, Wuhan Wudong Hospital, Wuhan, China*
[2]*Department of Psychiatry, Affiliated Wuhan Mental Health Center, Tong ji Medical College of Huazhong University Science & Technology, Wuhan, China*
[3]*School of Architecture and Urban Planning, Huazhong University Science & Technology, Wuhan, China*
*Corresponding author: cheny_2021@21cn.com
#Authors contribute equally to the article

group was 46.66 ± 13.40 years. All participants signed written informed consent and obtained the consent of the hospital ethics committee.

2.2 Inclusion and exclusion criteria

Inclusion criteria: (1) It meets the diagnostic criteria of schizophrenia(Guan et al., 2021); (2) The acute mental symptoms were basically controlled, and there was no obvious extrapyramidal reaction; (3) Interested in gardening; (4) The patient or guardian gave informed consent and signed the informed consent form. (5) disease course was longer than 3 years; (5) hospital admission was longer than 2 years; (5) could communicate verbally.

Exclusion criteria: (1) Patients who had communication difficulties; (2) pollen/plant allergies; (3) Other mental diseases, serious physical diseases and serious suicidal tendencies.

2.3 Methods

In the EHT group, a six-session EHT program which related to the five senses was developed by qualified horticultural therapists, psychotherapists, and psychiatrists (Table 1). Seasonal plants which was safe, hardy, palatable and has short natural life cycle had been chose. For example, in the first session (Table 1), participants planted and named lettuce, then shared and communicated each patient's experiences in order to enhanced their communication and expression abilities. After that, a six-session EHT program was organized in the hospital garden and rehabilitation room of Wuhan Wudong Hospital, Wuhan, Hubei Province, China. The EHT group participated in the program once a week (60 min on average).And cooperate with drug treatment.The control group was only treated with drugs.

2.4 Efficacy assessment

The BPRS was used to assess clinical symptoms of schizophrenia which had an 18-item rating scale completed by psychiatrists, the higher scores indicating severe symptoms.

The Chinese version of the 12-item SSFPI was used to assess social functioning. More than 38 points indicated normal social functioning (grade 5); 29 to 38 indicated mild social dysfunction (grade 4); 19 to 28 indicated moderate social dysfunction (grade 3); 9 to 18 indicated severe social dysfunction (grade 2), and less than or equal to 8 indicated very severe social dysfunction (grade 1).

LSIA was used to assess patients' life satisfaction LSIA included 12 positive and 8 negative items. The higher the total score, the greater the patient's life satisfaction. The evaluators were blinded to the group assignments.

2.5 Statistical analysis

SPSS 24.0 was used for data analysis. Continuous data was expressed as mean ± standard deviation, discontinuous data was expressed as frequency. t-test was used for comparison between groups. Discontinuous data were tested by chi-square test. $P<0.05$ was considered statistically significant.

3. Results

3.1 General information

In EHT group, the average age was 44.20 ± 13.695 years old. In the control group, the average age was 46.66 ± 13.401 years old. No significant differences was found in age and educational level between the groups.

Table 1. Six-session EHT program for patients with schizophrenia, based on activities with plants.

Session	Title/topic	Core competencies	Activity content	Edible plant
1	A good start	Tactile and visual sense engagement, physical activity, communication, and expression	Plant lettuce and name the plants Share experience and communicate with other patients	Lettuce(var. *ramosa* Hort.)
2	Stimulation of the tip of the tongue	Engagement with tactile, taste, and visual senses; physical activity; communication skills	Watering the lettuce Taste hawthorn and describe the sensation Share experience and communicate with other patients	Hawthorn (*Fructus crataegi pinnatifidae*)
3	Enjoyment of smell	Engagement with olfactory, visual, and tactile senses; attention; teamwork	Warm-up finger exercise Touch and smell different plants Plant small peppermint plants	*Plectranthus tomentosa* (*Plectranthus* 'Cerveza 'n Lime'), Mint (*Mentha haplocalyx* Briq.)
4	Comprehensive training in plant inscription rubbing (i.e., painting the back of leaves and then printing the leaves on a white bag)	Engagement with visual, tactile, and olfactory senses, expression and creativity	Choose a fruit leaf Create a print Share experience and communicate with other patients	Leaves of grapefruit (*Citrus paradisi* Macf.), orange (*Citrus reticulata* Blanco.), pomegranate (*Punica granatum* L.)
5	Comprehensive training in planting different combinations of vegetables in pots, similar to arranging flowers	Engagement with tactile and visual senses, collaborative work, expression and creativity	Warm-up activity Plant vegetables Share experience and communicate with other patients	Lettuce (var. *ramosa* Hort.), coriander (*Coriandrum sativum* L.), shallot (*Allium fistulosum* L.), celery (*Apium graveolens* L.)
6	Harvest and gratitude	Engagement with sense of taste, physical activity, expression, collaborative work	Harvest own lettuce Make fruit salad and share with friends Share feelings about these activities with others	Lettuce (var. *ramosa* Hort.), tomato (*Solanum lycopersicum*), mint (*Mentha haplocalyx* Briq.)

