



Original Article

Horticultural therapy program for improving emotional well-being of elementary school students: an observational study

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ARTICLE INFO

Article history:

Received 11 September 2019

Received in revised form 12 January 2020

Accepted 12 January 2020

Available online 20 January 2020

Keywords:

Complementary and alternative medicine

Horticultural education

School farming

Socio-horticulture

ABSTRACT

Background: Children in modern society are exposed to high levels of stress. Various previous studies have reported that horticultural activities help children's emotional stability. The objective of this study is to develop and implement a horticultural therapy program to improve the emotional intelligence, resilience, and self-efficacy of elementary school students.

Methods: A total of 582 Korean students (11–13 years old) from 28 schools participated in this study. The horticultural therapy program consisted of seven sessions and was conducted once a week for 60 min per session, during regular or after-school classes. Before and after the horticultural therapy program, emotional intelligence, resilience, and self-efficacy of the elementary school students were assessed using questionnaires. At the end of the program, students evaluated their satisfaction with the program.

Results: The horticultural therapy program significantly improved emotional intelligence ($p=0.000$), resilience ($p=0.001$), and self-efficacy ($p=0.003$) of the elementary students participating in this study. After the program, emotional intelligence improved both male and female students. In resilience and self-efficacy, male students improved after the program, but female students did not.

Conclusions: This study may show a potential of horticultural therapy for psycho-emotional health of children.

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Introduction

Elementary school students in South Korea experience academic stress due to the competitive educational environment.¹ According to a survey by the National Youth Policy Institute, the factor causing the most stress in elementary school students is academic difficulties. This stressful educational environment leads to psychologically maladjusted children.²

In the United States of America, social emotional learning (SEL) has been introduced to address the emotional problems of students. SEL focuses on social aspects that promote positive relationships with others, self-awareness, relationship skills, and responsible decision making. 'Strong Kids' is an SEL program with brief and practical sessions that was designed to enhance emotional intelligence, reduce depression, improve resilience, and increase the

coping skills of children and early adolescents.³ This program is aimed at both prevention and early intervention, and has a wide range of applications. It includes 12 lessons of 45–55 min each and may be used effectively with high functioning, typical, at-risk, or emotionally/behaviorally disordered students in a variety of settings.

Exposure to natural environments during childhood has been reported as beneficial to teach children about the value of life.⁴ Several recent studies have indicated that horticultural activities in schools are effective for fostering an appreciation for nature, life skills, academic ability, and positive emotional experiences.^{5–8} Moreover, activities that involves contact with plants lead to positive emotional states, enhanced emotional intelligence and social competence, reduced stress and improved immune function.^{9–12} Accordingly, the importance of nature-based education is recognized and used in personality education.^{13–19}

The present study was developed as a seven-session horticultural therapy program based on the Strong Kids program, and used to test the veracity of the program to improve emotional wellbeing

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in terms of emotional intelligence, resilience, and self-efficacy in Korean elementary school students.

Methods

Subjects

To recruit elementary schools for this study, flyers with program information such as purpose, contents, period, and requirements were distributed in Gyeonggi-do, South Korea. Finally, twenty-eight elementary schools (582 students aged 11–13 years; Grades 4–6) participated in the study.

The children who wanted to participate were given application and parental/guardian consent forms to complete and return. Before the first session of the program, the instructor visited each school and presented an introduction to the program to orient participants to the purpose and process of the study, and to complete further consent and demographic information forms. The study was approved by the Institutional Review Board of Konkuk University (7001355-201805-HR-245).

Horticultural therapy program

A horticultural therapy program was developed based on the Strong Kids program³ and the seventh elementary curriculum of South Korea for 4th to 6th graders (Table 1) (<http://english.moe.go.kr/sub/info.do?m=020101&s=english>). The Strong Kids program consists of 12 lessons, of which seven lessons were selected for the horticultural therapy program, including lessons such as emotional strength training, understanding your feelings, understanding other people's feelings, letting go of stress, positive living, and completing of projects.³ Horticultural lessons and activities included information on soil types, watering, plant structure, propagation, and photosynthesis. Native and foliage plants, such as *Hemerocallis fulva*, *Liriope platyphylla*, *Dicentra spectabilis*, *Prunella vulgaris* var. Liliciand, etc. were used as horticultural crops (Table 1). The horticultural therapy program was structured as seven weekly, 60 min sessions during regular school hours or after-school hours.

