

ASSESSING PSYCHOLOGICAL, ENVIRONMENTAL, AND NUTRITIONAL VARIABLES  
OF ADOLESCENTS IN HORTICULTURAL THERAPY PROGRAMS OF BEHAVIORAL  
HEALTH SERVICE INSTITUTIONS

by

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B.S., CHUNG-ANG UNIVERSITY, 1994  
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AN ABSTRACT OF A DISSERTATION

submitted in partial fulfillment of the requirements for the degree

DOCTOR OF PHILOSOPHY

Department of Horticulture, Forestry, and Recreation Resources  
College of Agriculture

KANSAS STATE UNIVERSITY  
Manhattan, Kansas

2011

## **Abstract**

Subjects of this research were 64 adolescents receiving treatment at two behavioral health service institutions located in an urban mid-western city. Both institutions provided horticultural therapy and non-horticultural therapy programs. Research subjects were adolescents with diverse treatment needs and their responses on research questions were inconsistent compared to other related studies with general population. Current research assessed the adolescents with horticultural therapy treatment and without horticultural therapy treatment in three aspects.

First, the levels of psychological aspects of adolescents were assessed with the Rosenberg Self-Esteem Scale and Nowicki-Strickland Locus of Control Scale for Children. The levels of self-esteem and locus of control of adolescents with horticultural therapy treatment were not significantly different from those of adolescents without horticultural therapy treatment at both institutions. Based on the different level of worthiness and competence factors, it is recommended to design horticultural therapy programs focused on improving the worthiness factor of self-esteem.

Second, the pastoralism disposition of the Children's Environmental Response Inventory was used to assess the level of environmental attitude of the adolescents with and without horticultural therapy treatment. Horticultural experience and environmental attitude had a positive relationship with most subjects. At one institution, the level of environmental attitude of the adolescents with horticultural therapy treatment was significantly higher than the adolescents without horticultural therapy treatment. The adolescents at the horticultural therapy program which was scheduled more frequently showed higher environmental attitude scores. To improve

environmental attitude of adolescents, horticultural therapy program should provide diversity and abundant opportunities of horticultural experiences.

Third, basic horticultural knowledge was tested with the Basic Horticultural Knowledge Questionnaire. Vegetable/fruit consumption and preference were described with the Vegetable and Fruit Preference and Consumption Survey. Basic horticultural knowledge scores of the horticultural therapy group were significantly higher than that of the non-horticultural therapy group at one institution, but the scores were similar between the two groups at the other institution. Basic horticultural knowledge of subjects was significantly correlated to their vegetable and fruit consumption. To increase vegetable/fruit consumption, horticultural therapy programs should set goals to incorporate nutrition education.

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## Table of Contents

List of Figures .....	xiii
List of Tables .....	xiv
CHAPTER 1 - Introduction .....	1
Psychological Aspects .....	2
Environmental Education Aspect .....	3
Nutrition Education Aspect.....	3
Objectives .....	4
Definition of Terms.....	5
Limitations .....	7
References.....	8
CHAPTER 2 - Literature Review .....	11
Self-esteem and locus of control.....	11
Self-esteem.....	11
Self-esteem and demographics .....	11
Self-esteem and behavioral, psychological and psychiatric problems.....	13
Self-esteem factors: Worthiness and competence.....	14
Locus of control .....	15
Age, gender, and locus of control .....	15
Locus of control and psychological problems .....	16
Locus of control and behavioral, psychological problems, and academic achievements.	17
Locus of control and intervention programs.....	18
Horticultural therapy and psychological variables .....	19
Environmental Education .....	20
Environmental knowledge and attitudes.....	21
Residential environmental education.....	22
Activity-based environmental education .....	22
Nutrition Education.....	24
Nutrition and health .....	24



Vegetable/fruit consumption and health problems .....	24
Vegetable and fruit consumption and preferences.....	25
Nutrition education programs .....	27
References.....	30
<b>CHAPTER 3 - Self-esteem and locus of control of adolescents in horticultural therapy programs</b>	
in behavioral health service institutions .....	40
Abstract.....	41
Introduction.....	42
Self-esteem.....	42
Locus of control .....	44
Method .....	48
Research Sites .....	48
Subjects.....	49
Instruments.....	50
Demographic Information.....	50
Rosenberg Self-Esteem Scale (RSES).....	50
Nowicki-Strickland Locus of Control Scale for Children .....	52
Procedure and data collection .....	53
Data Analyses .....	53
Results.....	55
Demographics .....	55
Institution A .....	55
Institution B .....	55
Self-esteem.....	56
Institution A .....	56
Institution B .....	59
Worthiness and Competence factors.....	60
Locus of Control .....	61
Self-esteem and Locus of Control.....	63
Discussion.....	65
References.....	69

CHAPTER 4 - Environmental attitude of adolescents with and without horticultural therapy	
treatment at behavioral health service institutions.....	77
Abstract.....	78
Introduction.....	79
Method.....	81
Research Sites.....	81
Subjects.....	82
Instruments.....	84
Horticultural Background Questionnaire.....	84
Children’s Environmental Response Inventory.....	84
Demographic Information.....	85
Procedure and data collection.....	86
Data Analyses.....	86
Results.....	88
Horticultural background.....	88
Horticultural experience.....	88
Future horticultural interest.....	91
Children’s Environmental Response Inventory (CERI).....	94
Institution A.....	94
Institution B.....	96
Discussion.....	100
References.....	104
CHAPTER 5 - Basic horticultural knowledge and vegetable/fruit consumption of adolescents	
with and without horticultural therapy treatment at behavioral health service institutions.	106
Abstract.....	107
Introduction.....	108
Method.....	111
Research Sites.....	111
Subjects.....	112
Instruments.....	114
Vegetable and Fruit Preference and Consumption Survey.....	114

Basic Horticulture Knowledge Test.....	114
Demographic Information.....	115
Horticultural Background Questionnaire.....	115
Nowicki-Strickland Locus of Control Scale for Children .....	115
Procedure and data collection.....	116
Data Analyses .....	117
Results.....	118
Vegetable and Fruit Consumption and Preference .....	118
Vegetable and fruit consumption frequency.....	118
Vegetable and fruit preferences .....	122
Vegetable consumption frequency and preference.....	124
Vegetable consumption frequency and fruit consumption frequency .....	124
Basic Horticultural Knowledge.....	125
Institution A .....	125
Institution B .....	126
Comparisons of three basic horticultural knowledge fields.....	129
Basic Horticultural Knowledge and Vegetable/Fruit Consumption and Preferences.....	131
Institution A .....	131
Institution B .....	132
Discussion.....	134
References.....	138
CHAPTER 6 - Conclusion.....	141
Appendix A - Instruments for Chapter 3 .....	143
Demographic Information.....	144
Rosenberg Self-Esteem Scale.....	145
Nowicki-Strickland Locus of Control Scale for Children .....	146
Appendix B - Instruments for Chapter 4.....	149
Horticultural Background Questionnaire.....	150
Children’s Environmental Response Inventory .....	151
Demographic Information.....	152
Appendix C - Instruments for Chapter 5.....	153

Vegetable and Fruit Preference and Consumption Survey .....	154
Basic Horticultural Knowledge Test.....	155
Demographic Information.....	157
Horticultural Background Questionnaire.....	158
Nowicki-Strickland Locus of Control Scale for Children .....	159
Appendix D - Informed Consent Statements and Forms .....	162
INFORMED CONSENT STATEMENT .....	163
INFORMED CONSENT STATEMENT .....	164
INFORMED CONSENT FORM.....	165
INFORMED CONSENT FORM.....	166

## List of Figures

Figure 4.1 The model of circular relationship of horticultural experiences, positive environmental attitude, and horticultural interest .....	102
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## List of Tables

Table 3.1 Demographic information of the subjects from Institution A and B .....	56
Table 3.2 Mean differences of global self-esteem, self-liking, and self-competence between the HT and NHT groups of Institution A.....	57
Table 3.3 Mean difference of global self-esteem scores between the two groups of different racial background in Institution A .....	58
Table 3.4 Mean difference of self-liking scores between the two groups of different racial background in Institution A .....	58
Table 3.5 Mean difference of self-competence scores between the two groups of different racial background in Institution A .....	59
Table 3.6 Mean differences of global self-esteem, self-liking, and self-competence between the HT and NHT groups of Institution B .....	60
Table 3.7 Mean differences between self-liking and self-competence of Institution A and B....	61
Table 3.8 Mean differences of locus of control between the HT and NHT groups of Institution A and Institution B.....	62
Table 3.9 Mean differences of locus of control between male and female subjects of Institution A and Institution B.....	63
Table 3.10. Pearson Correlations of locus of control with three self-esteem scores of Institution A and B .....	64
Table 4.1 Previous horticultural experiences of the adolescent subjects from Institution A and Institution B .....	89
Table 4.2 Listing of previous horticultural experiences by adolescent subjects from Institution A .....	90
Table 4.3 Listing of previous horticultural experiences by adolescent subjects from Institution B .....	91
Table 4.4 Future horticultural interest of adolescent subjects from Institution A and Institution B .....	92
Table 4.5 Listing of future horticultural interest of adolescent subjects from Institution A .....	94
Table 4.6 Listing of future horticultural interest of adolescent subjects from Institution B.....	94

Table 4.7 Mean difference between the HT and NHT groups in the Children’s Environmental Response Inventory (CERI) scores of Institution A .....	95
Table 4.8 Mean differences in the Children’s Environmental Response Inventory (CERI) scores among the groups based on the number of types of previous horticultural experiences of Institution A .....	96
Table 4.9 Mean difference between the HT and NHT groups in the Children’s Environmental Response Inventory (CERI) scores of Institution B.....	97
Table 4.10 Mean differences in the Children’s Environmental Response Inventory (CERI) scores among different age groups of Institution B .....	98
Table 4.11 Mean difference of Children’s Environmental Response Inventory (CERI) scores between the groups with and without future horticultural interest of Institution B.....	98
Table 4.12 Mean differences of Children’s Environmental Response Inventory (CERI) scores among the groups with different numbers of future horticultural interest of Institution B ..	99
Table 5.1 Vegetable consumption frequency of Institution A and Institution B.....	118
Table 5.2 Fruit consumption frequency of Institution A and Institution B .....	119
Table 5.3 Mean differences in the vegetable consumption frequency among the groups with different numbers of future horticultural interest of Institution A .....	120
Table 5.4 Mean difference of the fruit consumption frequency between two different racial groups at Institution A .....	121
Table 5.5 Mean differences of the numbers of preferred vegetables and fruits between the HT and NHT groups of Institution A and Institution B .....	122
Table 5.6 Mean difference of the vegetable preference between the groups with and without interest in future horticultural activity in Institution B .....	123
Table 5.7 Mean difference of the fruit preference between two genders in Institution B .....	124
Table 5.8 Pearson Correlation of vegetable consumption frequency and vegetable preference of Institution A .....	124
Table 5.9 Pearson Correlation of vegetable and fruit consumption frequencies of Institution A and Institution B.....	125
Table 5.10 Mean scores on the basic horticultural knowledge test of the HT and NHT groups at Institution A .....	126

Table 5.11 Mean scores on the basic horticultural knowledge test of the HT and NHT groups at Institution B .....	127
Table 5.12 Mean scores on the Basic Horticultural Knowledge Test (HORTTEST) among different ages at Institution B.....	128
Table 5.13 Mean scores on the Basic Horticultural Knowledge Test (HORTTEST) among different ages of NHT group of Institution B .....	128
Table 5.14 Mean differences among the scores of three fields of basic horticultural knowledge in each group of Institution A and Institution B .....	130
Table 5.15 Mean difference of the HTGR scores between the groups with different vegetable consumption frequencies in HT group of Institution A .....	131
Table 5.16 Mean differences of the scores of the Basic Horticultural Knowledge Test (HORTTEST) and HTGR between the groups with different fruit consumption frequencies of NHT group of Institution A .....	132
Table 5.17 Mean differences of the scores of the Basic Horticultural Knowledge Test (HORTTEST) and HTGR among the groups with different range of vegetable preference in HT group of Institution B .....	133



## **CHAPTER 1 - Introduction**

The therapeutic value of gardening and horticulture has been recognized and used to treat mentally ill patients since the early eighteenth century. Today, horticultural therapy is widely used to help various populations with many therapeutic needs.

In his theory of human motivation, Maslow (1943) described a hierarchy of basic human needs as physiological, safety, love, esteem, and self-actualization. The desires to fulfill these needs are the motivation of human behavior. Glasser (1998) explained human motivation as the satisfaction of five basic needs. The basic needs are survival, love and belonging, power, freedom, and fun. His five basic needs do not form any hierarchy and are different depending on the individual.

Considering the described human needs, horticultural therapy could be used to fulfill these human needs. Nutritious foods and physical exercise could fulfill the physiological and survival need. A calm and safe environment could be useful for the satisfaction of safety. The relationship with horticultural therapists and other people working together could share their experiences and feelings and give a sense of love and belonging. The experiences of achievement and success in horticultural activities could give feelings of being valued and fulfill the esteem and power needs. Reinforcement from the horticultural therapists also satisfies esteem, power, and freedom needs. The need of fun and self-actualization could be obtained through learning horticultural knowledge and experiencing various horticultural activities. Good relationships with other people in a therapy group could be a source of fun as well.

Horticultural therapy research has been reported in various populations with many topics (Lohr & Relf, 2000). However, the research on adolescents has been rarely reported compared

to the research on children, elderly people, or special populations. Although research studies are limited, various institutions provide horticultural therapy for adolescents.

This research studied two horticultural therapy programs for adolescents at behavioral health service institutions located in an urban mid-western city. The adolescents at these institutions were diagnosed with primary and secondary conditions. These may have included attention deficit hyperactivity disorder (ADHD), eating disorders, conduct disorder (CD), post-traumatic stress disorder (PTSD), drug abuse, sexual abuse, autism, chronic depression, schizophrenia, bipolar, and learning disabilities. The current evaluation system of each institution was not enough to assess the adolescents with horticultural therapy treatment in-depth in various aspects. The horticultural therapy program at one of the institutions uses the Walker-McConnell Scale of Social Competence and School Adjustment to assess the self control and peer-relations of the adolescents at the institution. At the other institution, the horticultural therapy program did not use any formal evaluation except a grade for class and occasional horticultural knowledge tests as a part of their horticultural therapy curriculum. For both institutions, horticultural therapists observed adolescents during a treatment session and that information was discussed with other therapists. Therefore, this study assessed the adolescents with and without horticultural therapy treatment in three aspects.

### ***Psychological Aspects***

In this research, self-esteem and locus of control were assessed as psychological aspects. Self-esteem and locus of control are some of the most frequently studied and reviewed psychological elements. Low self-esteem has been reported to be related with poor psychological, behavioral, and emotional adjustment in adolescent's development (DuBois & Tevendale, 1999; Meggert, 2006) while high self-esteem was related with healthy outcomes.

Internal locus of control is positively related with adolescents' psychological, behavioral, and academic development (Heaven, 1988; Lamont, 1972; Nowicki & Duke, 1983; Nunn, 1988; Shaw & Uhl, 1971). It was suggested that therapeutic or educational intervention programs could increase adolescents' self-esteem and locus of control (Autry & Langenbach, 1985; Deiker & Matson, 1979; Eitzen, 1974; Fertman & Chubb, 1992; Mruk, 2006; Nowicki & Strickland, 1973).

### ***Environmental Education Aspect***

The basic goal of environmental education is changing environmental behavior through education. Pooley and O'Connor (2000) suggested that environmental educators should focus on emotions and beliefs for changing environmental attitude. Meinhold and Malkus (2005) reported that a pro-environmental attitude predicts a pro-environmental behavior. With the goal of changing environmental attitude, various forms of environmental education are given to youth. Many studies reported that experiencing the natural environment and active involvement in horticultural experience were effective for positive environmental attitude education (Cammack, Waliczek, & Zajicek, 2002; Campbell, Waliczek, Bradley, Zajicek, & Townsend, 1997; Dresner & Gill, 1994; Harvey, 1989; Waliczek & Zajicek, 1999). Thus, pastoralism disposition of environmental attitude was used to assess the environmental education aspect.

### ***Nutrition Education Aspect***

Nutrition has an important role in adolescents' growth, development, and learning ability. It is also reported that poor nutrition at younger ages predisposes adolescents to persistent externalizing behavior problems (Liu, Raine, Venables, & Mednick, 2004). Vegetable and fruit intake is recommended for healthier diet and preventing disease. Food preferences are considered as the strongest predictor of food consumption (Harvey-Berino, Rourke, Terrance,

Dorwaldt, & Secker-Walker, 1997). Nutrition education programs focused on this prediction were effective in fruit and vegetable consumption (Domel, Thompson, Davis, Baranowski, Leonard, & Baranowski, 1996). Gardening related nutrition education programs reported significant improvement in vegetable and fruit consumption and preferences in children and elderly populations (Hackman & Wagner, 1990; Lineberger & Zajicek, 2000; Morris & Zidenberg-Cherr, 2002; Morris, Koumjian, Briggs, & Zidenberg-Cherr, 2002). Vegetable/fruit consumption and their preferences were studied with the basic horticultural knowledge of adolescents for a nutrition education aspect of horticultural therapy.

### ***Objectives***

The objectives of this research were as follows.

1. To assess the levels of self-esteem and locus of control of adolescents with and without horticultural therapy treatment at behavioral health service institutions.
2. To assess the environmental attitude of adolescents with and without horticultural therapy treatment at behavioral health service institutions.
3. To assess the vegetable/fruit consumption and preferences of adolescents with and without horticultural therapy treatment at behavioral health service institutions.

### *Definition of Terms*

The following terms are defined to assist in understanding of the research:

**Competence:** a generalized sense of self-efficacy represented by self-competence dimension of global self-esteem (Mruk, 2006).

**External locus of control:** the perception that the reinforcement is the result of luck, chance, fate, or powerful external force. Higher scores of the Nowicki-Strickland Locus of Control Scale mean external locus of control (Nowicki & Strickland, 1973).

**Horticultural therapy group:** the group of subjects who have history of receiving horticultural therapy treatment from the institution currently receiving behavioral health service.

**Internal locus of control:** the perception that the reinforcement is the result of one's own effort, ability, or action. Lower scores of the Nowicki-Strickland Locus of Control Scale mean internal locus of control (Nowicki & Strickland, 1973).

**Locus of control:** a generalized expectancy regarding the perception of reinforcement as either internal or external to the self (Rotter, 1966; Strickland, 1989). Locus of control was measured with the Nowicki-Strickland Locus of Control Scale (Nowicki & Strickland, 1973). Higher scores mean internal locus of control and lower scores mean external locus of control.

**Non-horticultural therapy group:** the group of subjects who do not have history of receiving horticultural therapy treatment from the institution currently receiving behavioral health service.