3.2 BPRS, SSFPI and LSIA between two groups

Before treatment,the BPRS, SSFPI and LSIA scores were similar between two groups, but they differed in both groups after the treatment (Table 2-4). After 6 stages of treatment, the SSFPI score in eht group was significantly higher than that in control group. There was almost no change between the control group and before treatment. There was significant difference between the two groups ($P < 0.05$). LSIA index in eht group was higher than that before treatment, while that in control group was lower than that in control group. After treatment, the LSIA index of EHT group was higher than that of the control group, and the difference between the two groups was statistically significant ($P < 0.05$). The BPRS index of EHT group was lower than that before treatment, but there was little change in the control group. There was significant difference between the two groups ($P < 0.05$).

3.3 Comparison of participant feedback

After EHT, participants generally showed improved cognitive level and social function recovery and looked forward to the next session. After EHT, these patients also became more talkative than before. Doctors comfirmed that patients' attitudes significantly improved and they more actively cooperated with the treatment.

4. Discussion

Due to mental symptoms and side effects of therapeutic drugs, schizophrenic patients have impaired social function, decreased cognitive ability, behavioral withdrawal, divorced from society and gradually moved towards mental decline. In addition, long-term inpatients have limited Schizophrenia patients' social contact and caused serious social functional defects. Thus, improving social function has became the ultimate goal for schizophrenia. Because improvement of social function cannot only alleviate the disease, shorten the course, but also decrease the burden on society (Zhu, 2018).

EHT (Sun, 2015; Gao et al., 2016; Hu et al., 2018) has a unique therapeutic effect with plants as the therapeutic medium. It can enable patients to slowly cultivate regular habits and enhance self-confidence from daily care plants, effectively delay the decline of social function of mental patients and reduce the incidence of disability. And gardening is closely related to daily life. It can not only connect people with nature to achieve the purpose of rehabilitation, but also learn gardening skills and make food.

The edible plants in EHT included lettuce, hawthorn, tomato and mint. Lettuce Easy to grow, short maturity period, is the main material for the production of the salad. The bioavailable polyphenols of fresh or least processed Lettuce after simulated gastrointestinal digestion were 32.6 or 43.3 mg/100 g, respectively (Lafarga et al., 2020). Hawthorn is rich in nutrients and antioxidant compounds (Liu et al., 2019). Tomato is a magical fruit rich in plant chemicals that promote health, which helps to prevent important chronic degenerative diseases (Chaudhary et al., 2018). Mint showed superior mineral components (high contents of potassium, calcium and iron) and high antioxidant activity (Singh et al., 2016). These plants are not only nutritious, but also taste good. Patients in the treatment process, through identity conversion, further strengthen the social function, enhance self-confidence and happiness.

Studies at home and abroad have shown that horticultural therapy, as an adjuvant therapy, can effectively improve patients' symptoms and improve patients' self-care ability and social function (Zhu et al., 2017; Lai et al., 2017; Huang, 2017). After 6 weeks of treatment, SSFPI score and LSIA index in eht group increased, and were significantly higher than those in control group. There was little change in the control group compared

Table 2. Effects of EHT on clinical symptoms of patients with schizophrenia based on BPRS.

Variable	EHT group (n = 30)	Control group (n = 29)	P value
Before experiment	35.50 ± 6.268	37.86 ± 4.381	0.100
After experiment	31.83 ± 4.698	37.38 ± 4.617	<0.001
D-value	–3.67	–0.48	
P value	<0.001	0.020	

Table 3. Impact of EHT on social function of patients with schizophrenia based on SSFPI scores.

Variable	EHT group (n = 30)	Control group (n = 29)	P value
Before experiment	28.37 ± 6.536	26.17 ± 5.471	0.168
After experiment	34.87 ± 5.970	26.07 ± 5.230	<0.001
D-value	+6.5	–0.1	
P value	<0.001	0.541	

Table 4. Impact of EHT on life satisfaction of patients with schizophrenia based on LSIA scale scores.

Variable	EHT group (n = 30)	Control group (n = 29)	P value
Before experiment	22.07 ± 7.393	19.56 ± 7.002	0.201
After experiment	23.29 ± 7.586	16.22 ± 5.774	<0.001
P value	0.273	<0.001	

with that before treatment. The BPRS index of EHT group was significantly lower than that before treatment, but there was no significant change in the control group. This is similar to the research results of Hu et al. (2018), suggesting that standardized horticultural treatment for long-term hospitalized patients with schizophrenia can improve the quality of life of patients.