Prior to the program, 46 instructors were recruited to facilitate the program in the 28 elementary schools. One main instructor and one assistant instructor were dispatched to each school. Before starting the horticultural therapy program, researchers provided three training sessions for the instructors about the purpose of the program, how to manage each session of the program, how to use the teaching materials, etc. All instructors were provided with the same lesson plans, materials, and supplies. To qualify as a main instructor, the applicant had to be qualified as a level 2 or higher horticultural therapist through the Horticultural Therapy and Well-being Association of South Korea. For the assistant instructor positions, applicants had to complete a horticultural therapist training course provided by the Horticultural Therapy and Well-being Association of South Korea.

For example, session 3 was aimed at teaching kids about the different types and roles of soil, and about positive emotions. This activity was planned according to the 'Understanding your feelings 2' part of the Strong Kids program. In addition, teachers demonstrated different types of soil and discussed their roles, which is included in the seventh elementary curriculum in South Korea. Then students mixed peat moss, vermiculite, and perlite by themselves. For the emotional part of the session, students designed a name tag based on a positive adjective that they felt described themselves. Teachers proposed some positive adjectives to the students and allowed them to choose. Through this activity, students were able to determine their strengths in terms of positive ego

expression. The name tags were attached to flowerpots and displayed so students could see them and feel a sense of achievement.

Assessments

To assess emotional intelligence, a questionnaire with 47 questions was used. It was designed for elementary school students and developed by Moon.²⁰ Higher scores indicated greater emotional intelligence.

To understand the effects of the program on resilience, we tested participants with a five-point Likert scale of 36 questions. It was developed by Reivich and Shatte and revised by Lee to be more appropriate for elementary school students.^{21,22} It includes eight subcategories: emotion control, impulse control, optimism, causal analysis, empathy, self-efficacy, and positive conductivity. Higher scores indicated higher resilience. Lee reported a Cronbach's α of 0.94.²²

A five-point Likert scale was also used in the self-efficacy questionnaire, which consisted of 24 questions developed by Kim and modified by Han.^{23,24} It had three subscales, namely self-confidence, self-control efficacy, and task difficulty. Han reported a Cronbach's α of 0.88.²⁴ The researchers modified the satisfaction questionnaire from Park et al. and Lee.^{25,26} The questionnaire consisted of nine sub-items, namely overall interest, program time, program frequency, preferred activities, re-participation, recommendation to others, and improvement of school environment. To investigate subjective mood from the improvement to the school environment, the semantic differential method developed by Osgood was included in the satisfaction evaluation item.²⁷

Data analysis

The results of the psychological and emotional questionnaires before and after the horticultural activities were analyzed using SPSS (version 24 for Windows; IBM, Armonk, NY). A paired *t*-test was performed to compare the pre- and post-test results. Demographic information and satisfaction-questionnaire results were analyzed using descriptive statistics in Excel (Microsoft Office 2007; Microsoft Corp., Redmond, WA). The level of statistical significance used was $p < 0.05$.

Results

Characteristics of the subjects

A total of 582 elementary school students from 28 elementary schools participated in this program. The average age of the students was 11.9 ± 0.7 years. The attendance for the horticultural therapy program was 94.9%.

Outcome measures

The horticultural therapy program significantly improved the emotional intelligence (Table 2). Analysis of gender differences showed that emotional intelligence was significantly improved in both male and female students.

The horticultural therapy program improved the resilience of children significantly (Table 2). Analysis of gender differences showed that the resilience of male students improved, but there was no significant difference in the resilience of female students.

The horticultural therapy program also improved self-efficacy in children significantly (Table 2). According to the analysis of gender differences, the self-efficacy of male students was improved after participation in the program, but there was no significant improvement in female students. The satisfaction survey was completed

Table 1
Activities and session details for the 7-session horticultural therapy program based on the Strong Kids and seventh elementary school curriculum in South Korea.