**Pastoralism:** enjoyment and conservation of the natural environment in an intellectual and aesthetic fashion measured with Children's Environmental Response Inventory (Bunting

& Semple, 1979). Higher scores mean high pastoralism which is considered as positive environmental attitude.

**Self-competence:** the sense of personal efficacy measured by Self-Competence dimension of Rosenberg Self-esteem Scale (Tafarodi & Swann, 1955). It represents the competence factor of self-esteem. Higher scores mean higher levels of competence.

**Self-esteem:** individual's overall evaluation or perception of his or her own worth and efficacy measured with Rosenberg Self-Esteem Scale. Higher scores mean high self-esteem and lower scores mean low self-esteem (Rosenberg, 1989).

**Self-liking:** the sense of social worth measured by Self-Liking dimension of Rosenberg Self-esteem Scale (Tafarodi & Swann, 1955). It represents the worthiness factor of self-esteem. Higher scores mean higher levels of worthiness.

**Worthiness:** the sense of self-worth represented by self-liking dimension of global self-esteem (Mruk, 2006).

### *Limitations*

1. Due to the institutional restriction for the confidentiality of the subjects, the researcher was not allowed to access individual subjects. Limited demographic information was provided by the therapists at both institutions.

2. Considering the diagnoses of the research subjects, research instruments were selected and designed to be short and simple.

3. Because the two institutions and their horticultural therapy programs have different systems, physical/environmental settings, and goals, the data from the two institutions were analyzed individually.

4. Considering the diagnoses of the research subjects and other unidentified factors which could influence the subjects' response, the application of the result should be limited to each behavioral health service institution and should not be generalized.

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## **CHAPTER 2 - Literature Review**

### **Self-esteem and locus of control**

#### *Self-esteem*

Self-esteem has been studied and identified as an important psychological element influencing various aspects of adolescents' development. The relationships of self-esteem with demographics, behavioral, and clinical issues were reviewed.

#### *Self-esteem and demographics*

Phinney, Cantu, and Kurtz (1997) studied the relationship between self-esteem, ethnic identity and American identity. A total of 669 American-born high school students from three different ethnic groups (African American, Latino, and white) participated in the study. For all three groups, ethnic identity was a significant predictor of self-esteem; the more they feel close attachment with their ethnic group, the higher their self-esteem. And only for white students, American identity was a strong predictor of self-esteem. Ethnic identity was a significant predictor of self-esteem among ethnic minority girls (Carlson, Uppal, & Prosser, 2000). Carlson et al. also reported significantly lower self-esteem of Hispanic girls. Twenge and Crocker (2002) conducted meta-analyses among 712 studies to examine race differences in self-esteem. They reported that self-esteem of blacks was higher than whites, and whites were higher than other racial minorities. A similar result was reported by Brown, McMahon, Biro, Crawford, Schreiber, Similo, Waclawiw, and Striegel-Moore (1998). The self-esteem of black girls showed little change between the ages of nine and 14 years while that of white girls decreased significantly.

Brown et al. related this to racial differences in attitudes toward physical appearance and obesity. Biro, Striegel-Moore, Franko, Padgett, and Bean (2006) studied the self-esteem of girls aged nine and ten, and annually measured changes for 10 years. They found that black girls reported higher self-esteem than white girls and for adolescent girls, body mass index was an important predictor of self-esteem. In the study of 547 French speaking adolescents, Marcotte, Fortin, Potvin, and Papillon (2002) reported that girls showed more negative body image than boys and body image was more importantly related with girls' self-esteem.

Gender differences in self-esteem were reported consistently. Brack, Orr, and Ingersoll (1988), Overholser, Adams, Lehnert, and Brinkman (1995), Kling, Hyde, Showers, and Buswell (1999), Quatman and Watson (2001), Polce-Lynch, Myers, Kliewer, and Kilmartin (2001), and Van Houtte (2005) reported male self-esteem higher than female self-esteem. Block and Robins (1993) and Bolognini, Plancherel, Bettschart, and Halfon (1996) conducted longitudinal studies on the gender differences of self-esteem. Both studies reported that self-esteem of males tended to increase and female self-esteem tended to decrease during adolescence. Robins, Trzesniewski, Tracy, Gosling, and Potter (2002) studied self-esteem of 326,641 individuals (aged nine to 90 years) and reported that self-esteem levels were high in childhood and dropped during adolescence. Self-esteem gradually rose throughout adulthood and declined sharply in old age.

The longitudinal study by McGee and Williams (2000) showed that the self-esteem from ages nine to 13 significantly predicted adolescent problem eating, suicidal ideation, and multiple health compromising behaviors. In the study on the relationship with health-related behaviors of adults, a clear link was found between individuals' self-esteem and predicted longevity.

### *Self-esteem and behavioral, psychological and psychiatric problems*

The relationship between low self-esteem and eating disorders was reported. Button, Sonuga-Barke, Davies, and Thompson (1996) measured the self-esteem of 594 school girls (aged 11 to 12) and followed up after four years. The study reported that girls with low self-esteem at age 11 to 12 had significantly greater risk of developing severe eating disorders and other psychological problems by the ages of 15 to 16. Jacobi, Paul, de Zwaan, Nutzinger, and Dahme (2004) reported that for adult patients in all three groups of eating disorders (anorexia nervosa, bulimia nervosa, and binge eating disorder) displayed lower self-esteem. Cervera, Lahortiga, Martínez-González, Gual, Irala-Estévez, and Alonso (2003) reported that higher self-esteem was protective for eating disorders in the study of 2,862 Spanish girls aged 12 to 21. Halvorsen and Heyerdahl (2006) reported that former anorexia nervosa patients with high self-esteem presented good eating disorder outcome, while lower self-esteem was related with poor eating disorder outcome.

Guillon, Crocq, and Bailey (2003) reported the relationships between adolescents' low self-esteem and various psychiatric disorders. Compared to a control group of 119 adolescents, a clinical population showed significantly lower self-esteem. Female patients showed significantly lower self-esteem than male patients and a history of suicide attempts and sexual abuse was associated with significantly lower self-esteem. Overholser et al. (1995) reported that the self-esteem of 288 high school students was higher than that of 254 adolescent psychiatric inpatients. Low self-esteem was closely related with higher levels of depression, hopelessness, and suicidal tendencies. Rucklidge (2006) reported lower self-esteem in a bipolar disorder group as compared to a control group. Prelow, Weaver, and Swenson (2006) reported that self-esteem serves as an important mediator of ecological risk and depressive symptoms for both African

American and European American adolescents.

***Self-esteem factors: Worthiness and competence***

Kernis (2003) discussed optimal self-esteem and fragile high self-esteem. Many of his concerns about various forms of fragile high self-esteem were also discussed by Baumeister, Campbell, Krueger, and Vohs (2003). Their questions on high self-esteem covered people with narcissistic tendencies, failure to identify causality of academic performance, and the failure of preventing unhealthy behaviors such as drinking, smoking, and using drugs. The self-esteem which intensifies both pro-social and antisocial tendencies was also questioned.

Mruk (2006) explained the controversies about self-esteem with the concept of two-factor theory of self-esteem. Branden (1969) described self-esteem as the two interrelated aspects of self-competence and self-respect. Tafarodi and Swann (1995) formed two dimensions of self-esteem called self-liking – “our affective judgment of ourselves, our approval or disapproval of ourselves, in line with internalized social values” and self-competence – “the overall sense of oneself as capable, effective, and in control” (p. 325). Tafarodi and Swann (1995) and Tafarodi and Milne (2002) divided Rosenberg’s Self-Esteem Scale which was widely used to measure global self-esteem into two dimensions of self-liking and self-competence. Although Rosenberg’s scale was developed without dimensionality, it was decomposed perfectly into two dimensions with the same number of questions in each dimension. Mruk’s Meaning-Based, Two-Factor Theory of Self-Esteem applied the same concept of two factors, but used different terms for them, ‘worthiness’ and ‘competence.’ This two-dimensional model was adapted for school teaching for support vulnerable children. Miller and Moran (2006) and Miller and Daniel (2007) discussed the concept of adaptation of two dimensions of self-esteem and the way of application of each dimension into the classroom.

Bardone, Perez, Abramson, and Joiner (2003) studied the relationships between self-liking, self-competence, and bulimic symptoms from the longitudinal studies of 535 undergraduate females. The study reported that self-competence, rather than self-liking, was predictive of changes in bulimic symptoms over time. Paterson, Power, Yellowlees, Park, and Taylor (2007) found that self-competence was the main predictor of eating disorder in the clinical sample and self-liking was the main predictor in the non-clinical sample. In the study about the laxative abuse of patients with anorexia nervosa, Surgenor, Maguire, Russell, and Touyz (2007) found a significant association between laxative abuse and self-liking rather than self-competence.

### ***Locus of control***

Locus of control refers to a generalized expectancy regarding the perception of reinforcement as either internal or external to the self (Rotter, 1966; Strickland, 1989). Individuals with internal locus of control see the reinforcement as the result of their own effort, ability, or actions while the individual with external locus of control perceive it as the result of luck, fate, chance, or powerful external force (Elliott, 1996; Kulas, 1996; Nunn, 1987; Roberts & Monroe, 1992).

### ***Age, gender, and locus of control***

Knoop (1981) studied 1,960 public school teachers about the relationship between age and locus of control. Internal locus of control tended to increase with age until the early sixties. Strand and Nowicki (1999) also reported the relationship between age and locus of control. In research with children and adolescents, children aged eight to 13 showed more external locus of control than adolescents aged 14 to 16. The relationship between locus of control and gender

was more consistently reported. Dixon, McKee, and McRae (1976) measured locus of control of 221 university students (98 males and 123 females) with three different scales. In the results of all three scales, females scored more external locus of control than males. Kumar and Tripathi (1986) reported that girls had significantly more external locus of control than boys. Cairns, McWhirter, Duffy, and Barry (1990) studied locus of control of 2,490 young people related with their environmental stabilities. There was no significant difference between male and female locus of control in the group which remained in the same school over an 18-month period. The locus of control of the males in the group who entered employment and in the group who changed schools was more internal than the locus of control of females. Kulas (1996) reported in a three-year longitudinal study that the directional changes of locus of control were different between the two genders. The locus of control of females moved toward an external direction over time. In contrast, the locus of control of males started more internal than that of females, and moved more internal over one year. After the test on the third year, the locus of control of males moved in a more external direction. In his review paper, Sherman (1997) reported that even though the gender differences of locus of control were in the same trend (females were more external than males), in recent years the significance decreased and male and female locus of control became similar.

### ***Locus of control and psychological problems***

Nunn (1988) studied the relationship between locus of control and anxiety. A total of 267 students (fifth to eighth grade) participated in the research. External locus of control was positively related with increasing levels of anxiety for both male and female students. Rawson (1992) studied 127 children with emotional and behavioral problems (aged eight to twelve). Results indicated a positive inter-correlation between external locus of control and anxiety.



Consistent results were found by Weems, Silverman, Rapee, and Pina (2003) showing significantly negative correlations between anxiety control score and external locus of control. An earlier study reported similar results of adult subjects (Watson, 1967).

In the study of 944 fourth- and fifth-grade children, Lefkowitz, Tesiny, and Gordon (1980) reported associations between high depression scores and external locus of control and low depression scores and internal locus of control. Friedman, Goodrich, and Fullerton (1985) investigated the relationship between locus of control and severity of psychiatric illness in 48 chronically disturbed adolescent inpatients. Severity of psychiatric illness was negatively correlated with internal locus of control. The study of relationship between bipolar disorder and locus of control of adolescents (aged 13 to 17) showed that compared to the adolescents without bipolar, adolescents with bipolar reported more external locus of control (Rucklidge, 2006).

Dunn and Shapiro (1999) studied the relationship of locus of control with attention deficit hyperactivity disorder (ADHD). From the comparison between 37 ADHD children and 36 non-ADHD children, ADHD children showed more external locus of control. Similar result was reported by Strand and Nowicki (1999) with children and adolescents with conduct disorders (CD). Compared to their peers without CD, children and adolescents with CD were more externally controlled.

### ***Locus of control and behavioral, psychological problems, and academic achievements***

Strickland (1973) studied the delay of gratification of children. A total of 152 third to fifth grade children participated in the study. The results showed that children with internal locus of control chose the delayed reward. Locus of control was also related with extreme behavior among 173 high school females (DuCette & Wolk, 1972). Students with external locus of control were characterized by extreme risk, low persistence, atypical shifts in level of

aspiration, and extreme estimation of success in academic, occupational, and cognitive activities. Duke and Fenhagen (1975) reported similar findings on the external locus of control of delinquent girls.

Academic achievement and locus of control relationships were reported by Shaw and Uhl (1971), Bar-Tal and Bar-Zohar (1977), and Gordon (1977). Shaw and Uhl studied 211 second-grade children and found that the higher the external score, the lower the reading score. Bar-Tal and Bar-Zohar reviewed previous research studies and reported that the more internal the individual's orientation, the higher the individual's achievement. Gordon also found the positive relationship between internal locus of control and academic achievement. Hallahan, Gajar, Cohen, and Tarver (1978) reported that learning disabled children exhibited a greater degree of external control than normal children on both the academic and non-academic oriented measurements. Fincham and Barling (1978) studied three groups of children varying in academic achievement. Children with learning disabilities exhibited the most externally oriented locus of control, and gifted children exhibited the least external locus of control.

Nunn (1987) reported in a study with 268 children that locus of control was negatively correlated with attitudes toward home, school, and peers. Heaven (1988) found that internal locus of control of adolescents was related to positive attitudes toward authority. Lynch, Hurford, and Cole (2002) studied parental attitudes and locus of control of children. Parents of at-risk students were significantly more enabling than parents of honors students. The locus of control of at-risk children was significantly more external than that of honors students.

### ***Locus of control and intervention programs***

Nowicki and Barnes (1973) reported that teenagers with a one week structured camp experience showed increased internal locus of control. Eitzen (1974) reported that juvenile

delinquent boys showed significantly more internal locus of control after receiving behavior modification treatment at a community-based home. Deiker and Matson (1979) tested locus of control of 41 emotionally disturbed adolescents who were in a unit token economy system. More perceived internal control of behavior was reported across levels. Autry and Langenbach (1985) assigned 40 adolescents to four groups: a self-regulation group to monitor constructive behaviors, a self-regulation group to monitor disruptive behaviors, an external regulation group, and a no regulation group. As a result of trainings, all three regulation groups were effective in increasing internal expectancies.

### ***Horticultural therapy and psychological variables***

For adult populations, Migura, Whittlesey, and Zajicek (1997) reported the relationship between the horticulture program for female inmates and their self-esteem. The locus of control and self-esteem of 36 inmates participating in a Master Gardener program and non-participants were compared. None of the group showed significant changes in locus of control. However, both participant groups significantly increased their self-esteem. Son, Um, Kim, Song, and Kwack (2004) examined the effect of horticultural therapy on the changes of self-esteem of individuals with chronic schizophrenia but no meaningful change was reported.

Williams and Mattson (1988) studied horticultural activities and demographic factors related to children's self-esteem. Only children gardening without other siblings showed higher self-esteem. A study by Martin-Yates (1990) reported no significance on the examination of horticultural therapy effects on self-esteem of adults with visual disabilities. Hudkins (1995) reported that a horticultural therapy program for troubled youth increased participants' self-esteem. Lawson and McNally (1995) described programs that employed at-risk youth for landscape program and their effects on various aspects of teens included self-esteem

improvement. Cammack, Waliczek, and Zajicek (2002) evaluated a community-based horticultural program for juvenile offenders. Juvenile offenders who participated in this program increased non-significantly their self-esteem.

In summary, low self-esteem has been reported to be related with poor psychological, behavioral, and emotional adjustment in adolescent development. With the concept of two dimensions of self-esteem, the relationships between self-esteem and various health issues could be understood more accurately.

The direction of locus of control was related with a psychological health of children and adolescents. The use of therapeutic or educational intervention programs was suggested to increase the locus of control of children and adolescents.

Horticultural therapy research has been reported with various topics but the research considering psychological variables, especially for adolescent populations, is anecdotal and rarely reported. The two factors of self-esteem have never been considered in horticultural therapy studies. More research is needed on horticultural therapy with psychological variables in various therapy settings and for various populations.

## **Environmental Education**

Environmental education has been developed and applied to youth for decades. Various types of environmental education were reviewed.

### *Environmental knowledge and attitudes*

Ramsey and Rickson (1976) studied 482 high school seniors on their environmental knowledge and attitudes. They reported circularity between environmental attitudes and knowledge. Ostman and Parker (1987) conducted a telephone survey of 336 residents (aged 16 and up) of Ithaca, New York, to find the variables impacting on environmental knowledge, concerns, and behaviors. Respondents' education and newspaper use led to greater effects. They concluded that environmental knowledge, concerns, and behaviors had positive interconnections.

The other view on the relationships among environmental knowledge, attitudes, and behavior was described by Meinhold and Malkus (2005). They examined the responses of 848 adolescents (aged 14 to 18) on environmental knowledge and attitudes. It was reported that pro-environmental attitudes predicted pro-environmental behaviors. Environmental knowledge was a moderator for the relationship between environmental attitudes and environmental behaviors. Earlier, Schahn and Holzer (1990) also reported the moderating role of knowledge between environmental attitudes and behavior from the study of 167 German adults. Inconsistent with other reports, Hausbeck, Milbrath, and Enright (1992) did not find positive relationships between environmental knowledge and awareness. The authors studied approximately 3,200 11th-grade students in New York State for the level of environmental knowledge and awareness. The environmental knowledge of students was low but their levels of environmental awareness and concern were higher.

Armstrong and Impara (1991) evaluated the impact of environmental education program on environmental knowledge and attitude of fifth- and seventh-grade students. The environmental education program did not impact significantly on students' environmental

knowledge and attitude. Pooley and O'Connor (2000) suggested the importance of emotions and beliefs in environmental response as well as environmental knowledge for changing environmental attitudes.

### ***Residential environmental education***

Among various forms of environmental education for adolescents, one of the popular methods of education is residential environmental education. High school students attended two different residential environmental workshops and showed different responses to environmental questionnaires (Jordan, Hungerford, & Tomera, 1986). Students who received instruction in environmental issues and action strategies showed an increased level of environmental action knowledge and participated in a greater number of environmental behaviors as compared to the students who just received issue awareness instruction. Dresner and Gill (1994) also studied residential environmental education camps for students. A two-week environmental education program raised students' self-esteem. And the students' self-esteem was significantly correlated with environmentally responsible action. From the study about residential environmental education of 169 seventh-grade students, the program showed a significant effect on the environmental adaptation subscale (Smith-Sebasto & Cavern, 2006).