People recover faster in green or natural environments than in urban environments because natural environment could reduce emotional stress and activate the sympathetic nervous system. Our results indicated that EHT can be not only an adjunct to the treatment of mental illness, but also can be introduced into urban public spaces to create green and healthy healing environments from the perspective of disease prevention, edible landscape (Zhu & Wang, 2015; Wu et al., 2018). Rehabilitation is a subject integrating many factors such as clinical, psychological, social and educational factors, not a simple therapeutic function. Horticultural therapy is the carrier of the cross integration of multiple factors, and horticultural therapy is an effective supplement to modern rehabilitation therapy. Horticultural therapy has just begun to be applied in clinic. The research on its efficacy and mechanism at home and abroad is still in the exploratory stage, and there is a broad space for development in this field.

4.1 Limitations

Firstly, our study was a single-center trial, another multiple center trial was still needed in the future. Secondly, the sample size of this study was very limited and only female patients were recruited. It is necessary to conduct another larger scale experiment to involve more participants.

5. Conclusion

EHT maybe valuable for improving clinical symptoms of schizophrenia and recovery of social function. Traditional horticultural therapy is a promising supplement to traditional medicine.

Ethical approval

This study was conducted in accordance with the Declaration of Helsinki and approved by the ethics committee of Wuhan Wudong Hospital.

Conflict of interest

All of the authors had no any personal, financial, commercial or academic conflicts of interest separately.

Availability of data and material

All data generated or analyzed during this study are included in this published article.

Funding

Scientific research project of Wuhan Municipal Health Commission (No. WX21D53).

Author contributions

Tao Liu, Mingchao Li and Fan Zhou conceived of the study, and Qiuming Ji, Yu Chen and Chi Li participated in its design and coordination and Cairong Wang, Haiying Chen and Hui He helped to draft the manuscript. All authors read and approved the final manuscript.

References

Burns, T., & Patrick, D. (2007). Social functioning as an outcome measure in schizophrenia studies. *Acta Psychiatrica Scandinavica*, 116(6), 403-418. http://dx.doi.org/10.1111/j.1600-0447.2007.01108.x. PMid:17941964.

Chaudhary, P., Sharma, A., Singh, B., & Nagpal, A. K. (2018). Bioactivities of phytochemicals present in tomato. *Journal of Food Science and Technology*, 55(8), 2833-2849. http://dx.doi.org/10.1007/s13197-018-3221-z. PMid:30065393.

Gao, Y., Huang, S., & Lu, Y. Q. (2016). Analysis on the rehabilitation effect of horticultural therapy on chronic schizophrenia. *Chinese Medical Science*, 6(7), 202-205.

Gaszner, P. (2009). Complex therapy of schizophrenia. *Neuropsychopharmacologia Hungarica*, 11(1), 41-45. PMid:19731818.

Gonzalez, M. T., Hartig, T., Patil, G. G., Martinsen, E. W., & Kirkevold, M. (2011). A prospective study of group cohesiveness in therapeutic horticulture for clinical depression. *International Journal of Mental Health Nursing*, 20(2), 119-129. http://dx.doi.org/10.1111/j.1447-0349.2010.00689.x. PMid:21371227.

Guan, X. F., Hu, X. Y., & Lu, Z. (2021). Update of diagnostic criteria and classification changes of schizophrenia. *Chongqing Yike Daxue Xuebao*, 46(07), 760-763.

Hu, X. L., Zhang, Y. H., Lu, Y., Liang, Z., & Zhao, J. W. (2018). Intervention of horticultural therapy on quality of life of long-term hospitalized schizophrenic patients. *Chinese Journal of Health Psychology*, 26(10), 1457-1461.

Huang, Y. Y. (2017). Effect of horticultural treatment on long-term hospitalized patients with senile schizophrenia. *Nursing Practice and Research*, 14(14), 150-151.

Kurtz, M. M., Gopal, S., John, S., & Thara, R. (2019). Objective psychosocial function vs. subjective quality-of-life in schizophrenia within 5-years after diagnosis: a study from southern India. *Psychiatry Research*, 272, 419-424. http://dx.doi.org/10.1016/j.psychres.2018.12.149. PMid:30611958.

Lafarga, T., Villaró, S., Rivera, A., Bobo, G., & Aguiló-Aguayo, I. (2020). Bioaccessibility of polyphenols and antioxidant capacity of fresh or minimally processed modern or traditional lettuce (*Lactuca sativa* L.) varieties. *Journal of Food Science and Technology*, 57(2), 754-763. http://dx.doi.org/10.1007/s13197-019-04108-7. PMid:32116384.

Lai, J. N., Peng, Q. Y., Liang, X. Y., & Liu, G. (2017). Theory and practice of horticultural therapy in rehabilitation therapy. *Electronic Journal of Translational Medicine*, 4(2), 81-84.