Session	Program Name	Contents		Main Activities	Horticultural Plants used
1	I am going to be a little gardener	Horticultural knowledge ^a Strong Kids ^b	Horticulture and health About Strong Kids: Emotional strength training	Learning about the benefits of plants Conducting pre-test	
2	Comfortable feelings for me	Horticultural knowledge Strong Kids	Horticulture and water Understanding your feelings 1	Learning about proper watering methods Assembling the modular flowerpot Mixing soils Planting flowers	<i>Hemerocallis fulva</i> , <i>Pulsatilla tongkangensis</i> (Y. N. Lee & T. C. Lee)
3	I am the person like...	Horticultural knowledge Strong Kids	Horticulture and soil Understanding your feelings 2	Learning about the role of soil Mixing soils Planting flowers Making name tags with positive adjectives	<i>Liriope platyphylla</i> , <i>Dicentra spectabilis</i> , <i>Prunella vulgaris</i> var. lilacina, <i>Iris sanguinea</i>
4	How do you feel?	Horticultural knowledge Strong Kids	Structure of a plant Understanding other people's feeling	Learning about the structure of a plant Planting flowers Observing the plants and making plant information signs	<i>Dianthus chinensis</i> L., <i>Dianthus superbus</i> var. speciosus, <i>Campanula punctata</i> , <i>Aster yomena</i>
5	Fragrant life	Horticultural knowledge Strong Kids	Propagation of a plant Letting go of stress	Learning about vegetative propagation of plants Cutting herbs	<i>Pelargonium inquinans</i>
6	I can do it	Horticultural knowledge Strong Kids	Photosynthesis of a plant Positive living	Learning about photosynthesis and transpiration Planting succulents	Succulent (<i>Sedeveria Letizia</i> , <i>Echeveria 'A Grimm One'</i> , <i>Graptopoveria Bronze</i> etc.)
7	I am a little gardener	Horticultural knowledge Strong Kids	- Completing projects	Expressing the students' feelings during the program Conducting post test	-

^a The Strong Kids programs are brief and practical social-emotional learning curricula that were designed for the purpose of teaching social and emotional skills, promoting resilience, strengthen assets, and increasing coping skills of children and early adolescents.³

^b The horticultural lessons and activities were selected from the seventh elementary curriculum of South Korea for 4th to 6th graders (<http://english.moe.go.kr/sub/info.do?m=020101&s=english>).

Table 2
Comparison of emotional intelligence, resilience, and self-efficacy in children before and after the 7-session horticultural therapy program.

Variable		Pre-test	Post-test
Emotional intelligence	Male (n = 284)	62.76 ± 14.30	64.29 ± 15.32*
	Female (n = 298)	65.26 ± 12.94	65.78 ± 14.15**
	Total (n = 582)	64.04 ± 13.66	65.57 ± 14.77***
Resilience	Male (n = 284)	123.68 ± 18.06	126.03 ± 19.19**
	Female (n = 298)	129.43 ± 18.86	130.73 ± 19.47
	Total (n = 582)	126.74 ± 18.69	128.52 ± 19.46**
Self-efficacy	Male (n = 284)	82.79 ± 15.05	84.67 ± 15.44**
	Female (n = 298)	82.37 ± 14.05	83.41 ± 14.81
	Total (n = 582)	82.57 ± 14.53	84.02 ± 15.11**

Data presented as mean ± standard deviation.

* p < 0.05.

** p < 0.01.

*** p < 0.001.

by the participants after completing the horticultural activity program. Overall interest in the program suggested that 77% (448 students) were interested and 19.9% (116 students) were neutral. Regarding the difficulty of the program, 69.9% (407 students)

answered 'easy', 27.7% (161 students) answered 'normal', and 1.7% (10 students) answered 'difficult'.

Regarding the satisfaction of the participants for session duration, 45.5% (265 students) were 'very satisfied', 31.4% (183 students) were 'satisfied', 51.3% (89 students) were 'neutral', and 5.1% (30 students) were 'not satisfied'. Those who answered 'not satisfied' suggested that sessions longer than 60 min or 40 min as regular school time would be adequate. For the number of sessions per week, 44.8% (261 students) were 'very satisfied', 29.7% (173 students) were 'satisfied', 16.2% (94 students) were 'neutral', 6.4% (37 students) were 'not satisfied', and 2.1% (12 students) answered that they were 'not satisfied at all'. The respondents who answered 'not satisfied' specified that they would prefer to participate two or three times a week.