### ***Activity-based environmental education***

Francis (1995) found that when children were involved in plant growing activities, a deeper significance and meaning was established as compared to passive observers. From a telephone survey, Lohr and Pearson-Mims (2005) reported that childhood experiences of active gardening strongly influenced adult environmental attitude and actions. With the understanding of the importance of action based learning, school gardening programs were developed for students of different grades. Skelly and Zajicek (1998) reported that the Project Green Program

which was developed for environmental education had a positive influence on elementary school students as compared to the students who did not participate in the program. Waliczek and Zajicek (1999) also studied 598 students (aged eight to 15) and reported the same positive effect on environmental attitudes. Aguilar, Waliczek, and Zajicek (2008) studied environmental education using a youth gardening program for 654 third through fifth grade students. The program did not show statistically significant differences between the program participants and non-participants. However, they found a significant positive relationship between previous gardening experience and environmental attitudes of elementary students.

Campbell, Waliczek, Bradley, Zajicek, and Townsend (1997) studied 44 high school students enrolled in an activity-based environmental education class. Students who participated in environmental education studied environmental science and plant propagation activities. The students with actual propagation activities with an environmental lesson reported more positive environmental attitudes. Cammack et al. (2002) investigated community-based environmental education with juvenile offenders. Study participants of the program conducted horticultural technique lessons and outdoor landscaping projects in the community. Participants of the programs improved the horticultural knowledge and environmental attitude significantly.

Many environmental education studies reported positive relationship between gardening and positive environmental attitudes, most horticultural therapy programs do not consider environmental education as a major program goal. Because the horticultural therapy programs at behavioral health service institutions are already providing various types of horticultural activities, it is recommended to study the relationship of horticultural therapy programs and environmental attitude of the adolescents who are receiving horticultural therapy.

## **Nutrition Education**

Nutrition has an important role in adolescents' growth. Increasing vegetable and fruit consumption has been recommended by government and many nutrition education programs related with children and adolescents' health issues. Studies on vegetable/fruit consumption and nutrition education were reviewed.

### ***Nutrition and health***

During adolescence, physical growth increases rapidly and the needs of energy and nutrition also increase (Neumark-Sztainer, Wall, Perry, & Story, 2003). Poor nutrition at an early age can cause lower IQ (Gross, 2006) and lead to persistent externalizing behavior problems (Liu, Raine, Venables, & Mednick, 2004). Neumark-Sztainer, Story, Resnick, and Blum (1996) reported that inadequate vegetable and fruit intake among adolescents was correlated with low family connectedness, weight dissatisfaction, and poor academic achievement. Binge eating, substance abuse, and past suicide attempts were also correlated with inadequate vegetable/ fruit intake.

### ***Vegetable/fruit consumption and health problems***

Increased vegetable and fruit intake has been recommended for a healthier diet and for preventing disease. Rolls, Ello-Martin, and Tohill (2004) recommended increased intake of vegetables and fruits with decreased energy intake for weight management for obesity. Vegetable and fruit intake was reported as strongly related with various types of cancers (Block, Patterson, & Subar, 1992). Vegetable and fruit intake significantly prevents cancers in respiratory, digestive, reproductive, and other miscellaneous sites. For lung cancer, vegetables and fruits showed strong and consistent protective effects. Infrequent fruit consumption and less



than daily vegetable consumption was strongly related with increased risk for laryngeal cancers. Fruits were reported as significantly protective in esophagus, oral cavity, and larynx cancers. Vegetable and fruit intake was strong protective effect of pancreas and stomach cancers as well as colorectal and bladder cancers. Vegetable and fruit consumption strongly and consistently showed protective effect of cervix, ovary, and breast cancers. Ness and Powles (1997) reported in their review that vegetables and fruits or alternative nutrients had significant protective effect on coronary heart diseases.

### ***Vegetable and fruit consumption and preferences***

Improving vegetable and fruit consumption is one of the goals of nutrition education. Most adolescents in the United States consume fewer vegetables and fruits than recommended amounts. Birch and Sullivan (1991) suggested to measure vegetable and fruit preferences to use them as predictors of vegetable and fruit consumption. Domel, Thompson, Davis, Baranowski, Leonard, and Baranowski (1996) developed a fruit and vegetable consumption questionnaire and tested fourth and fifth grade students. The result showed that vegetable and fruit preferences were the only significant predictors of fruits, vegetables, and total fruit/vegetable consumption. Harvey-Berino, Hood, Rourke, Terrance, Dorwaldt, and Secker-Walker (1997) also reported that food preferences were the strongest predictors of behavior.

The relationship between vegetable and fruit consumption and demographic information was studied by several researchers. Granner, Sargent, Calderon, Hussey, Evans, and Watkins (2004) studied 736 adolescents (aged 11 to 15, black and white Americans) for their vegetable and fruit intake. Compared to younger adolescents, older adolescents (aged 14 to 15) reported lower preferences for vegetables and fruits. In the research of 6,513 children and adolescents, Lorson, Melgar-Quinonez, and Taylor (2009) reported that the fruit consumption of older

adolescents (aged 12 to 18) was lower than for younger children. However, the vegetable consumption of older adolescents was significantly higher than that of younger children.

Regarding gender differences, Granner et al. reported that female adolescents had a higher preference for vegetables than males. Caine-Bish and Scheule (2009) studied the vegetable and fruit preference of 1,818 school-aged (third to twelfth grade) children and adolescents and reported that girls preferred vegetables and fruits more than boys did. In contrast, in terms of consumption, Lorson et al. reported boys consumed significantly more vegetables than girls did.

For the vegetable preferences, white adolescents reported higher preference than black adolescents (Granner et al., 2004). In the study by Riediger, Shooshtari, and Moghadasian (2007), Mexican American children and adolescents consumed more fruit than non-Hispanic whites did. In the research of Canadian adolescents, vegetable and fruit consumption was significantly and positively associated with household income and education level of adults in the household.

Actual vegetable and fruit intake was mostly determined by availability of vegetables and fruits. In the study with 3,597 adolescents, vegetable and fruit intake was strongly correlated with the socio-environmental factors including social support for healthy eating, family meal patterns, food security, socio-economic status, and home availability of fruits and vegetables (Neumark-Sztainer et al., 2003). Blanchette and Brug (2005) reviewed literature about potential determinants of vegetable and fruit intakes. The availability and accessibility of vegetables and fruits were positively and most consistently related to consumption. Parental vegetable and fruit intake, and knowledge of consumption recommendation and skills were also positively associated.

### *Nutrition education programs*

Domel, Baranowski, Davis, Thompson, Leonard, Riley, Baranowski, Dudovitz, and Smyth (1993) developed a school intervention program to increase fruit and vegetable consumption among 4th and 5th grade students. The students who received the intervention program training showed increased fruit and vegetable knowledge and increased preferences for fruits. One of the widespread nutrition education programs included a school garden.

One hundred and eleven elementary students who participated in school garden programs completed a fruit and vegetable preference questionnaire before and after participating in a gardening and lesson program. Nutrition lessons with hands-on gardening experience significantly improved students' attitudes towards vegetables, but the vegetable and fruit consumption of students did not significantly improve (Lineberger & Zajicek, 2000).

Morris and Zidenberg-Cherr (2002) examined nutrition knowledge and vegetable/fruit preferences of fourth-grade school children. Three groups of children participated to the nutrition education program combined with vegetable gardening, a nutrition lesson only program, and no formal nutrition education, respectively. The nutrition knowledge score of both the nutrition education program groups were significantly greater than the no education group. The nutrition education program also improved children's vegetable preferences for several vegetables. Children who participated in nutrition education combined with the gardening program improved their preference for more kinds of vegetable than children from the nutrition education only program. Children with nutrition education compared to nutrition lesson program and on fourth-grade school children.

Similar results were reported by Parmer, Salisbury-Glennon, Shannon, and Struempfer (2009) with second-grade students' nutrition knowledge and preference. Students from the

nutrition education with gardening activities were more likely to choose and consume vegetables in a lunchroom setting. McAleese and Rankin (2007) also compared three schools with different nutrition education programs. Sixth-grade adolescents participated in one of three groups: the research at a school with no nutrition education, a school with nutrition education only, and a school with nutrition education with corresponding garden activities. The vegetable and fruit servings, vitamin A and C, and fiber intake were all significantly increased at the schools with environmental education and garden activities. Home gardens and other garden activities outside the school did not impact on the results.

Heim, Stang, and Ireland (2009) measured various responses of fourth and sixth grade children after garden-based nutrition education programs. After participating in a garden-based nutrition education program, children reported high levels of enjoyment in the program. The program increased the number of fruits and vegetables eaten, vegetable preference, and fruit and vegetable asking behavior at home. In contrast, some programs did not obtain the same significant effects from garden based nutrition education programs. Koch, Waliczek, and Zajicek (2006) reported that the garden based nutrition education program only improved the children's knowledge about the benefits of fruit and vegetable intake but not in their attitude toward vegetables and fruits. The garden based nutrition program designed to utilize after-school time and a standard nutrition program did not improve nutritional knowledge, fruit and vegetable preferences or consumption self-efficacy (Poston, Shoemaker, & Dzewaltowski, 2005).

In summary, adolescents' nutrition education is critical for improving their healthy growth and development. Many nutrition education studies indicate that proper nutrition education with corresponding hands-on gardening activities improve children and adolescents'

nutrition knowledge and attitudes. Also, nutrition programs providing exposure to new vegetables and fruits could improve preference. Preference improvement has been suggested to increase vegetable and fruit consumption.

The horticultural therapy programs provide various horticultural activities based on various program goals. Although many studies reported nutrition education adapting gardening activities, horticultural therapy programs at the behavioral health service institutions did not describe nutrition education as a major program goal. Considering the hands-on horticultural activities and many other nutrition education studies, it is recommended to study the relationship of the horticultural therapy programs and the vegetable/fruit consumption of the adolescents at the behavioral health service institutions for their physical health.

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**CHAPTER 3 - Self-esteem and locus of control of adolescents in  
horticultural therapy programs in behavioral health service  
institutions**



## **Abstract**

The purpose of this research was to assess the levels of self-esteem and locus of control of the horticultural therapy group and non-horticultural therapy group subjects and to propose the future direction of horticultural therapy programs to improve psychological aspects of the adolescents. A total of 64 adolescents from two behavioral health service institutions completed self-esteem and locus of control scales. Based on their treatment history, the adolescents were divided into two groups. A horticultural therapy group consisted of adolescents who were currently receiving or previously received horticultural therapy treatment at the institutions. A non-horticultural therapy group consisted of adolescents who had no history of horticultural therapy treatment at the institutions. No significant difference was found on self-esteem and locus of control scores between the two groups. Based on the different level of worthiness and competence factors, it is recommended to design horticultural therapy programs focused on improving worthiness factor of self-esteem.

## **Introduction**

The therapeutic value of gardening and horticulture has been recognized and used to treat mentally ill patients since the early eighteenth century. Today, horticultural therapy is widely used to help various populations with many therapeutic needs. Subjects of this research were adolescents receiving behavioral health services from two institutions. Each institution provides horticultural therapy as a part of their health services. Because one of the goals of these institutions is improve the psychological health of adolescents in their institutions, current research assessed the levels of psychological variables of the adolescents with and without horticultural therapy treatment at both institutions. Among the many personality variables, self-esteem and locus of control have been studied and reviewed many times as important psychological elements. Both variables influence various aspects of the adolescent's psychological and physical health.

### ***Self-esteem***

Low levels of self-esteem are considered to be related to poor psychological, behavioral, and emotional adjustment in adolescent development (DuBois & Tevendale, 1999; Meggert, 2006). Eating disorder patients displayed lower self-esteem (Halvorsen & Heyerdahl, 2006; Jacobi, Paul, de Zwaan, Nutzinger, & Dahme, 2004; Silverstone & Salsali, 2003) and low self-esteem was reported as a predictor of future eating problems (Button, Sonuga-Barke, Davies, & Thopson, 1996; McGee & Williams, 2000). Low self-esteem was also reported as related with other psychiatric problems such as depressive disorder, substance abuse, suicidal ideation (Cervera, Lahortiga, Martínez-González, Gual, Irala-Estévez, & Alonso, 2003; McGee & Williams, 2000; Overholser, Adams, Lehnert, & Brinkman, 1995; Silverstone & Salsali, 2003)

and also fostering delinquency (Rosenberg, 1989). On the contrary, high levels of self-esteem are assumed to be related with healthy outcomes through adolescents' developmental processes.

Kernis (2003) discussed optimal self-esteem and fragile high self-esteem. Many of his concerns about various forms of fragile high self-esteem were also discussed by Baumeister, Campbell, Krueger, and Vohs (2003). Their questions on high self-esteem covered people with narcissistic tendencies, failure to identify causality of academic performance, and the failure of preventing unhealthy behaviors such as drinking, smoking, and using drugs. The self-esteem which intensifies both pro-social and antisocial tendencies was also questioned.

Mruk (2006) explained the controversies about self-esteem with the concept of two-factor theory of self-esteem. Branden (1969) described self-esteem as the two interrelated aspects of self-competence and self-respect. Tafarodi and Swan (1995) formed two dimensions of self-esteem called self-liking – “our affective judgment of ourselves, our approval or disapproval of ourselves, in line with internalized social values” and self-competence – “the overall sense of oneself as capable, effective, and in control” (p. 325). Rosenberg's Self-Esteem scale is widely used to measure global self-esteem. With the dimensionality, they divided it into two dimensions. Although Rosenberg's scale was developed without dimensionality, it was divided perfectly into two dimensions with the same number of questions for each dimension. Mruk's Meaning-Based, Two-Factor Theory of Self-Esteem applied the same concept of two factors but only used two terms for them: 'worthiness' and 'competence'. For better understanding of the interaction of these two factors, Mruk created a matrix and placed worthiness on the vertical axis and competence on the horizontal axis. Each quadrant made from this matrix represented four types of self-esteem characterized by the amount of contributions of each factor. This theory emphasized the balance of the two factors for healthy outcome. In addition to the two factors of

self-esteem, sources of self-esteem were also defined. Coopersmith (1967) and Epstein (1979) described four sources of self-esteem and Mruk (2006) grouped them into the sources that belonged to the worthiness and competence factors. ‘Acceptance or being valued by others’ and ‘virtue or acting on beliefs’ are the worthiness factors of self-esteem. ‘Achievement or success’ and ‘influence or power’ belonged to the competence factor of self-esteem. Interestingly, this four-source idea could be found in the Traditional Native American child-rearing philosophies as well. Brendtro, Brokenleg, and Van Bockern (1998) described these as following:

(1) significance was nurtured in a cultural milieu that celebrated the universal need for belonging; (2) competence was ensured by guaranteed opportunities for mastery; (3) power was fostered by encouraging the expression of independence; and (4) virtue was reflected in the preeminent value of generosity. (p. 45)

These Native American philosophies show the direction to improve self-esteem. These concepts could be applied to horticultural therapy programs to enhance adolescents’ self-esteem.

### ***Locus of control***

Locus of control refers to a generalized expectancy regarding the perception of reinforcement as either internal or external to the self (Rotter, 1966; Strickland, 1989). Individuals with a high perception of internal locus of control see the reinforcement as the result of their own effort, ability, or actions while the individual with external locus of control perceive it as the result of luck, fate, chance, or powerful external force (Elliott, 1996; Kulas, 1996; Nunn, 1987; Roberts & Monroe, 1992).

Research studies reported that internal locus of control is associated with positive social

behavior (Nowicki & Duke, 1983), positive attitudes towards authority (Heaven, 1988), higher academic achievement (Bar-Tal & Bar-Zohar, 1977; Shaw & Uhl, 1971), less depression and anxiety (Lamont, 1972; Lefkowitz, Tesiny, & Gordon, 1980; Nunn, 1988; Watson, 1967), delay of gratification (Strickland, 1973), self-control (Ferrer & Krantz, 1987), and higher self-esteem (Gordon, 1977). External locus of control, however, is associated with delinquency (Duke & Fenhagen, 1975; Kendall, Finch, Little, Chirico, & Ollendick, 1978), learning disabilities (Hallahan, Gajar, Cohen, & Tarver, 1978), suicidal potential (Melges & Weisz, 1971), and psychiatric illness in hospitalized adolescents (Friedman, Goodrich, & Fullerton, 1985). Several research studies suggested that the internality of locus of control could be increased by therapeutic or educational intervention programs (Autry & Langenbach, 1985; Deiker & Matson, 1979; Eitzen, 1974; Fertman & Chubb, 1992; Nowicki & Barnes, 1973; Nowicki & Strickland, 1973).

In his summary of findings about self-esteem enhancement programs, Mruk (2006) described these programs as having elements of “setting clear goals, providing workable steps to reach them, offering encouragement when necessary, and above all, being sensitive to the ‘teachable moment’ (p. 147). These elements are all applicable in horticultural therapy programs. Horticultural therapists understand the goals of treatments for each individual and choose and apply horticultural activities based on the goals. Every horticultural activity has a step-by-step procedure and therapists could offer knowledge and encouragement through this procedure. Through mastering each step and following the procedure, each individual could learn new knowledge and skills, and could be encouraged by therapists.

Plant growing and nurturing in horticultural activities require responsibilities of the

grower with direct outcomes. The experience of responsibility and accomplishment in horticultural activities and appropriate reinforcement from horticultural therapists could be effective in increasing internal locus of control.

Among the research studies reported in the horticultural therapy field, studies on adolescents with psychological variables have been rarely reported. Even though few beneficial effect of horticultural therapy has been mentioned and reported related with psychological variables, it is mostly anecdotal and does not provide enough information to adopt in the other settings or different programs. Especially the two factors of global self-esteem have never been used in horticultural therapy studies. Study on these factors could be useful to develop horticultural activities enhancing specific factor of self-esteem and apply them to improve well balanced self-esteem.

The purpose of this research was to assess the levels of self-esteem and locus of control of the horticultural therapy group and non-horticultural therapy group subjects and to propose the future direction of horticultural therapy programs to improve psychological aspects of the adolescents.

The objectives of this research were

1. to assess the level of self-esteem of the adolescents with and without horticultural therapy treatment at the two behavioral health service institutions.
2. to identify demographic factors related to adolescents' self-esteem.
3. to determine the contribution of worthiness and competence on adolescents' global self-esteem.

4. to assess the level of locus of control of the adolescents with and without horticultural therapy treatment at the two behavioral health service institutions.

5. to determine the correlation of adolescents' self-esteem and locus of control.

## **Method**

### ***Research Sites***

Two behavioral health service institutions in Kansas City, Missouri, were selected as research sites. These institutions are behavioral health service providers to adolescents with emotional, behavioral, psychological, social, or learning problems and their families. These institutions provide various types of treatment services for adolescents. These include drug treatment, anger management therapy, creative art therapy, recreation therapy, exercise therapy, expressive therapy, trauma and loss group therapy and other psychiatric treatments. In addition to these services, both institutions also provide horticultural therapy.