Liu, H., Liu, J., Lv, Z., Yang, W., Zhang, C., Chen, D., & Jiao, Z. (2019). Effect of dehydration techniques on bioactive compounds in hawthorn slices and their correlations with antioxidant properties. *Journal of Food Science and Technology*, 56(5), 2446-2457. http://dx.doi.org/10.1007/s13197-019-03720-x. PMid:31168127.

Liu, Y., Bo, L., Sampson, S., Roberts, S., Zhang, G., & Wu, W. (2014). Horticultural therapy for schizophrenia. *Cochrane Database of Systematic Reviews*, 2014(5), CD009413. http://dx.doi.org/10.1002/14651858.CD009413.pub2. PMid:24842458.

Mochizuki-Kawai, H., Kotani, I., Mochizuki, S., & Yamakawa, Y. (2018). Structured floral arrangement program benefits in patients with neurocognitive disorder. *Frontiers in Psychology*, 9, 1328. http://dx.doi.org/10.3389/fpsyg.2018.01328. PMid:30123151.

Naoki, K., Nobuo, A., & Emi, I. (2003). Randomized controlled trial on effectiveness of the community re-entry program to inpatients with schizophrenia spectrum disorder, centering around acquisition of illness self-management knowledge. *Seishin Shinkeigaku Zasshi. Psychiatria et Neurologia Japonica*, 105(12), 1514-1531. PMid:15027310.

Oh, Y. A., Park, S. A., & Ahn, B. E. (2018). Assessment of the psychopathological effects of a horticultural therapy program in patients with schizophrenia. *Complementary Therapies in Medicine*, 36, 54-58. http://dx.doi.org/10.1016/j.ctim.2017.11.019. PMid:29458931.

Singh, J. P., Kaur, A., Shevkani, K., & Singh, N. (2016). Composition, bioactive compounds and antioxidant activity of common Indian fruits and vegetables. *Journal of Food Science and Technology*, 53(11), 4056-4066. http://dx.doi.org/10.1007/s13197-016-2412-8. PMid:28035161.

Sun, Y. L. (2015). Overview of the origin and development of horticultural therapy. *Journal of Guangxi University for Nationa*, 4, 48-53.

van Os, J., & Kapur, S. (2009). Schizophrenia. *Lancet*, 374(9690), 635-645. http://dx.doi.org/10.1016/S0140-6736(09)60995-8. PMid:19700006.

Wichrowski, M., Whiteson, J., Haas, F., Mola, A., & Rey, M. J. (2005). Effects of horticultural therapy on mood and heart rate in patients participating in an inpatient cardiopulmonary rehabilitation program. *Journal of Cardiopulmonary Rehabilitation*, 25(5), 270-274. http://dx.doi.org/10.1097/00008483-200509000-00008. PMid:16217230.

Wu, H. Y., Ma, L., Zhang, T. S., Cao, M., & Zhang, S. Z. (2018). Effects of horticultural therapy on cognitive function and quality of life in patients with mild to moderate Alzheimer's disease. *Chinese Journal of Geriatric Multiple Organ Diseases*, 17(3), 197-201.

Yanagida, N., Uchino, T., & Uchimura, N. (2017). The effects of psychoeducation on long-term inpatients with schizophrenia and schizoaffective disorder. *The Kurume Medical Journal*, 63(3.4), 61-67. http://dx.doi.org/10.2739/kurumemedj.MS00011. PMid:28381728.

Zhang, S., & Han, Y. W. (2021). Research progress of horticultural rehabilitation therapy for patients with mental diseases. *China Urban Forestry*, 19(1), 117-122.

Zhang, W. B. (2018). *Research on the practical application of horticultural therapy in social work* (Dissertation). Anhui University, Hefei.

Zhu, J. J. (2018). Effect of occupational therapy on rehabilitation and sleep of patients with chronic schizophrenia. *World Journal of Sleep Medicine*, 5(10), 1233-1234.

Zhu, S. H., Lu, Z. D., Wan, H. J., & Ye, C. Y. (2017). Effect of horticultural treatment on metabolism of hospitalized patients with chronic schizophrenia. *Chinese Journal of Mental Health*, 31(06), 447-453.

Zhu, S., Wan, H., Lu, Z., Wu, H., Zhang, Q., Qian, X., & Ye, C. (2016). Treatment effect of antipsychotics in combination with horticultural therapy on patients with schizophrenia: a randomized, double-blind, placebo-controlled study. *Shanghai Jingshen Yixue*, 28(4), 195-203. http://dx.doi.org/10.11919/j.issn.1002-0829.216034. PMid:28638192.

Zhu, Y., & Wang, F. J. (2015). Observation on rehabilitation effect of occupational therapy on female patients with chronic schizophrenia. *China Minkang Medicine*, 27(1), 93-94.