In our horticultural therapy program, the highest proportion of participants preferred activities involving planting succulent plants (21.8%). This was followed by planting (20.6%), herb cutting (17.7%), soil mixing (17.1%), designing name tags or plant signs (13.5%), and the classes on horticulture (9.3%). Of all the students, 70.1% (408 students) answered that they would like the program to continue, and the same number of children indicated that they would recommend the program. Regarding improvement of the school

environment, 56.2% answered that the school environment had improved since the start of the program, 41.4% answered 'neutral', and 1.9% answered 'the school environment did not improve'. The results of the semantic differential method suggested that students expressed the positive mood states: comfortable (3.6 ± 2.5), neutral (3.4 ± 2.7), and relaxed (3.2 ± 2.7).

Discussion

In our study, horticultural therapy was found to be an effective method for improving emotional intelligence in elementary school children regardless of gender. Our results are consistent with those of previous studies.^{25,28–30} Plant-handling activities allow children the opportunity to develop emotionally by increasing peer–peer understanding and collaboration.³¹ Ballantyne and Packer suggested that exposure to nature in schools can be an important tool for developing relationships between students and teachers.³² Children are better able to express emotions during horticultural activities because they involve collaboration with peers, which leads to shared emotional experiences.^{4,33} The temporal lobe of the brain functions in emotional expression and is activated when viewing plants, indicating that horticultural activities affect emotional intelligence.³⁴

The present program also provided opportunities for students and teachers to cooperate and develop relationships by planting plants and creating a nature-friendly school environment in their own school. Through participation in activities and communicating with peers, emotional recognition and expression could be improved. Certain units of the Strong Kids program, such as 'Understanding my feelings' and 'Understanding other people's feelings', could also improve emotional intelligence.

Our results were consistent with those of previous studies showing that horticultural activities are effective at improving the resilience of children.^{35,36} Kaplan and Kaplan provided evidence to suggest that, when a person is exposed to nature, stress from the external environment is alleviated and attention is restored.³⁷ Previous studies have shown that stress reduction and physiological recovery are improved in a natural environment.^{38–41} This is especially evident in children, and students in schools with nature-friendly playgrounds tend to exhibit higher levels of resilience than students in non-environmentally friendly school playgrounds.⁴² In addition, being near in natural environments has been shown to relieve stress and improve psychological stability.^{43,44} By gender, the resilience of male students was significantly improved after the program, but female students were not statistically significant. This result may have been influenced by the tendency of adolescent females to be more easily affected by stress from external stimuli, such as academic, family problems, relationships with friends, and appearance.

Our results are consistent with the results of previous research that self-efficacy was significantly increased in patients with schizophrenia after a 16-session horticultural therapy program.⁴⁵ Han reported that horticultural activities strengthen self-esteem, self-reliance, and self-efficacy of children with intellectual disabilities.⁴⁶ Kwon et al. also suggested that participation in horticultural activities led to improvements in self-efficacy and motivation to learn in elementary school students.⁴⁷ Furthermore, while the self-efficacy of male students who participated in the program improved, the self-efficacy of female students did not show significant difference. This may be because appearance-related stress, which is one of the factors that degrades self-efficacy of adolescents, acts more on the female students, resulting in a higher stress index of the female students.

Although our findings are promising, the data are limited to an area of South Korea, and therefore future studies should expand

the study to different areas and eventually, nationwide. The participants were children without any eligibility criteria regarding emotional or psychological status, so there is limitation in observing therapeutic effects. Furthermore, our study did not use control intervention and we cannot completely elucidate the non-specific effects of horticulture therapy.

In conclusion, the results of our study have shown that the horticultural therapy program may be effective in improving psychological stability and social-emotional competence in terms of emotional intelligence, resilience, and self-efficacy in elementary school children.

Author contributions

Program Development, Y.A., A.Y., S.A. and K.J.; Program Operation, Y.A. and A.Y.; Data Analysis, Y.A. and S.A.; Writing & Editing, Y.A. and S.A.

Conflict of interest

The author declares no conflicts of interest.

Funding

This study is supported by Gyeonggi Province (Project No: S201804S00051).

Ethical statement

The institutional review board of Konkuk University approved this study (7001355-201805-HR-245). The participants agreed to the use of collected data for scientific purposes.

Data availability

Data will be made available on request.

Acknowledgments

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

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.imr.2020.01.007>.

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