Horticultural therapy programs of these institutions are year round programs consisting of various types of horticultural activities. Each horticultural therapy program is based on therapeutic goals and provided by professional horticultural therapists.

The overall goal of the horticultural therapy program at Institution A is to provide pre-vocational and vocational skills for the adolescents to take with them once discharged from the program. One specific goal of this program is to increase the adolescents' basic horticultural knowledge. Individual goals are also set based on the specific diagnosis of an individual adolescent. Adolescents in this institution can join a horticultural therapy program with the nomination of their own individual therapists. Adolescents in this horticultural therapy program attend one hour group or individual therapy sessions composed with instruction and activity once per week. The horticultural therapy program of this institution consists of a variety of activities depending on the season, group skill level, and individual participant needs. Horticultural



activities include seasonal gardening, propagation, plant maintenance, educational field trips, crafts, and spring and winter plant sales.

The goal of the horticultural therapy program at Institution B is to use the greenhouse to increase self-esteem, self-confidence, and social skills, and to emphasize responsibility by giving students a sense of ownership in the program. Individual goals are set for each adolescents based on their diagnoses. Adolescents in this institution can join a horticultural therapy program when their therapists refer or select them to participate or when they request to join with a good behavior record. The horticultural therapy program in this institution consists of hands-on activities and class work such as journaling, charting, or instruction for activities. Each session is 50 minutes in length and a group of four to five adolescents attend the session every school day. The horticultural therapy program at this institution consists of various types of activities and education classes including propagation, plant structure and physiology, growing vegetables, herbs, house plants, and bedding plants, composting, landscaping, plant care and pest control, and a plant sale. For both horticultural therapy programs, the plant sale is the most popular activity.

### ***Subjects***

A total of 64 adolescents (ages ranged from 13 years to 20 years) receiving behavioral health service were recruited. From each institution, subjects were recruited in two different groups. The horticultural therapy group (HT group) consisted of the adolescents who were participating in the horticultural therapy program, and the non-horticultural therapy group (NHT group) consisted of adolescents who had not participated in horticultural therapy program at the institution.

From Institution A, a total of 33 adolescents were recruited. Sixteen subjects (five male, 11 female) participated as a HT group and 17 subjects (four male, 13 female) participated as a NHT group. The subjects of the HT group received one-hour horticultural therapy session once a week in individual or group setting.

There were 31 subjects in Institution B. The HT group had 15 subjects (12 male, three female) and the NHT group had 16 subjects (14 male, two female). The subjects of the HT group attended 50-minute horticultural therapy session five days a week in group class setting.

### ***Instruments***

Instruments used in this research were completed by the therapist at each institution or individual research subjects. Demographic information was provided by the therapist at each institution for accuracy and elimination of any confidentiality risk. A self-esteem scale and a locus of control scale were completed by each individual subject.

#### ***Demographic Information***

Demographic information (Appendix A-1) was collected on gender, age, racial background and the length of treatment at the institution and horticultural therapy program. This information was provided by the therapist of each institution to insure accurate information and elimination of any risk.

#### ***Rosenberg Self-Esteem Scale (RSES)***

The Rosenberg Self-Esteem Scale (RSES, Schmitt & Allik, 2005) is one of the most generally-used standardized self-esteem measures in social science research and has been translated and used in 28 languages (Appendix A-2). RSES is a 10-item scale using four-point

scale from strongly agree to strongly disagree. Scores ranged 10 to 40. Rosenberg (1989) reported a Guttman scale reproducibility coefficient of 0.92 among adolescents and test-retest correlations in the range 0.82 to 0.88. This self-esteem scale has been used to measure the self-esteem of various generations and it also has been used for various adolescents with psychological, emotional, or social problems including students with learning disabilities (Tollefson, Tracy, Johnsen, Buenning, Farmen, & Barke, 1982), African Caribbean adolescents in residential care (Robinson, 2000), youth with serious emotional disturbances with DSM-IV-TR diagnoses (Powell, 2006), adolescent psychiatric patients with a history of suicidal behavior (Rotheram-Borus, Picentini, Van Rossem, Graae, Cantwell, Castro-Blanco, Miller, & Feldman, 1996; West, Spreng, Rose, & Adam, 1999), young adults with eating disorder (Halvorsen & Heyerdahl, 2006), youths in residential treatment with behavioral and emotional problems (Rivard, Bloom, Abramovitz, Pasquale, Duncan, McCorkle, & Gelman, 2003), psychiatric outpatient children with ADHD (Healey & Rucklidge, 2006), delinquent and at-risk adolescents (Carroll, Hattie, Durkin, & Houghton, 2001), and adolescent mothers and pregnant teenagers (Barth, Schinke, Maxwell, 1983). In this study, RSES was used for global self-esteem measurement because of its brevity and high reliability.

Based on the study of Tafarodi and Swann (1995), 10 items were grouped into five self-liking dimension and five self-competence dimension which represent worthiness and competence factors, respectively. Self-liking and self-competence scores were summed and used individually for self-esteem comparisons. The possible score range of each dimension is five to 20.

### *Nowicki-Strickland Locus of Control Scale for Children*

The Nowicki-Strickland Locus of Control Scale for Children (Appendix A-3) was used to measure locus of control of research subjects. Nowicki-Strickland Locus of Control Scale for Children is a 40-item scale having Yes-No responses. This scale measures generalized expectancies for internal versus external control of reinforcement among children. Possible scores ranged from 0 to 40. Higher scores mean external locus of control and lower scores mean internal locus of control. Test-retest reliability over six-week was .63 - .71 and estimates of internal consistency were .63 - .81 (Nowicki & Strickland, 1973). Nowicki-Strickland Locus of Control Scale for Children has been used in research on child and adolescent populations including learning disabled children and gifted children (Fincham & Barling, 1978), at-risk students and honor students (Lynch, Hurford, & Cole, 2002), institutionalized juvenile delinquents (Little & Kendall, 1978), behaviorally disturbed children (McIntosh & Rawson, 1988), ADHD children and adolescents (Dunn & Shapiro, 1999; Rucklidge & Tannock, 2001), children with behavioral disorder (Elliot, 1996; Rawson, 1992), youths in residential treatment with behavioral and emotional problems (Rivard et al., 2003), children and adolescents with conduct disorders in residential treatment (Strand & Nowicki, 1999), sexually abused girls (Mannarino & Cohen, 1996), children and adolescents with PTSD (March, Amaya-Jackson, Murray, & Schulte, 1998), adolescents with pediatric bipolar disorder (Rucklidge, 2006), children and adolescents with anxiety disorder (Weems, Silverman, Rapee, & Pina, 2003), and severely disturbed adolescents in a private residential psychiatric hospital (Yates, Hecht-Lewis, Fritsch, & Goodrich, 1993).

### ***Procedure and data collection***

The Research Involving Human Subjects protocol developed for this research project was reviewed and approved by the Kansas State University Institutional Review Board, by the Institutional Review Board of the two behavioral health service institutions, and by the Department of Social Service, State of Missouri. After the research approval, therapists of both institutions explained the objectives and procedures of the research to the adolescents receiving health service. After explanation, therapists recruited research subjects for both groups based on their treatment history among the adolescents who volunteered to participate. After obtaining consent from participants and informed consent authority, therapists of the behavioral health service institutions administered the data collection. The demographic information of research subjects was provided by the therapist who administered data collection. Sets of instruments were given to subjects in each group and completed in one hour. When completed, the instruments were collected and matched with individual demographic information for analyses.

### ***Data Analyses***

Due to the differences of the two institutions, data of the two institutions were analyzed individually. Collected data were statistically analyzed with statistical analysis software (SAS 9.2). The mean scores of two groups were compared with the *t*-test. Regression analyses were used to determine the relationship of demographics on self-esteem and locus of control.

Due to the institutional restriction for the confidentiality of the subjects, data were collected once. To support this limitation, regression analyses were conducted and determined

the associations of the length of treatment at the institution and the length of horticultural therapy treatment on self-esteem and locus of control.

## Results

### *Demographics*

#### *Institution A*

A total of 33 adolescents participated as subjects in this research. Sixteen subjects (five male, 11 female) participated as a HT group and 17 subjects (four male, 13 female) participated as a NHT group. Mean age of the HT group was 15.94 years ( $SD = 1.91$ , age 13 to 19) and mean age of the NHT group was 15.76 years ( $SD = 1.30$ , age 14 to 17).

Among the HT group, 11 subjects were European American (68.75%) and five subjects were African American (31.25%). Among the NHT group, 14 subjects were European American (82.35%) and three subjects were African American (17.65%).

The average length of treatment at the institution (Avg. INW) was 59.35 weeks ( $SD = 41.46$ ) for the HT group and 15.53 weeks ( $SD = 12.37$ ) for the NHT group (Table 3.1). The average length of horticultural therapy treatment for the HT group was 45.88 weeks ( $SD = 38.76$ ).

#### *Institution B*

There were 31 research participants in Institution B. The HT group had 15 subjects (12 male, three female) and the NHT group had 16 subjects (14 male, two female). The mean age of the HT group was 16.8 years ( $SD = 1.37$ , age 15 to 20) and the mean age of the NHT group was 15.75 years ( $SD = 0.93$ , age 15 to 17).

The racial background of the HT group subjects was European American ( $n = 12$ , 80%), African American ( $n = 2$ , 13.33%) and others ( $n = 1$ , 6.67%). The racial background of the NHT

group subjects was European American ( $n = 8, 50\%$ ), African American ( $n = 6, 37.5\%$ ), and others ( $n = 2, 12.5\%$ ).

The average length of treatment at the institution was 99.2 weeks ( $SD = 67.23$ ) for the HT group and 78.44 weeks ( $SD = 56.17$ ) for the NHT group (Table 3.1). The average length of horticultural therapy treatment for the HT group was 59.67 weeks ( $SD = 44.41$ )

**Table 3.1 Demographic information of the subjects from Institution A and B**

<b>Institution A</b>			Gender		Race		
Group	Avg. INW <sup>z</sup>	Mean Age yrs. (SD)	Male	Female	European American	African American	Others
HT	59.35 (41.46)	15.94 (1.91)	5 (31.25%)	11 (68.75%)	11 (68.75%)	5 (31.25%)	0
NHT	15.53 (12.37)	15.76 (1.30)	4 (23.53%)	13 (76.47%)	14 (82.35%)	3 (17.65%)	0
Total	34.33 (33.27)	15.85 (1.60)	9 (27.27%)	24 (72.73%)	25 (75.76%)	8 (23.24%)	0
<b>Institution B</b>			Gender		Race		
Group	Avg. INW <sup>z</sup>	Mean Age yrs. (SD)	Male	Female	European American	African American	Others
HT	99.2 (67.23)	16.8 (1.37)	12 (80%)	3 (20%)	12 (80%)	2 (13.33%)	1 (6.67%)
NHT	78.44 (56.17)	15.75 (0.93)	14 (87.5%)	2 (12.5%)	8 (50%)	6 (37.5%)	2 (12.5%)
Total	88.48 (61.63)	16.26 (1.26)	26 (83.87%)	5 (16.13%)	20 (64.52%)	8 (25.81)	3 (9.67%)

<sup>z</sup> INW = weeks of treatment at the institution.

### *Self-esteem*

#### *Institution A*

The mean self-esteem scores of the HT group were based on the scores of fifteen subjects because one subject failed to complete the entire questionnaire. As shown in Table 3.2, the mean global self-esteem score of Institution A was 31.33 ( $SD = 5.12$ ) for the HT group and 31.06 ( $SD$



= 5.12) for the NHT group. The mean self-liking score of the HT group was 13.80 ( $SD = 2.91$ ) and that of the NHT group was 14.59 ( $SD = 2.96$ ). Mean self-competence score of the HT group was 17.53 ( $SD = 1.85$ ) and that of the NHT group was 16.47 ( $SD = 2.45$ ). The two groups did not report significant difference in self-esteem scores.

**Table 3.2 Mean differences of global self-esteem, self-liking, and self-competence between the HT and NHT groups of Institution A**

	Mean ( $SD$ )		$t$ -value (prob.)
	HT (n=15)	NHT (n=17)	
SE <sup>z</sup>	31.33 (5.12)	31.06 (5.12)	0.16 (0.871) <sup>NS</sup>
SL <sup>y</sup>	13.80 (2.91)	14.59 (2.96)	-0.76 (0.454) <sup>NS</sup>
SC <sup>x</sup>	17.53 (1.85)	16.47(2.45)	1.37 (0.181) <sup>NS</sup>

<sup>NS</sup> Non-significant.

<sup>z</sup> SE = global self-esteem (Score range: 10 to 40).

<sup>y</sup> SL = self-liking dimension (Representing worthiness. Score range: 5 to 20).

<sup>x</sup> SC = self-competence dimension (Representing competence. Score range: 5 to 20).

Regression analyses were conducted to determine the existence of an association between self-esteem scores and demographics. While age, gender, and the length of treatment at the institution were not associated with self-esteem scores, racial background showed certain levels of association with self-esteem scores of each group.

The mean global self-esteem score of African American subjects (35.29,  $SD = 2.39$ ) was significantly higher than that of European American subjects (30.04,  $SD = 4.41$ ) with the probability of 0.006. Comparing the scores within groups, mean global self-esteem score of African American subjects was significantly higher than that of European American subjects in both HT group ( $p = 0.078$ ) and NHT group ( $p = 0.045$ ) (Table 3.3).

**Table 3.3 Mean difference of global self-esteem scores between the two groups of different racial background in Institution A**

Group	SE <sup>z</sup> (SD)		t-value (prob.)
	European American	African American	
HT	30.18 (4.21)	<b>34.5</b> (2.38)	1.91 (0.078)*
NHT	29.93 (4.45)	<b>36.33</b> (3.79)	2.19 (0.045)**
Institution	30.04 (4.41)	<b>35.29</b> (2.93)	2.95 (0.006)***

\*\*\*  $p < .01$ . \*\*  $p < .05$ . \*  $p < .10$ .

<sup>z</sup>SE = Mean global self-esteem (Score range: 10 to 40).

As shown in Table 3.4, the mean self-liking scores of the African American subjects (16.43,  $SD = 2.37$ ) was significantly higher than the score of European American subjects (13.6,  $SD = 2.74$ ) with the probability of 0.021 among all the subjects at Institution A. In the HT group, the self-liking score of two racial groups did not show any significant difference but in the NHT group, African American subjects showed significantly higher mean self-liking score (18.00,  $SD = 1.73$ ) than European American subjects (13.86,  $SD = 2.66$ ) with the probability of 0.022.

**Table 3.4 Mean difference of self-liking scores between the two groups of different racial background in Institution A**

Group	SL <sup>z</sup> (SD)		t-value (prob.)
	European American	African American	
HT	13.27 (3.04)	15.25 (2.22)	1.18 (0.259) <sup>NS</sup>
NHT	13.86 (2.66)	<b>18.00</b> (1.73)	2.53 (0.022)*
Institution	13.6 (2.78)	<b>16.43</b> (2.37)	2.44 (0.021)*

\*  $p < .05$ . <sup>NS</sup> Non-significant.

<sup>z</sup>SL = Mean self-liking score (Representing worthiness. Score range: 5 to 20).

In the comparison of mean self-competence scores, the score of African American subjects was significantly higher (18.86,  $SD = 1.35$ ) than that of European American subjects (16.44,  $SD = 2.14$ ) with the probability of 0.009. In the HT group, the mean score of African American subjects (19.25,  $SD = 0.50$ ) was significantly higher than the mean score of European American subjects (16.91,  $SD = 2.40$ ) with the probability of 0.023. In the NHT group, mean self-competence score of African American subjects was higher than that of European American subjects (Table 3.5.).

**Table 3.5 Mean difference of self-competence scores between the two groups of different racial background in Institution A**

Group	SC <sup>z</sup> ( <i>SD</i> )		<i>t</i> -value (prob.)
	European American	African American	
HT	16.91 (1.76)	<b>19.25</b> (0.50)	2.55 (0.023)*
NHT	16.07 (2.40)	18.33 (2.08)	1.50 (0.159) <sup>NS</sup>
Institution	16.44 (2.14)	<b>18.86</b> (1.35)	2.81 (0.009)**

\*\*  $p < .01$ . \*  $p < .05$ . <sup>NS</sup> Non-significant.

<sup>z</sup>SC = Mean self-competence score (Representing competence. Score range: 5 to 20).

### ***Institution B***

No significant difference in self-esteem scores was found between the two research groups at Institution B (Table 3.6). The mean global self-esteem score of the HT group was 28.80 ( $SD = 5.57$ ) and that of the NHT group was 31.44 ( $SD = 4.82$ ). The mean self-liking score of the HT group was 13.46 ( $SD = 3.07$ ) and that of the NHT group was 13.80 ( $SD = 2.91$ ). The HT group showed 15.33 ( $SD = 2.97$ ) of mean self-competence score while the mean self-

competence score of the NHT group was 16.19 ( $SD = 2.26$ ). From the regression analyses, no association was found between demographics and self-esteem scores in Institution B.

**Table 3.6 Mean differences of global self-esteem, self-liking, and self-competence between the HT and NHT groups of Institution B**

	Mean ( <i>SD</i> )		<i>t</i> -value (prob.)
	HT (n=15)	NHT (n=16)	
SE <sup>z</sup>	28.80 (5.57)	31.44 (4.82)	1.41 (0.168) <sup>NS</sup>
SL <sup>y</sup>	13.46 (3.07)	15.25 (3.49)	1.51 (0.143) <sup>NS</sup>
SC <sup>x</sup>	15.33 (2.97)	16.19 (2.26)	0.91 (0.373) <sup>NS</sup>

<sup>NS</sup> Non-significant.

<sup>z</sup> SE = global self-esteem (Score range: 10 to 40).

<sup>y</sup> SL = self-liking dimension (Representing worthiness. Score range: 5 to 20).

<sup>x</sup> SC = self-competence dimension (Representing competence. Score range: 5 to 20).

### ***Worthiness and Competence factors***

The mean scores of self-liking and self-competence were compared to determine if the two self-esteem factors contribute equally to global self-esteem. At Institution A, the difference of mean scores of self-liking and self-competence were highly significant ( $p < .001$ ) (Table 3.7). In all three comparisons of research subjects, both the HT and NHT groups had significantly higher self-competence scores. Compared to the difference within the NHT group (1.88,  $p = 0.052$ ), the difference within the HT group (3.73,  $p < 0.001$ ) was more highly significant. The global self-esteem of the HT group in Institution A relied much more on the competence factor (represented by self-competence) than on the worthiness factor (represented by self-liking).

At Institution B, the significant difference of mean scores of the two self-esteem dimensions appeared in the comparison within all institution subjects (Table 3.7). The mean score of self-competence was higher than that of self-liking in each group but was not significant.

It is clear that for the global self-esteem of the research subjects, the competence factor contributed more than the worthiness factor. Especially for the HT group in Institution A, the reliance of global self-esteem was greater on the competence factor.

**Table 3.7 Mean differences between self-liking and self-competence of Institution A and B**

<b>Institution A</b>	SL <sup>z</sup> (SD)	SC <sup>y</sup> (SD)	t-value (prob.)
HT	13.80 (2.91)	<b>17.53</b> (1.85)	-4.33 (<.001)**
NHT	14.59 (2.96)	<b>16.47</b> (2.45)	-2.02 (0.052)*
Institution	14.27 (2.99)	<b>17.14</b> (2.12)	-4.24 (<.001)**
<b>Institution B</b>	SL <sup>z</sup> (SD)	SC <sup>y</sup> (SD)	t-value (prob.)
HT	13.46 (3.07)	15.33 (2.97)	-1.69 (0.101) <sup>NS</sup>
NHT	15.25 (3.49)	16.19 (2.26)	-0.90 (0.374) <sup>NS</sup>
Institution	14.39 (3.36)	<b>15.77</b> (2.62)	-1.81 (0.075)*

\*\*  $p < .001$ . \*  $p < .10$ . <sup>NS</sup> Non-significant.

<sup>z</sup> SL = Mean self-liking score (Representing worthiness. Score range: 5 to 20).

<sup>y</sup> SC = Mean self-competence score (Representing competence. Score range: 5 to 20).

### ***Locus of Control***

At Institution A, the mean locus of control score of the HT group was 15.13 ( $SD = 4.60$ ) and that of the NHT group was 15.00 ( $SD = 5.53$ ). The mean differences of two groups were non-significant. The mean comparison at Institution B also did not show any significant

difference between the HT and the NHT groups with the scores of 17.70 ( $SD = 2.89$ ) and 18.50 ( $SD = 4.71$ ), respectively (Table 3.8).

**Table 3.8 Mean differences of locus of control between the HT and NHT groups of Institution A and Institution B**

	Mean <sup>z</sup> ( $SD$ )		<i>t</i> -value (prob.)
	HT group	NHT group	
Institution A	15.13 (4.60)	15.00 (5.53)	0.07 (0.944) <sup>NS</sup>
Institution B	17.70 (2.89)	18.50 (4.71)	0.57 (0.576) <sup>NS</sup>

<sup>NS</sup> Non-significant

<sup>z</sup> Mean: Mean locus of control (possible points = 40)

The regression analyses at Institution A indicated that the gender was the only associated demographic factor with the locus of control score. Age, race, and the length of treatment at the institution were not associated with the locus of control score. The locus of control score of female subjects (16.13,  $SD = 4.29$ ) was significantly higher than that of male subjects (12.22,  $SD = 5.95$ ) (Table 3.9). In other words, female subjects showed more external locus of control than male subjects. This is consistent with previous studies reporting more external locus of control of female (Dixon, McKee, & McRae, 1976; Kumar & Tripathi, 1986; Sherman, 1997). The regression analyses defined no associated demographics with locus of control scores at Institution B.

**Table 3.9 Mean differences of locus of control between male and female subjects of Institution A and Institution B**

<b>Institution A</b>	Mean LOC <sup>z</sup> (SD)	<i>t</i> -value (prob.)
Male ( <i>n</i> =9)	12.22 (5.95)	-2.09 (0.045)*
Female ( <i>n</i> = 24)	16.13 (4.29)	
<b>Institution B</b>	Mean LOC <sup>z</sup> (SD)	<i>t</i> -value (prob.)
Male ( <i>n</i> =26)	18.08 (3.86)	7.52 (0.861) <sup>NS</sup>
Female ( <i>n</i> = 5)	18.40 (4.51)	

\*  $p < .05$ . <sup>NS</sup> Non-significant.

<sup>z</sup> Mean LOC: Mean locus of control (possible points = 40).

### *Self-esteem and Locus of Control*

Regression and correlation analyses were conducted to determine the association of the self-esteem and the locus of control of research subjects. As shown in Table 3.10, all three self-esteem scores and locus of control score were significantly correlated with all subjects at Institution A. The same results were found from the analyses in both HT and NHT groups.

The Pearson correlation between global self-esteem and locus of control of the subjects at Institution A was -0.5753 ( $p < .001$ ). Pearson correlations of self-liking and self-competence scores with locus of control score were -0.5224 ( $p = 0.002$ ) and -0.5174 ( $p = 0.002$ ), respectively. In the HT group, the locus of control score and global self-esteem, self-liking, and self-competence scores were significantly correlated with the Pearson correlations of -0.6558 ( $p = 0.008$ ), -0.6014 ( $p = -0.018$ ) and -0.5518 ( $p = 0.033$ ), respectively. In the NHT group, Pearson correlations of global self-esteem, self-liking, and self-competence scores with locus of control were -0.5289 ( $p = 0.029$ ), -0.4907 ( $p = 0.046$ ), and -0.5114 ( $p = 0.036$ ), respectively.

As shown in the Pearson correlations, self-esteem scores and locus of control scores were negatively correlated to show that higher self-esteem is related to more internal locus of control, while lower self-esteem is related to more external locus of control. The regression analyses for Institution B did not found any significant correlations between self-esteem and locus of control.

**Table 3.10. Pearson Correlations of locus of control with three self-esteem scores of Institution A and B**

<b>Institution A</b>	Pearson Correlation (Prob.)		
	SE <sup>z</sup> /LOC <sup>y</sup>	SL <sup>x</sup> /LOC	SC <sup>w</sup> /LOC
HT	-0.6559 (0.008)**	-0.60142 (0.018)*	-0.5518 (0.033)*
NHT	-0.5289 (0.029)*	-0.4907 (0.046)*	-0.5114 (0.036)*
Institution	-0.5753 (< .001)**	-0.5224 (0.002)**	-0.5174 (0.002)**
<b>Institution B</b>	Pearson Correlation (Prob.)		
	SE <sup>z</sup> /LOC <sup>y</sup>	SL <sup>x</sup> /LOC	SC <sup>w</sup> /LOC
HT	-0.2614 (0.347) <sup>NS</sup>	-0.3135 (0.255) <sup>NS</sup>	-0.1666 (0.553) <sup>NS</sup>
NHT	0.0455 (0.867) <sup>NS</sup>	-0.0446 (0.870) <sup>NS</sup>	0.1661 (0.539) <sup>NS</sup>
Institution	-0.0439 (0.815) <sup>NS</sup>	-0.0989 (0.597) <sup>NS</sup>	0.0386 (0.837) <sup>NS</sup>

\*\*  $p < .01$ . \*  $p < .05$ . <sup>NS</sup> Non-significant.

<sup>z</sup> SE = global self-esteem.

<sup>y</sup> LOC = locus of control.

<sup>x</sup> SL = self-liking dimension (Representing worthiness).

<sup>w</sup> SC = self-competence dimension (Representing competence).



## Discussion

It was predicted that the self-esteem of the adolescents in behavioral health service institutions would be lower considering their health condition. However, collected global self-esteem data of these subjects were very similar with the previously reported self-esteem of 547 French-speaking adolescents who attended an urban community public school (Marcotte, Fortin, Potvin, & Papillon, 2002). 209 private religious school students from a large city (Polce-Lynch, Myers, Kliever, & Kilmartin, 2001), and the self-esteem of 199 students obtained from cross-temporal meta-analysis (Twenge & Campbell, 2001). Different from the prediction, the self-esteem of the research subjects was not lower in comparison with adolescents without a behavioral health condition. It could be assumed that because the subjects were receiving various kinds of treatments for their health problems, their self-esteem was improved or maintained through the institutional treatments.

The higher self-esteem of African American subjects at Institution A was constant over the groups and self-esteem factors. Higher self-esteem of African American subjects was corresponding with the result of many other studies on ethnic differences in self-esteem (Brown, McMahon, Biro, Crawford, Schreiber, Similo, Waclawiw, & Striegel-Moore, 1998; Carlson, Uppal, & Prosser, 2000; Phinney, Cantu, & Kurtz, 1997; Twenge & Crocker, 2002). Gender difference in adolescent self-esteem has been studied frequently over the years, and the results are consistent. While numerous studies reported the tendency of lower self-esteem of females compared to males (Allgood-Merten, Lewinsohn, & Hops, 1990; Bergman & Scott, 2001; Birndorf, Ryan, Auinger, & Aten, 2005; Bolognini, Plancherel, Bettschart, & Halfon, 1996;

Cairns, McWhirter, Duffy, & Barry, 1990; Kling, Hyde, Showers, & Buswell, 1999), no gender differences were found in this research.

Self-competence scores were much higher than self-liking scores at Institution A. Subjects at Institution B also showed a similar trend as Institution A. Research studies about self-esteem and individualism-collectivism explained this tendency through the self-liking/self-competence comparisons between collectivist cultures (e.g., China, Malaysia) and individualist cultures (e.g., USA, UK). Whereas collectivist cultures foster self-liking, individualist cultures foster self-competence (Tafarodi & Swann, 1996; Tafarodi, Lang, & Smith, 1999). Because of the American nationality of the research subjects and considering its individualist culture, it is natural to see higher self-competence over self-liking.

As shown in the results, the difference between the worthiness factor (represented by self-liking) and the competence factor (represented by self-competence) was much larger in the HT group as compared to that in the NHT group of each institution. In other words, the dependence of global self-esteem on the competence factor was much higher with the HT group subjects.

Even though the relationship of the horticultural therapy program and self-esteem was not found in both institutions, it is still possible to use horticultural therapy program to improve adolescents' self-esteem. Considering the characteristics of hands-on experience based activities, it could be assumed that horticultural therapy could be directly used to improve the competence factor of self-esteem rather than the worthiness factor. Many activities in horticultural therapy are directly related with the experience of success or achievement which has been identified as self-esteem sources related to competence. But considering the two factor theory of self-esteem by Mruk (2006), the balance of two self-esteem factors are as important as the high level of

global self-esteem. As the subjects of this research showed comparatively higher competence than worthiness, horticultural therapy should focus more on improving worthiness than competence. Horticultural therapy activities should go one step further from the experience of success or achievement to the experience of feelings of being valued or acting on beliefs.

Being valued and acting on beliefs, the two self-esteem sources that belong to the worthiness factor, are more difficult to improve directly through horticultural activities (Coopersmith, 1967; Epstein, 1979; Mruk, 2006). Rather, these sources would be achieved or enhanced with the active engagement of horticultural therapists. Through giving reinforcement and meanings on their achievements, horticultural therapists could facilitate the adolescents' process of obtaining the feelings of being valued from horticultural experiences and provide reasons and directions to act on their beliefs. In brief, horticultural therapists could help adolescents to see the value of their achievement and lead them to act on the value they achieved with horticultural activities. As a result, the worthiness factor of self-esteem could be enhanced and then the competence and worthiness factors could be more balanced.

Current research did not find difference on locus of control between the horticultural therapy group subjects and non-horticultural therapy group subjects. A significant difference was found only between two genders at Institution A. Higher external locus of control of females was predictable from earlier studies on gender differences of locus of control. Compared to the mean score (12.87) of 615 students ranging from the seventh grade through the twelfth grade attending an urban area school system (Nowicki & Strickland, 1973), the locus of control of the subjects of this research was much more external. The individuals with psychological, emotional, behavioral, and psychiatric problems had been reported to show external locus of control (Haine, Ayers, Sandler, Wolchik, & Weyer, 2003; Kendall et al., 1978;

Lefkowitz et al., 1980; March, Amaya-Jackson, Murray, & Schulte, 1998; Nelson, Finch, Montgomery, & Bristow, 1975; Watson, 1967). Therefore, it could be explained with the relation of the behavioral, psychological, emotional, and psychiatric health condition of the subjects.

The correlation of locus of control and self-esteem was confirmed at Institution A. The internal locus of control was positively correlated with the higher scores of global self-esteem, worthiness and competence of each group. It could be expected from these correlations that if the horticultural therapy program has positively influence self-esteem of adolescents, that could lead the locus of control toward an internal direction.

In summary, adolescents who participated in horticultural therapy programs at both institutions did not show different levels of self-esteem or locus of control as compared to the adolescents who did not participate in horticultural therapy program. Based on the different level of worthiness and competence factors, it is recommended to design horticultural therapy programs focused on improving worthiness factor of self-esteem.

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*Journal of Youth and Adolescence*, 23, 289-314.

**CHAPTER 4 - Environmental attitude of adolescents with and  
without horticultural therapy treatment at behavioral health service  
institutions**

## **Abstract**

In this research, environmental attitude of adolescents with and without horticultural therapy treatment at two behavioral health service institutions was measured with a pastoralism scale. Horticultural therapy programs and environmental education programs both use natural environment, hands-on activities with living plant material, and experiences of learning ecosystems and life cycles of plants. However, currently neither institution described environmental education as a horticultural therapy goal.

A total of 64 adolescents were grouped in either a horticultural therapy group or a non-horticultural therapy group based on their treatment history. Previous horticultural experience, future interest, and environmental attitude data were collected and analyzed. The result showed a strong relationship between environmental attitude and previous horticultural experience. To improve positive environmental attitude, horticultural therapy programs should emphasize diversity and abundant opportunities of horticultural experiences.

## **Introduction**

In his book, Louv (2005) described the lack of environmental experience of children as Nature Deficit Disorder. He assumed this hypothetical concept was one of the factors of children's attention difficulties. Because of this concern, the awareness and interest of environmental issues has increased and the demand for environmental education is growing. Environmental education for adolescent is given in various forms. Schools provide lectures, field trips, or other related activities. Summer youth camps and classes at botanic gardens, and community based programs are also used for environmental educational purposes.

Pooley and O'Connor (2000) suggested that the affective domain in environmental response was important for environmental attitude as well as environmental knowledge. Meinhold and Malkus (2005) reported that pro-environmental attitudes predicted pro-environmental behaviors. Many research studies regarding environmental education and attitudes reported that experiencing natural environments (Dresner & Gill, 1994; Harvey, 1989) and hands-on experiences (Cammack, Waliczek, & Zajicek, 2002; Waliczek & Zajicek, 1999) were effective for positive environmental attitude education. A research study by Campbell, Waliczek, Bradley, Zajicek, and Townsend (1997) reported that high school students who completed plant propagation experiment successfully showed positive environmental attitude.

In this research, environmental attitude of adolescents with and without horticultural therapy treatment at two behavioral health service institutions was measured with a pastoralism disposition of Children's Environmental Response Inventory. For years, these behavioral health service institutions have been providing horticultural therapy treatment to adolescents with various behavioral, emotional, psychological, and learning problems as well as other types of

education and treatments. The horticultural therapy program of each institution has different physical and environmental settings and different treatment goals. Currently neither institution describes environmental education as a horticultural therapy goal. However, horticultural therapy could be used as an environment educational tool while achieving other therapeutic goals. Horticultural therapy activities include aspects of natural and safe environments, hands-on experiences with living material, and experiences of learning ecosystems and life cycles of plants which are commonly used in environmental education. Therefore, in this research, the relationship between horticultural therapy programs and environmental attitude of the adolescents in both behavioral health service institutions were studied.

The objectives of this research were

1. to determine general horticultural experiences and interests of the adolescents in two behavioral health service institutions.
2. to determine the difference between the adolescents with and without horticultural therapy treatment on environmental attitude.
3. to identify demographic factors and horticultural experience/interests related to adolescents' environmental attitude.



## **Method**

### ***Research Sites***

Two behavioral health service institutions in Kansas City, Missouri, were selected as research sites. These institutions are behavioral health service providers to adolescents with emotional, behavioral, psychological, social, or learning problems and their families. These institutions provide various types of treatment services for adolescents. These include drug treatment, anger management therapy, creative art therapy, recreation therapy, exercise therapy, expressive therapy, trauma and loss group therapy and other psychiatric treatments. In addition to these services, both institutions also provide horticultural therapy.

Horticultural therapy programs of these institutions are year round programs consisting of various types of horticultural activities. Each horticultural therapy program is based on therapeutic goals and provided by professional horticultural therapists.

The overall goal of the horticultural therapy program at Institution A is to provide pre-vocational and vocational skills for the adolescents to take with them once discharged from the program. One specific goal of this program is to increase the adolescents' basic horticultural knowledge. Individual goals are also set based on the specific diagnosis of an individual adolescent. Adolescents in this institution can join a horticultural therapy program with the nomination of their own individual therapists. Adolescents in this horticultural therapy program attend one hour group or individual therapy sessions composed with instruction and activity once per week. The horticultural therapy program of this institution consists of a variety of activities depending on the season, group skill level, and individual participant needs. Horticultural

activities include seasonal gardening, propagation, plant maintenance, educational field trips, crafts, and spring and winter plant sales.

The goal of the horticultural therapy program at Institution B is to use the greenhouse to increase self-esteem, self-confidence, and social skills, and to emphasize responsibility by giving students a sense of ownership in the program. Individual goals are set for each adolescents based on their diagnoses. Adolescents in this institution can join a horticultural therapy program when their therapists refer or select them to participate or when they request to join with a good behavior record. The horticultural therapy program in this institution consists of hands-on activities and class work such as journaling, charting, or instruction for activities. Each session is 50 minutes in length and a group of four to five adolescents attend the session every school day. The horticultural therapy program at this institution consists of various types of activities and education classes including propagation, plant structure and physiology, growing vegetables, herbs, house plants, and bedding plants, composting, landscaping, plant care and pest control, and a plant sale. For both horticultural therapy programs, the plant sale is the most popular activity.

### *Subjects*

A total of 64 adolescents were recruited for this research from two behavioral health service institutions in Kansas City, Missouri. Subjects of this research were adolescents receiving health service for behavioral, psychological, developmental, social, psychiatric or learning problems from the institutions providing residential treatment and school based treatment. Specifically, these conditions included conduct disorder (CD), attention deficit hyperactivity disorder (ADHD), eating disorders, drug abuse, sexual abuse, posttraumatic stress

disorder (PTSD), autism, chronic depression, schizophrenia, learning disabilities and others. Each institution had two groups of subjects. The horticultural therapy group (HT group) consisted of adolescents who had a history of receiving horticultural therapy treatment or currently were receiving horticultural therapy treatment. The non-horticultural therapy group (NHT group) consisted of adolescents who had never received horticultural therapy treatment from the institution.

Among 33 subjects from Institution A, 16 subjects (five male, 11 female) participated as a HT group and 17 subjects (four male, 13 female) participated as a NHT group. The mean age of the HT group was 15.94 years ( $SD = 1.91$ , age 13 to 19) and that of the NHT group was 15.76 years ( $SD = 1.30$ , age 14 to 17). Eleven subjects of the HT group were European American (68.75%) and five subjects were African American (31.25%). Among the NHT group subjects, 14 were European American (82.35%) and three were African American (17.65%). The average length of treatment at the institution was 59.35 weeks ( $SD = 41.46$ ) for the HT group and 15.53 weeks ( $SD = 12.37$ ) for the NHT group. The average length of horticultural therapy treatment for the HT group was 45.88 weeks ( $SD = 38.76$ ).

There were 31 subjects from Institution B. The HT group of Institution B had 15 subjects (12 male, three female) with mean age of 16.8 years ( $SD = 1.37$ , age 15 to 20) and the NHT group had 16 subjects (14 male, two female) with a mean age of 15.75 years ( $SD = 0.93$ , age 15 to 17). Among the HT group, the racial background of the subjects included European American ( $n = 12$ , 80%), African American ( $n = 2$ , 13.33%), and others ( $n = 1$ , 6.67%). The NHT group consisted of eight European Americans (50%), six African Americans (37.5%) and two with other racial backgrounds (12.5%). The racial background of the subjects of the NHT group were European American ( $n = 8$ , 50%), African American ( $n = 6$ , 37.5%), and others ( $n = 2$ , 12.5%).

The average length of treatment at the institution was 99.2 weeks ( $SD = 67.23$ ) for the HT group and 78.44 weeks ( $SD = 56.17$ ) for the NHT group. The average length of horticultural therapy treatment of HT group was 59.67 weeks ( $SD = 44.41$ ).

### ***Instruments***

Instruments used in this research were completed by the therapist at each institution or individual research subjects. Demographic information was provided by the therapist at each institution for accuracy and elimination of any confidentiality risk. Instruments used for horticultural background information and environmental attitude information were completed by each individual subject.

#### ***Horticultural Background Questionnaire***

The Horticultural Background Questionnaire used for this horticultural therapy research was previously used for the probation program at Paris, Texas (Hale, Marlowe, Mattson, & Nicholson, 2005) and was modified for the adolescent subjects in this research (Appendix B-1). The questionnaire asked about their home residential area, previous horticultural experience, and future interest in horticultural activity.

#### ***Children's Environmental Response Inventory***

A pastoralism questionnaire from the Children's Environmental Response Inventory (CERI) (Appendix B-2) was used to measure environmental attitude. Bunting and Semple (1979) revised McKechnie's Environmental Response Inventory (McKechnie, 1974) for younger populations and developed the Children's Environmental Response Inventory. The Children's Environmental Response Inventory included eight environmental dispositions identified as

pastoralism, urbanism, environmental adaptation, stimulus seeking, environmental trust, antiquarianism, need privacy, and mechanical orientation, and communality for evaluating test-taking attitudes. Each disposition contains approximately 20 self-report, 5-point Likert scale questions from disagree very much to agree very much. Considering the characteristics of horticultural therapy which are closely related to natural elements and environment, pastoralism was most relevant disposition among the eight environmental dispositions. Bunting and Semple (1979) defined pastoralism as "enjoyment and conservation of the natural environment in an intellectual and aesthetic fashion." (p. 273) Because of the limitations of data collection, only pastoralism was used for this research. The pastoralism questionnaire consists of 22 items such as "I really enjoy nature." The total score can range from 22 to 110 and the mean score of 1,109 students was 86.06 ( $SD = 12.02$ ) (Bunting & Cousins, 1983). A higher score on pastoralism indicates a positive environmental attitude. The alpha coefficient for the reliability of pastoralism based on the test with 1,109 students was 0.89 (Bunting & Cousins, 1983). This instrument had been tested with students in grade four, six, seven, eight, and ten (Bunting & Semple, 1979), and has been used for research with elementary school children (Harvey, 1989; Skelly & Zajicek, 1998).

### ***Demographic Information***

Demographic information (Appendix B-3) was collected on gender, age, racial background and the length of treatment at the institution and horticultural therapy program. This information was provided by the therapist of each institution to insure accurate information and elimination of any risk.

### ***Procedure and data collection***

The Research Involving Human Subjects protocol developed for this research project was reviewed and approved by the Kansas State University Institutional Review Board, by the Institutional Review Board of the two behavioral health service institutions, and by the Department of Social Service, State of Missouri. After the research approval, therapists of both institutions explained the objectives and procedures of the research to the adolescents receiving health service. After explanation, therapists recruited research subjects for both groups based on their treatment history among the adolescents who volunteered to participate. After obtaining consent from participants and informed consent authority, therapists of the behavioral health service institutions administered the data collection. The demographic information of research subjects was provided by the therapist who administered data collection. Sets of instruments were given to subjects in each group and completed in one hour. When completed, the instruments were collected and matched with individual demographic information for analyses.

### ***Data Analyses***

Because the two institutions had different systems and settings, and also the gender ratio differed of the recruited subjects, the research data of the two institutions were analyzed individually. Collected data were analyzed with statistical analysis software (SAS 9.2). The mean scores of the two groups were compared with the *t*-test and the least significant difference test was used for multiple comparisons of means. Regression analyses were used to determine the relationship between major research factors, demographics, and horticultural backgrounds.

Due to the institutional restriction for the confidentiality of the subjects, data were collected once. To support this limitation, regression analyses were conducted and determined

the associations of the length of treatment at the institution and the length of horticultural therapy treatment on environmental attitude of research subjects.

## Results

### *Horticultural background*

#### *Horticultural experience*

For Institution A, 29 subjects (87.85%) had horticultural experience and four subjects did not have previous horticultural experience. In the HT group, 13 subjects (81.25%) had horticultural experience before they joined the horticultural therapy program and three subjects (18.75%) did not have any horticultural experience before joining the horticultural therapy program. Sixteen subjects (94.2%) of the NHT group reported they had horticultural experience and only one subject (5.88%) did not have horticultural experience (Table 4.1).

Among the subjects of Institution B, 29 subjects (93.55%) had previous horticultural experience and only two subjects (6.45%) did not have any previous horticultural experience. In the NHT group, 14 subjects (87.5%) had horticultural experience and two subjects (12.5%) did not have any horticultural experience while all HT group subjects had previous horticultural experience (Table 4.1).

Subjects with horticultural experience were asked to choose all types of horticultural experience they had and the total number of horticultural experience types were counted. In Institution A, there was no significant difference between the HT group and the NHT group on the average number of horticultural experience types. The average number of horticultural experiences of 29 subjects was 2.33 ( $SD = 1.36$ ).

In Institution B, the average number of horticultural experience types of 29 subjects was 2.52 ( $SD = 1.46$ ). The average numbers of horticultural experience types of the two groups were



significantly different. The subjects from the HT group experienced more various types of horticulture ( $M = 3.2$ ,  $SD = 1.26$ ) than the subjects from the NHT group did ( $M = 2.59$ ,  $SD = 1.36$ ) (Table 4.1).

**Table 4.1 Previous horticultural experiences of the adolescent subjects from Institution A and Institution B**

<b>Institution A</b>	Horticultural experiences			
	<i>N</i>	Yes	No	Mean number <sup>z</sup> ( <i>SD</i> )
HT	16	13 (81.25%)	3 (18.75%)	2.06 (1.57)
NHT	17	16 (94.12%)	1 (5.88%)	2.59 (1.12)
<i>t</i> -value <sup>y</sup> (prob.)				1.11 (0.274)
<b>Institution B</b>	Horticultural experiences			
	<i>N</i>	Yes	No	Mean number <sup>z</sup> ( <i>SD</i> )
HT	15	15 (100%)	0	3.2 (1.26)
NHT	16	14 (87.5%)	2 (12.5%)	1.88 (1.36)
<i>t</i> -value <sup>y</sup> (prob.)				2.80 (0.009)*

\*  $p < .01$ .

<sup>z</sup> Mean number = Average number of types of horticultural experiences subjects reported.

<sup>y</sup> *t*-value = The result from the *t*-test of the mean number of horticultural experience types of two research groups.

The experiences of the subjects from Institution A included “growing fruits or vegetables” (51.72% of subjects with horticultural experience), “growing flowers or shrubs” (79.31%), “growing indoor plants” (58.62%), “mowing grass” (75.86%), and “growing herbs” (6.25%).

For the subjects from the HT group (the average number of horticultural experiences was 2.06,  $SD = 1.57$ ), “growing indoor plants” was the most common experience (76.92% of HT subjects with horticultural experience) followed by the order of “growing flowers or shrubs”, “mowing grass” (61.54%, individually), “growing fruits or vegetables” (46.15%) and “growing

herbs” (6.25%). For the NHT group subjects, the average number of horticultural experiences was 2.59 ( $SD = 1.12$ ). “Growing flower and shrubs” was the most common experience (93.75% of NHT subjects with horticultural experience) followed by “mowing grass” (87.5%), “growing fruits and vegetables” (56.25%), and “growing indoor plants” (43.75%) (Table 4.2).

For Institution B, “growing fruits and vegetables” (72.41%) was the most common horticultural experience followed by “growing indoor plants” (65.52%), “growing flowers or shrubs” (62.07%), and “mowing grass” (55.17%). The most common horticultural experience of HT group subjects was “growing fruits or vegetables” (86.67% of HT subjects) and “growing flowers or shrubs” (80%) and “growing indoor plants” (80%) were the second most common experience followed by “mowing grass” (53.33%). “Growing herbs”, “growing cactus”, and “flower wall” (6.67% individually) were also reported as previous horticultural experiences. For the NHT group, “growing fruits or vegetables” and “mowing grass” (57.14% of the subjects with horticultural experience individually) were the most common horticultural experience and followed by “growing indoor plants” (50%) and “growing flowers or shrubs” (42.86%). “Plant sale” (7.14%) was also reported as a previous horticultural experience (Table 4.4).

**Table 4.2 Listing of previous horticultural experiences by adolescent subjects from Institution A**

	HT (% of group) ( <i>n</i> = 13)	NHT (% of group) ( <i>n</i> = 16)	Institution ( <i>n</i> = 29)
Growing fruits or vegetables	6 (46.15%)	9 (56.25%)	15 (51.72%)
Growing flowers or shrubs	8 (61.54%)	15 (93.75%)	23 (79.31%)
Growing indoor plants	10 (76.92%)	7 (43.75%)	17 (58.62%)
Mowing grass	8 (61.54%)	14 (87.5%)	22 (75.86%)
(Other)			
Growing herbs	1 (7.69%)	0	1 (3.45%)

**Table 4.3 Listing of previous horticultural experiences by adolescent subjects from Institution B**

	HT (% of group) (n = 15)	NHT (% of group) (n = 14)	Institution (n = 29)
Growing fruits or vegetables	13 (86.67%)	8 (57.14%)	21 (72.41%)
Growing flowers or shrubs	12 (80%)	6 (42.86%)	18 (62.07%)
Growing indoor plants	12 (80%)	7 (50%)	19 (65.52%)
Mowing grass	8 (53.33%)	8 (57.14%)	16 (55.17%)
(Others)			
Growing herbs	1 (6.67%)	0	1 (3.45%)
Growing cactus	1 (6.67%)	0	1 (3.45%)
Flower wall	1 (6.67%)	0	1 (3.45%)
Plant sale	0	1 (7.14%)	1 (3.45%)

***Future horticultural interest***

For the question “Do you want to garden or grow plants in future?”, 30 subjects (90.91%) from Institution A answered “yes” and 3 subjects (9.09 %) answered “no.” In the NHT group, 14 subjects (82.35%) answered “yes” and 3 subjects (17.65%) answered “no” while all HT group subjects said “yes” for this question (Table 4.4).

At Institution B, 20 subjects (64.52%) answered “yes” and 11 subjects (35.48%) answered “no” for the future interest in horticultural activity question. Thirteen subjects (86.67%) of the HT group positively answered for the future interest in horticultural activity and 2 subjects (13.33%) answered negatively. In the NHT group, seven subjects (43.75%) answered “yes” for future interest in horticultural activity while nine subjects (56.25%) answered “no” (Table 4.4).

The subjects with the answer “yes” were asked to choose all types of horticultural activity they want to do in the future. The average number of choices on future horticultural interest at

Institution A was 2.3 ( $SD = 1.45$ ). The average number of the HT group and the NHT group were significantly different with 2.81 ( $SD = 1.52$ ) and 1.82 ( $SD = 1.24$ ), respectively (Table 4.4). The HT group showed more interest in horticultural experiences in the future than the NHT group.

For Institution B, the average number of choices on future horticultural interest was 1.68 ( $SD = 1.62$ ). The HT group and the NHT group showed significantly different average number of choices (Table 4.4). The average number of the HT group was 2.33 ( $SD = 1.54$ ) and that of the NHT group was 1.06 ( $SD = 1.48$ ). For both Institution A and B, the HT group showed more interest in future horticultural experience than the NHT group did.

**Table 4.4 Future horticultural interest of adolescent subjects from Institution A and Institution B**

<b>Institution A</b>	Future horticultural interest		
	<i>N</i>	Yes	Mean number <sup>z</sup> ( <i>SD</i> )
Institution	33	30 (90.91%)	2.3 (1.45)
HT	16	16 (100%)	2.81(1.52)
NHT	17	14 (82.35%)	1.82 (1.24)
<i>t</i> -value <sup>y</sup> (prob.)			2.06 (0.048)*
<b>Institution B</b>	Future horticultural interest		
	<i>N</i>	Yes	Mean number <sup>z</sup> ( <i>SD</i> )
Institution	31	20 (64.52%)	1.68 (1.62)
HT	15	13 (86.67%)	2.33 (1.54)
NHT	16	7 (43.75%)	1.06 (1.48)
<i>t</i> -value <sup>y</sup> (prob.)			2.33 (0.026)*

\*  $p < .05$ .

<sup>z</sup> Mean number = Average number of types of horticultural activities the subjects were interested in for future experience.

<sup>y</sup> *t*-value = The result from the *t*-test between the HT and the NHT groups.

For the answers about the future horticultural interest, the choices of subjects from Institution A included “growing fruits or vegetables” (60% of the subjects with future horticultural interest), “growing flowers or shrubs” (73.33%), “growing indoor plants” (70%), “mowing grass” (36.67%), “growing herbs” (6.67%), and “growing all kinds of plant” (10%). In the HT group, “growing indoor plants” (87.5%) was the most frequent choices followed by the order of “growing fruits or vegetables” (62.5%), “growing flowers or shrubs” (56.25%), “mowing grass” (43.75%), “growing all kinds of plant” (18.75%), and “growing herbs” (12.5%). In the NHT group, “growing flowers or shrubs” (92.86%) was most desired choice followed by “growing fruits and vegetables” (57.14%), “growing indoor plants” (50%), and “mowing grass” (28.57%) (Table 4.5).

For the subjects from Institution B, the choices for future horticultural interest included “growing fruits or vegetables” (75% of the subjects with future horticultural interest), “growing flowers or shrubs” (70%), “growing indoor plants” (70%), and “mowing grass”(35%). The choices also included “growing desert plants” (3.23%), “growing roses” (3.23%), and “plant sale” (3.23%). The most frequent choices for future horticultural interest of the HT group subjects were “growing fruits or vegetables” (84.62%) and “growing indoor plants” (69.23%). “Growing flowers or shrubs” (61.54%) and “mowing grass” (46.15%) were identified while “growing desert plants” (7.69%) was also reported as future interest areas of horticultural activity. For the NHT group, “growing flowers or shrubs” (85.71%) was the most frequent choice for future horticultural interest followed by “growing indoor plants” (71.43% of the subjects with horticultural experience) and “growing fruits or vegetables” (57.14% of HT subjects of the subjects with horticultural experience). “Mowing grass,” “growing roses,” and “plant sale” (14.29 % individually) were also reported (Table 4.6).

**Table 4.5 Listing of future horticultural interest of adolescent subjects from Institution A**

	HT (% of group) ( <i>n</i> = 16)	NHT (% of group) ( <i>n</i> = 14)	Institution ( <i>n</i> = 30)
Growing fruits or vegetables	10 (62.5%)	8 (57.14%)	18 (60%)
Growing flowers or shrubs	9 (56.25%)	13 (92.86%)	22 (73.33%)
Growing indoor plants	14 (87.5%)	7 (50%)	21 (70%)
Mowing grass	7 (43.75%)	4 (28.57%)	11 (36.67%)
(Other)			
Growing herbs	2 (12.5%)	0	2 (6.67%)
Growing all kinds of plant	3 (18.75%)	0	3 (10%)

**Table 4.6 Listing of future horticultural interest of adolescent subjects from Institution B**

	HT (% of group) ( <i>n</i> = 13)	NHT (% of group) ( <i>n</i> = 7)	Institution ( <i>n</i> = 20)
Growing fruits or vegetables	11 (84.62%)	4 (57.14%)	15 (75%)
Growing flowers or shrubs	8 (61.54%)	6 (85.71%)	14 (70%)
Growing indoor plants	9 (69.23%)	5 (71.43%)	14 (70%)
Mowing grass	6 (46.15%)	1 (14.29%)	7 (35%)
(Other)			
Growing desert plants	1 (7.69%)	0	1 (5%)
Growing roses	0	1 (14.29%)	1 (5%)
Plant Sale	0	1 (14.29%)	1 (5%)

### ***Children's Environmental Response Inventory (CERI)***

#### ***Institution A***

The mean difference of CERI scores between the HT and NHT groups was analyzed with the *t*-test. The mean CERI score of the HT group was 76.69 (*SD* = 19.28) while the CERI score of the NHT group was 91.82 (*SD* = 13.69). The CERI score of the NHT group was significantly higher than that score of the HT group ( $t = -2.10, p = 0.044$ ) (Table 4.7).

**Table 4.7 Mean difference between the HT and NHT groups in the Children’s Environmental Response Inventory (CERI) scores of Institution A**

	HT	NHT
<i>N</i>	16	17
CERI <sup>z</sup> ( <i>SD</i> )	79.69 (19.28)	91.82 (13.69)
<i>t</i> -value (prob.)	-2.10 (0.044)*	

\*  $p < .05$ .

<sup>z</sup>CERI = mean score of CERI. The total score can range from 22 to 110.

Regression analyses were conducted to determine if demographic and horticultural background information were associated with the CERI score. There was no association between CERI score and any demographics. While other horticultural backgrounds were not associated with CERI score, the number of types of previous horticultural experience was associated with CERI scores of Institution A subjects.

As shown in Table 4.8, the CERI score of the subjects without previous horticultural experience was 70.25 while the CERI scores of the subjects with three types and four to five types of horticultural experience were 92.87 and 92.80, respectively. The CERI scores of subjects with three or more types of horticultural experience were significantly higher than that of the subjects without horticultural experience. Aguilar, Waliczek, and Zajicek (2008) reported similar results that environmental education using youth gardening program was not significant on students’ environmental attitudes, but children with previous gardening experience scored higher on the environmental attitudes. Therefore, it is assumed that previous horticultural experience was positively related with pastoralism of the research subjects especially when the subjects had various types of horticultural experience. The more types of horticultural experience subjects had, the higher pastoralism subjects showed. In other words, subjects with

more various types of horticultural experience tend to enjoy more the natural environment in an intellectual and aesthetic fashion.

**Table 4.8 Mean differences in the Children’s Environmental Response Inventory (CERI) scores among the groups based on the number of types of previous horticultural experiences of Institution A**

	Number of types of previous horticultural experience			
	0	1-2	3	4-5
<i>N</i>	4	9	15	5
CERI <sup>z</sup>	70.25 <sup>a</sup>	77.56 <sup>ab</sup>	92.87 <sup>b</sup>	92.80 <sup>b</sup>

$\alpha = 0.05$ .

LSD=18.072.

<sup>z</sup>CERI = mean score of CERI. The total score can range from 22 to 110.

### ***Institution B***

From the *t*-test between the HT group and the NHT group, the HT and NHT groups showed significantly different CERI scores ( $t = 2.52, p = 0.017$ ). The mean CERI score of the HT group was 82.13 ( $SD = 16.02$ ) and that of the NHT group was 66.0 ( $SD = 19.30$ ). In other words, the subjects involved in the horticultural therapy treatment program at Institution B showed significantly higher pastoralism than the subjects not in the horticultural therapy treatment program (Table 4.9).



**Table 4.9 Mean difference between the HT and NHT groups in the Children’s Environmental Response Inventory (CERI) scores of Institution B**

	HT	NHT
<i>N</i>	15	16
CERI <sup>z</sup> ( <i>SD</i> )	82.13 (16.02)	66.00(19.30)
t-value (prob.)	2.52 (0.017)*	

\*  $p < .05$ .

<sup>z</sup>CERI = mean score of CERI. The total score can range from 22 to 110.

Regression analyses were conducted to determine the existence of association between CERI score and demographic and horticultural background information. Future horticultural interest and age were significantly associated with CERI score of the subjects from Institution B. There was no significant association between CERI score and other demographic. Previous horticultural experience was not associated with CERI score.

Subjects from Institution B were placed into three age groups and the mean CERI scores of the three groups were compared. The mean CERI scores gradually increased as the group age increased. Mean CERI score of the subjects with age 14 and 15 was 63.40, mean CERI score of the subjects aged 16 to 17 was 76.41 and that of the subjects aged 18 to 20 was 88.75. The mean CERI score of the subjects aged 18 to 20 was significantly higher than that of the subjects aged 14 to 15 (Table 4.10). Older subjects tend to have more positive environmental response than younger subjects even though age was not associated with previous horticultural experience or future horticultural interest.

**Table 4.10 Mean differences in the Children’s Environmental Response Inventory (CERI) scores among different age groups of Institution B**

	Age		
	14-15 yrs.	16-17 yrs.	18-20 yrs.
<i>N</i>	10	17	4
CERI <sup>z</sup>	63.40 <sup>a</sup>	76.41 <sup>ab</sup>	88.75 <sup>b</sup>

$\alpha = 0.05$ .

LSD=19.282.

<sup>z</sup>CERI = mean score of CERI. The total score can range from 22 to 110.

As shown in Table 4.11, the mean CERI score of the subjects with future horticultural interest was significantly higher than the mean score of the subjects without future horticultural interest. The mean CERI scores of the groups based on the number of future horticultural interest were also compared. The CERI scores of the subjects with at least one type of future horticultural interest were significantly higher than those of the subjects without future horticultural interest (Table 4.12). This means that having horticultural interest is more clearly associated with the CERI score than the numbers of future interest in horticulture.

**Table 4.11 Mean difference of Children’s Environmental Response Inventory (CERI) scores between the groups with and without future horticultural interest of Institution B**

	Future horticultural interest	
	Yes	No
<i>N</i>	20	11
CERI <sup>z</sup> ( <i>SD</i> )	82.20 (15.48)	58.55 (16.34)
<i>t</i> -value (prob.)	3.99 (<.001)*	

\*  $p < .01$ .

<sup>z</sup>CERI = mean score of CERI. The total score can range from 22 to 110.

**Table 4.12 Mean differences of Children’s Environmental Response Inventory (CERI) scores among the groups with different numbers of future horticultural interest of Institution B**

	Numbers of future horticultural interest		
	0	1-2	3-5
<i>N</i>	11	10	10
CERI <sup>z</sup>	58.55 <sup>a</sup>	81.70 <sup>b</sup>	82.70 <sup>b</sup>

$\alpha = 0.05$ .

LSD=14.485.

<sup>z</sup>CERI = mean score of CERI. The total score can range from 22 to 110.

## Discussion

For both institutions, the HT groups showed more future horticultural interest than their NHT comparison group. However, having previous horticultural experience did not guarantee a future horticultural interest. Subjects had various types of horticultural experience and all four major types of horticultural experiences were similarly common (62.07% - 70.69% of subjects experienced) to subjects. But for the future horticultural interest, “mowing grass” (36% of subjects preferred) was clearly less preferred than the other three major horticultural activities (66 - 72% of subjects preferred). One explanation may be that adolescents prefer complex horticultural activities rather than repetitive work like mowing grass.

The result of the relationship between the number of types of horticultural experience and environmental attitude can be compared with the result of the study of Harvey (1989) about the relationship between children’s environmental attitude and school ground vegetation. In Harvey’s research, children’s pastoralism is positively related with the complexity of environmental features on school grounds. Considering the similarities of basic horticultural skills needed for most horticultural experiences, the variety of plant materials used in horticultural experience could be considered as one of the factors related to environmental attitude. Therefore, response to the complexity of environmental features and the variety of plant material means that children in Harvey’s study and the subjects of this research both prefer diversity in their experience with environment or horticulture.

For Institution A, because the average length of treatment at institution of the HT group (59.35 weeks,  $SD = 41.46$ ) and the average length of horticultural therapy treatment of the HT group (41.9 weeks,  $SD = 36.21$ ) were much longer than the average length of treatment at

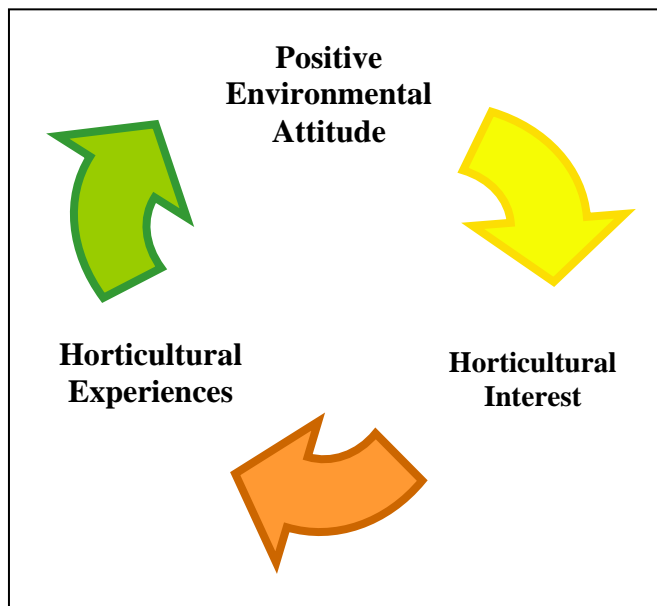
institution of the NHT group (15.53 weeks,  $SD = 12.37$ ), the number of types of horticultural experience and the CERI scores of the HT group were expected to be higher than those of the NHT group.

Currently in Institution A, the horticultural therapy treatment program provides a one-hour group or individual session once a week. In this hour, subjects experience various types of horticultural activity. It could be interpreted that horticultural therapy treatment in Institution A provided fewer horticultural experiences to significantly improve environmental response in a pastoralism disposition. Based on the result of this study, the horticultural therapy program of Institution A should provide longer activity time and more diversity of horticultural experiences. One interesting finding from Institution A is that the CERI score of the NHT group (91.82,  $SD = 13.69$ ) was higher than the mean score of the 1,109 student samples (86.06,  $SD = 12.02$ ) of the research of Bunting and Cousins (1983) with the probability of 0.043.

The HT group subjects at Institution B showed significantly higher environmental attitude. The significant difference of mean CERI score was also shown between the groups with and without future horticultural interest. The horticultural experience of the subjects from Institution A was considered as a factor that related with the higher CERI score, but it is unreasonable to see future horticultural interest as the influential factor on the CERI score as well. One possible relationship is that future horticultural interest is accompanied by or even the consequence of the positive environmental response. With higher pastoralism, which is defined by Bunting & Semple (1979) as “enjoyment of the natural environment in an intellectual and aesthetic fashion” (p. 273), people may desire more horticultural experience.

Based on the result of the relationship between horticultural experience and positive environmental attitude and the result of the relationship between positive environmental attitude

and future horticultural interest, it may be reasonable to conclude that horticultural experience, positive environmental attitude, and future horticultural interest have a circular relationship even though having horticultural experience did not directly relate to the presence of future horticultural interest (Figure 4.1).



**Figure 4.1 The model of circular relationship of horticultural experiences, positive environmental attitude, and horticultural interest**

One unique finding of this research is the association of age and CERI score of Institution B. Because previous studies using CERI including the result of Institution A and other environmental attitude studies consistently showed no significant relationship between age and environmental attitude (Bunting & Cousins, 1983, 1985; Cammack, et al., 2002; Waliczek & Zajicek, 1999), it is more reasonable to consider this result as the uniqueness of Institution B. The results of this research support previous environmental attitude studies reporting the relationship between horticultural experience and positive environmental attitude (Aguilar et al., 2008; Cammack et al., 2002; Campbell et al., 1997; Harvey, 1989; Skelly & Zajicek, 1998).

In conclusion, the horticultural experiences and interests of the adolescents in behavioral health service institution and their environmental attitude were positively related. The horticultural therapy programs of the two behavioral health service institutions had different settings and systems, and showed different effects on the present level of environmental attitude of the subjects. Considering the positive relationship between previous horticultural experience and environmental attitude, horticultural therapy programs could be used for improvement of environmental attitude.

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**CHAPTER 5 - Basic horticultural knowledge and vegetable/fruit  
consumption of adolescents with and without horticultural therapy  
treatment at behavioral health service institutions**

## **Abstract**

Adolescents from two behavioral health service institutions in a mid-western urban city were the subjects of this research. Based on their treatment history, adolescents were assigned in either a horticultural therapy group or a non-horticultural therapy group.

The horticultural therapy programs in these institutions are providing various horticultural activities and education to the adolescents based on each adolescent's need and ability. While many nutrition programs adapt gardening to increase vegetable and fruit consumption of children and adolescents, horticultural therapy programs in these institutions do not describe nutrition education as a separate program goal.

The HT group subjects did not show difference on vegetable/fruit preference and consumption compared to NHT group subjects but basic horticultural knowledge of adolescent subjects was significantly correlated with vegetable and fruit consumption. By adding nutrition education to horticultural activities, adolescents in these programs would be expected to further increase consumption of vegetables and fruits.

## **Introduction**

Nutrition has an important role in adolescents' growth, development, and learning ability (Gross, 2006; Liu, Raine, Venables, & Mednick, 2004; Neumark-Sztainer, Story, Resnick, & Blum, 1996). Fruit and vegetable intake is recommended for healthier diet and preventing disease. Various nutrition education programs have been developed for increasing consumption of these horticultural products. Research studies have reported that food preferences are considered as the strongest predictor of food consumption (Harvey-Berino, Hood, Rourke, Terrance, Dorwaldt, & Secker-Walker, 1997) and nutrition education programs which target preferences are effective in fruit and vegetable consumption (Domel, Thompson, Davis, Baranowski, Leonard, & Baranowski, 1996). Significant improvement in fruit and vegetable consumption and preferences are reported from nutrition education programs using gardening activities for children and elderly people (Hackman & Wagner, 1990; Lineberger & Zajicek, 2000; Morris & Zidenberg-Cherr, 2002; Morris, Koumjian, Briggs, & Zidenberg-Cherr, 2002).

Morris and Zidenberg-Cherr (2002) reported that children who participated in nutrition education combined with gardening programs improved their preference for more kinds of vegetables than children from nutrition education only programs. McAleese and Rankin (2007) compared the nutritional change of adolescents among the schools with nutrition education with either corresponding education, with nutrition education only, or with no nutrition education. They reported a similar result as Morris and Zidenberg-Cherr's study. The adolescents from a school with nutrition education with corresponding garden activities showed significantly increased vegetable and fruit servings, and vitamin A, vitamin C, and fiber intake. Adolescents from a school with no nutrition education or from a school with nutrition education only did not

report any change. From these results, it is assumed that nutrition education program combined with corresponding hands-on activities is more effective than a nutrition program with education only. Therefore, if horticultural therapy programs provide both nutrition education and hands-on activities, they could be used to improve the adolescents' nutrition knowledge and vegetable and fruit consumption.

Adolescents from two behavioral health service institutions in a mid-western urban city were the subjects of this research. These adolescents were receiving various therapy treatments for behavioral, psychological, emotional, and learning problems. One of the unique therapy programs of these institutions is horticultural therapy. The horticultural therapy programs in these institutions are providing various horticultural activities and education to the adolescents based on each adolescent's need and ability. In this condition, an individual adolescent can learn horticultural knowledge with support from horticultural therapists and hands-on experiences without competition with other individuals. This safe and supportive setting is expected to help adolescents' cognitive development and increase basic horticultural knowledge including plant anatomy and physiology, plant propagation and growing, and plant harvest, usage, and nutrition.

While many nutrition programs adapted gardening for increase of fruit and vegetable consumption of children and adolescents, horticultural therapy programs in these institutions do not describe nutrition education as a separate goal. Horticultural therapy programs provide the nutrition knowledge and opportunity to experience fruits and vegetables from their growing stage to harvest and use. These hands-on experiences with fruits and vegetables may provide more interest and knowledge of nutrition, and may have a positive effect on vegetable and fruit preferences and consumption.

Based on the expectations of horticultural therapy program for adolescents in behavioral health service institutions, the following objectives were determined:

1. To determine vegetable and fruit consumption frequencies and preferences.
2. To examine the association between vegetable and fruit consumption frequencies, preferences, demographics, and horticultural background information.
3. To determine the correlations between vegetable and fruit consumption frequencies and their preferences.
4. To assess the relationship of current horticultural therapy programs and basic horticultural knowledge.
5. To identify demographics associated with basic horticultural knowledge.
6. To determine if the levels of basic horticultural knowledge in three fields were equal.
7. To determine the correlation of vegetable and fruit consumption frequency, preference, and basic horticultural knowledge.

## **Method**

### ***Research Sites***

Two behavioral health service institutions in Kansas City, Missouri, were selected as research sites. These institutions are behavioral health service providers to adolescents with emotional, behavioral, psychological, social, or learning problems and their families. These institutions provide various types of treatment services for adolescents. These include drug treatment, anger management therapy, creative art therapy, recreation therapy, exercise therapy, expressive therapy, trauma and loss group therapy and other psychiatric treatments. In addition to these services, both institutions also provide horticultural therapy.

Horticultural therapy programs of these institutions are year round programs consisting of various types of horticultural activities. Each horticultural therapy program is based on therapeutic goals and provided by professional horticultural therapists.

The overall goal of the horticultural therapy program at Institution A is to provide pre-vocational and vocational skills for the adolescents to take with them once discharged from the program. One specific goal of this program is to increase the adolescents' basic horticultural knowledge. Individual goals are also set based on the specific diagnosis of an individual adolescent. Adolescents in this institution can join a horticultural therapy program with the nomination of their own individual therapists. Adolescents in this horticultural therapy program attend one hour group or individual therapy sessions composed with instruction and activity once per week. The horticultural therapy program of this institution consists of a variety of activities depending on the season, group skill level, and individual participant needs. Horticultural

activities include seasonal gardening, propagation, plant maintenance, educational field trips, crafts, and spring and winter plant sales.

The goal of the horticultural therapy program at Institution B is to use the greenhouse to increase self-esteem, self-confidence, and social skills, and to emphasize responsibility by giving students a sense of ownership in the program. Individual goals are set for each adolescents based on their diagnoses. Adolescents in this institution can join a horticultural therapy program when their therapists refer or select them to participate or when they request to join with a good behavior record. The horticultural therapy program in this institution consists of hands-on activities and class work such as journaling, charting, or instruction for activities. Each session is 50 minutes in length and a group of four to five adolescents attend the session every school day. The horticultural therapy program at this institution consists of various types of activities and education classes including propagation, plant structure and physiology, growing vegetables, herbs, house plants, and bedding plants, composting, landscaping, plant care and pest control, and a plant sale. For both horticultural therapy programs, the plant sale is the most popular activity.

### *Subjects*

A total of 64 adolescents were recruited as research subjects from two behavioral health service institutions in Kansas City, Missouri. These adolescents received health service from the institutions for behavioral, psychological, developmental, social, psychiatric, or learning problems. Specific diagnoses included conduct disorder (CD), attention deficit hyperactivity disorder (ADHD), eating disorder, drug abuse, posttraumatic stress disorder (PTSD), Asperger's syndrome, chronic depression, bipolar, and learning disabilities.



Subjects were divided into two groups based on their history of horticultural therapy treatment. Subjects with previous or current horticultural therapy history were in the horticultural therapy group (HT group) and subjects without any history of institutional horticultural therapy were assigned to the non-horticultural therapy group (NHT group).

Thirty-three subjects were recruited from Institution A, which included 16 subjects (five male, 11 female) in the HT group and 17 subjects (four male, 13 female) in the NHT group. The mean age of the HT group and the NHT group was 15.94 years (range 13 to 19) and 15.76 years (range 14 to 17), respectively. Eleven subjects in the HT group and 14 subjects in the NHT group were European American, five subjects from the HT group and three subjects from the NHT group were African American. The average length of treatment at the institution was 59.35 weeks ( $SD = 41.46$ ) for the HT group and 15.53 weeks ( $SD = 12.37$ ) for the NHT group. The average length of horticultural therapy treatment for the HT group was 45.88 weeks ( $SD = 38.76$ ).

Among the 31 subjects from Institution B, the HT group consisted of 15 subjects (12 male, three female) with a mean age of 16.8 years (range 15 to 20) and NHT group consisted of 16 subjects (14 male, two female) with a mean age of 15.75 years (range 15 to 17). Among the HT group, 12 subjects were European American, two subjects were African American, and one subject identified as “other” racial background. The NHT group consisted of eight European Americans (50%), six African Americans (37.5%) and two with “other” racial backgrounds (12.5%). The average length of treatment at the institution were 99.2 weeks ( $SD = 67.23$ ) for the HT group and 78.44 weeks ( $SD = 56.17$ ) for the NHT group. The average length of horticultural therapy treatment for the HT group was 59.67 weeks ( $SD = 44.41$ ).

## ***Instruments***

Instruments used in this research were completed by the therapist at each institution or individual research subjects. Demographic information was provided by the therapist at each institution for accuracy and elimination of any confidentiality risk. Instruments used for vegetable and fruit consumption and preference information, horticultural knowledge, horticultural background information, and locus of control were completed by each individual subject.

### ***Vegetable and Fruit Preference and Consumption Survey***

To measure the fruit and vegetable preference and consumption frequency, a Vegetable and Fruit Preference and Consumption Survey (Appendix C-1) was used. This survey included the following two types of questions:

*“Choose all the vegetables (fruits) you like to eat. (If you like other vegetables (fruits), please write the name”* (Preference)

*“How often do you eat vegetables (fruits)?*

*a) 2-3 times a day b) once a day c) 2-3 times a week d) once a week”* (Consumption)

The total number of preferred vegetables and fruits were used to determine the preference.

### ***Basic Horticulture Knowledge Test***

The Basic Horticultural Knowledge Test (Appendix C-2) was modified from the Basic Horticultural Knowledge Test previously used for horticultural therapy research at a probation program in Paris, Texas (Hale et al., 2005). It consisted of 15 multiple choice questions dealing with (a) plant anatomy and physiology (HTAP), (b) propagation and growing (HTGR), and (c) use and nutrition (HTNU). The total score was used to decide the level of overall horticultural

knowledge (HORTTEST). Possible range is 0 to 15. The score of each field (5 possible points each) was also used to determine the equality of the knowledge levels among the three fields.

### ***Demographic Information***

Demographic information (Appendix C-3) was collected on gender, age, racial background and the length of treatment at the institution and horticultural therapy program. This information was provided by the therapist of each institution to insure accurate information and elimination of any risk.

### ***Horticultural Background Questionnaire***

The Horticultural Background Questionnaire used for this horticultural therapy research was previously used for the probation program at Paris, Texas (Hale, Marlowe, Mattson, & Nicholson, 2005) and was modified for the adolescent subjects in this research (Appendix B-1). The questionnaire asked about their home residential area, previous horticultural experience, and future interest in horticultural activity.

### ***Nowicki-Strickland Locus of Control Scale for Children***

The Nowicki-Strickland Locus of Control Scale for Children (Appendix C-5) was used to measure locus of control of research subjects. Nowicki-Strickland Locus of Control Scale for Children is a 40-item scale having Yes-No responses. This scale measures generalized expectancies for internal versus external control of reinforcement among children. Possible scores ranged from 0 to 40. Higher scores mean external locus of control and lower scores mean internal locus of control. Test-retest reliability over six-week was .63 - .71 and estimates of internal consistency were .63 - .81 (Nowicki & Strickland, 1973). Nowicki-Strickland Locus of Control Scale for Children has been used in research on child and adolescent populations

including learning disabled children and gifted children (Fincham & Barling, 1978), at-risk students and honor students (Lynch, Hurford, & Cole, 2002), institutionalized juvenile delinquents (Little & Kendall, 1978), behaviorally disturbed children (McIntosh & Rawson, 1988), ADHD children and adolescents (Dunn & Shapiro, 1999; Rucklidge & Tannock, 2001), children with behavioral disorder (Elliot, 1996; Rawson, 1992), youths in residential treatment with behavioral and emotional problems (Rivard et al., 2003), children and adolescents with conduct disorders in residential treatment (Strand & Nowicki, 1999), sexually abused girls (Mannarino & Cohen, 1996), children and adolescents with PTSD (March, Amaya-Jackson, Murray, & Schulte, 1998), adolescents with pediatric bipolar disorder (Rucklidge, 2006), children and adolescents with anxiety disorder (Weems, Silverman, Rapee, & Pina, 2003), and severely disturbed adolescents in a private residential psychiatric hospital (Yates, Hecht-Lewis, Fritsch, & Goodrich, 1993).

### ***Procedure and data collection***

The Research Involving Human Subjects protocol developed for this research project was reviewed and approved by the Kansas State University Institutional Review Board, by the Institutional Review Board of the two behavioral health service institutions, and by the Department of Social Service, State of Missouri. After the research approval, therapists of both institutions explained the objectives and procedures of the research to the adolescents receiving health service. After explanation, therapists recruited research subjects for both groups based on their treatment history among the adolescents who volunteered to participate. After obtaining consent from participants and informed consent authority, therapists of the behavioral health service institutions administered the data collection. The demographic information of research

subjects was provided by the therapist who administered data collection. Sets of instruments were given to subjects in each group and completed in one hour. When completed, the instruments were collected and matched with individual demographic information for analyses.

### ***Data Analyses***

Statistical analysis software (SAS 9.2) was used to analyze collected data. The *t*-test was used to the comparison of the mean scores of the two different groups, and for the multiple comparisons of the mean scores, the least significant difference test was used. Associations and correlations were determined between demographics, horticultural background information, and other research variables with regression analyses.

Because institutions had strong restriction for the confidentiality of the subjects, data were collected one time. To identify the effects of the research variables, regression analyses were conducted to determine the associations between research variables and length of treatment at the institution and the length of horticultural therapy treatment.

## Results

### *Vegetable and Fruit Consumption and Preference*

#### *Vegetable and fruit consumption frequency*

At Institution A, 54.55 % of subjects reported eating vegetables two to three times a day. In the HT group, 62.5% of subjects reported eating vegetables two to three times a day while 47.06% of the NHT group subjects answered the same. A total of 75.76% of the subjects from Institution A reported eating vegetables at least once a day. For Institution B, a total of 54.84% of the subjects answered they eat vegetables at least once a day. One of the subjects in the NHT group reported not eating any vegetable. From the comparisons on percentages of vegetable consumption frequency, the HT and NHT groups did not show significant differences at both institutions (Table 5.1).

**Table 5.1 Vegetable consumption frequency of Institution A and Institution B**

<b>Institution A</b>	Frequency of vegetable consumption				
	<i>N</i>	2-3 times / day	1 time / day	2-3 times / week	1 time or less / week
HT	16	10 (62.5%)	5 (31.25%)	1 (6.25%)	0
NHT	17	8 (47.06%)	2 (11.76%)	5 (29.41%)	2 (11.76%)
Institution	33	18 (54.55%)	7 (21.21%)	6 (18.18%)	2 (6.06%)
<b>Institution B</b>	Frequency of vegetable consumption				
	<i>N</i>	2-3 times / day	1 time / day	2-3 times / week	1 time or less / week
HT	15	3 (20%)	4 (26.67%)	7 (46.67%)	1 (6.67%)
NHT	16	7 (43.75)	3 (18.75%)	3 (18.75%)	3 (18.75%)
Institution	31	10 (32.26%)	7 (22.58%)	10 (32.26%)	4 (12.91%)

For the fruit consumption frequency question, eating fruit two to three times a day was the most frequent answer for both institutions. At Institution A, 69.70% of subjects reported they ate fruits two to three times a day. The percentages of subjects who consumed fruits two to three times a day were similar for the HT and NHT groups (68.75% and 70.59%, respectively). As shown by shading in Table 5.2, a total of 75.76 % of the subjects at Institution A reported eating fruits at least once a day. For Institution B, 73.33 % of the subjects reported eating fruits at least once a day. From the comparisons on percentages of vegetable consumption frequency, the HT and NHT groups did not show significant differences at both institutions (Table 5.2).

**Table 5.2 Fruit consumption frequency of Institution A and Institution B**

<b>Institution A</b>	Frequency of fruit consumption				
	<i>N</i>	2-3 times / day	1 time / day	2-3 times / week	1 time / week
HT	16	11 (68.75%)	2 (12.5%)	3 (18.75%)	0
NHT	17	12 (70.59%)	0	5 (29.41%)	0
Institution	33	23 (69.70%)	2 (6.06%)	8 (24.24%)	0
<b>Institution B</b>	Frequency of fruit consumption				
	<i>N</i>	2-3 times / day	1 time / day	2-3 times / week	1 time / week
HT	14	6 (42.86%)	3 (21.43%)	3 (21.43%)	2 (14.29%)
NHT	16	7 (43.75%)	6 (37.5%)	3 (18.75%)	0
Institution	30	13 (43.33%)	9 (30%)	6 (20%)	2 (6.67%)

At Institution A, the HT group subjects reported more frequent vegetable and fruit consumption than the NHT group. At Institution B, the fruit consumption frequency was higher than that of vegetable consumption. When the frequencies were compared between two groups, the NHT group reported higher frequencies of vegetable and fruit consumption.

Regression analyses were conducted to determine if the vegetable and fruit consumption frequencies of the subjects were associated with demographics and horticultural background. For analyses, numbers of future horticultural interest were organized into three groups. They were a group without future horticultural interest, a group with future horticultural interest with one to two types of horticultural activities, and a group with future horticultural interest with three to five types of horticultural activities.

For Institution A, gender, age, length of treatment at the institution, and horticultural experience were not associated with vegetable and fruit consumption frequencies. Future horticultural interest ( $t = -2.55, p = 0.016$ ) and racial background showed significant associations with vegetable consumption frequency and fruit consumption frequency, respectively. There was no association between frequencies of vegetable/fruit consumption and demographics and horticultural background information in Institution B.

As shown in Table 5.3, vegetable consumption frequency was related to future interest in horticulture activity at Institution A. Subjects with future horticultural interest reported more frequent vegetable consumption (2-3 times a day and 1 time a day) than subjects without future horticultural interest (between one time a day and 2-3 times a week).

**Table 5.3 Mean differences in the vegetable consumption frequency among the groups with different numbers of future horticultural interest of Institution A**

	Numbers of future horticultural interest		
	0	1-2	3-5
<i>N</i>	3	16	14
<i>M<sup>z</sup></i>	2.33 <sup>a</sup>	2.06 <sup>ab</sup>	1.29 <sup>b</sup>

$\alpha = 0.05$ ,  $LSD=1.0293$ .

<sup>z</sup>*M* = mean vegetable consumption frequency. It ranged from 1 = 2-3 times / day, 2 = 1 time / day, 3 = 2-3 times / week, 4 = 1 time / week.



An association existed between fruit consumption frequency and racial background ( $t = -2.31, p = 0.028$ ) in Institution A. The fruit consumption frequency of European American subjects was between two to three times a day and once a day while that of African American subjects was between once a day and two to three times a week. This difference was significant at the 0.02 level of probability ( $t$ -test) (Table 5.4). This result could be compared with the study of Lorson, Melgar-Quinonez, and Taylor (2009) who reported the fruit intake of children from different racial backgrounds. They found that non-Hispanic African American children consumed more fruit than Mexican American and non-Hispanic White children. The difference of two research studies could be explained with the different measurement used in each study. Lorson et al. measured fruit consumption amount of subjects while current study measured the fruit consumption frequency of subjects. The physical and environmental conditions of the subjects of this research could be considered as another reason of the difference.

**Table 5.4 Mean difference of the fruit consumption frequency between two different racial groups at Institution A**

	Race	
	European American	African American
<i>N</i>	25	8
<i>M</i> <sup>z</sup> ( <i>SD</i> )	1.36 <sup>y</sup> (0.76)	2.13 <sup>x</sup> (0.99)
<i>t</i> -value (prob.)	-2.31 (0.028)*	

\*  $p < .05$ .

<sup>z</sup>  $M$  = mean fruit consumption frequency. It ranged from 1 = 2-3 times / day, 2 = 1 time / day, 3 = 2-3 times / week, 4 = 1 time / week.

<sup>y</sup> This number means subjects consumed fruit between 2-3 times a day and once a day.

<sup>x</sup> This number means subjects consumed fruit between once a day and 2-3 times a week.

***Vegetable and fruit preferences***

Subjects chose the vegetables and fruits they like to eat listed on the Vegetable and Fruit Preference Survey. For the vegetable preference of Institution A, the average number of preferred vegetables of the HT group was 5.94 and that of the NHT group was 6.65. For Institution B, the average number of preferred vegetables of the HT group was 6.87 while that of the NHT group was 6.13. Similarly as with the vegetable preference, there were no significant differences on average number of preferred fruits between the HT and NHT groups of each institution (Table 5.5).

**Table 5.5 Mean differences of the numbers of preferred vegetables and fruits between the HT and NHT groups of Institution A and Institution B**

<b>Vegetables</b>	GROUP	Mean <sup>z</sup> (SD)	t-value (prob.)
Institution A	HT (n = 16)	5.94 (2.29)	-0.83 (0.413) <sup>NS</sup>
	NHT (n = 17)	6.65 (2.60)	
Institution B	HT (n = 15)	6.87 (2.90)	0.64 (0.522) <sup>NS</sup>
	NHT (n = 16)	6.13 (3.46)	
<b>Fruits</b>	GROUP	Mean <sup>y</sup> (SD)	t-value (prob.)
Institution A	HT (n = 16)	4.69 (1.89)	-1.13 (0.269) <sup>NS</sup>
	NHT (n = 17)	5.41 (1.80)	
Institution B	HT (n = 15)	5.07 (1.39)	-0.22 (0.824) <sup>NS</sup>
	NHT (n = 16)	5.19 (1.60)	

<sup>NS</sup> Non-significant.

<sup>z</sup> Mean = mean numbers of preferred vegetables.

<sup>y</sup> Mean = mean numbers of preferred fruits.

Regression analyses were conducted to determine the existence of any significant association between vegetable/fruit preferences and demographics/horticultural background

information. No significant association was found in Institution A. For Institution B, future horticultural interest was significantly associated with vegetable preference ( $t = 2.17, p = 0.038$ ) and gender was associated with fruit preference ( $t = -2.24, p = 0.033$ ). Other factors were not associated.

The average number of preferred vegetable choices of subjects with future horticultural interests was significantly higher than that of subjects without future horticultural interests (Table 5.6). The subjects with future horticultural interest chose an average of 7.35 preferred vegetables, while subjects without future horticultural interest averaged 4.91 preferred vegetables.

**Table 5.6 Mean difference of the vegetable preference between the groups with and without interest in future horticultural activity in Institution B**

	Future horticultural interest	
	Yes	No
<i>N</i>	20	11
<i>M</i> <sup>z</sup> ( <i>SD</i> )	7.35 (3.00)	4.91 (2.98)
<i>t</i> -value (prob.)	2.17 (0.038)*	

\*  $p < .05$ .

<sup>z</sup> *M* = average number of preferred vegetables.

For fruit preference in Institution B, gender was another associated factor. As shown in Table 5.7, female subjects reported an average of 6.40 preferred fruits, while male subjects reported an average of 4.89 preferred fruits. This is consistent with previous reports on gender difference on fruit preference (Caine-Bish & Scheule, 2009; Granner, Sargent, Calderon, Hussey, Evans, & Watkins, 2004).

**Table 5.7 Mean difference of the fruit preference between two genders in Institution B**

	Male	Female
<i>N</i>	26	5
<i>M<sup>z</sup> (SD)</i>	4.89 (1.48)	6.40 (0.55)
<i>t</i> -value (prob.)	-2.24 (0.033)*	

\*  $p < .05$ .

<sup>z</sup> *M* = average number of preferred fruits.

### ***Vegetable consumption frequency and preference***

No significant correlation existed between vegetable consumption frequency and vegetable preference in Institution B. As shown in Table 5.8, the HT and NHT groups at Institution A had a significant correlation between vegetable consumption frequency and vegetable preference. It could be interpreted that when subjects preferred more vegetables, their vegetable consumption frequency was also higher.

**Table 5.8 Pearson Correlation of vegetable consumption frequency and vegetable preference of Institution A**

	Veg. Freq. <sup>z</sup> / Veg. Pref. <sup>y</sup> Pearson Correlation (Prob.)
HT	-0.5341 (0.033)*
NHT	-0.5186 (0.033)*
Institution	-0.4300 (0.013)*

\*  $p < .05$ .

<sup>z</sup> Veg. Freq. = vegetable consumption frequency.

<sup>y</sup> Veg. Pref. = vegetable preference.

### ***Vegetable consumption frequency and fruit consumption frequency***

To determine if the consumption frequencies of vegetable and fruit are related, correlations of the two factors were analyzed. At Institution A, vegetable consumption

frequency and fruit consumption frequency was significantly correlated. There was a highly significant correlation between vegetable and fruit consumption frequencies in the NHT group. In the HT group, no significant correlation was reported (Table 5.9).

At Institution B, a highly significant correlation occurred between vegetable consumption frequency and fruit consumption frequency. In the HT group, these two frequencies were significantly correlated while no correlation was found in the NHT group (Table 5.9).

**Table 5.9 Pearson Correlation of vegetable and fruit consumption frequencies of Institution A and Institution B**

	Veg. Freq. <sup>z</sup> / Frt. Freq. <sup>y</sup> Pearson Correlation (Prob.)	
	Institution A	Institution B
HT	0.1947 (0.470) <sup>NS</sup>	0.6881 (0.007)**
NHT	0.7800 (<.001)**	0.1072 (0.693) <sup>NS</sup>
Institution	0.5698 (<.001)**	0.4030 (0.027)*

\*\*  $p < .01$ . \*  $p < .05$ . <sup>NS</sup> Non-significant.

<sup>z</sup> Veg. Freq. = vegetable consumption frequency.

<sup>y</sup> Frt. Freq. = fruit consumption frequency.

### ***Basic Horticultural Knowledge***

#### ***Institution A***

As presented in Table 5.10, the scores of basic horticultural knowledge were similar for the HT and NHT groups. Regression analyses were conducted to find the presence of association between basic horticultural knowledge scores, demographics, and horticultural background information. No association was found from regression analyses.

**Table 5.10 Mean scores on the basic horticultural knowledge test of the HT and NHT groups at Institution A**

	Mean <sup>z</sup> ( <i>SD</i> )		<i>t</i> -value (prob.)
	HT	NHT	
HORTTEST <sup>y</sup>	9.50 (2.19)	9.41 (2.00)	0.12 (0.905) <sup>NS</sup>
HTAP <sup>x</sup>	2.69 (1.45)	3.18 (1.01)	-1.13 (0.268) <sup>NS</sup>
HTGR <sup>w</sup>	2.25 (1.00)	1.94 (1.03)	0.87 (0.389) <sup>NS</sup>
HTNU <sup>v</sup>	4.56 (0.63)	4.29 (0.85)	1.03 (0.313) <sup>NS</sup>

<sup>NS</sup> Non-significant.

<sup>z</sup> Mean = average Basic Horticultural Knowledge Score.

<sup>y</sup> HORTTEST= Basic Horticultural Knowledge (15 possible points).

<sup>x</sup> HTAP = Plant anatomy and physiology (5 possible points).

<sup>w</sup> HTGR = Plant propagation and growing (5 possible points).

<sup>v</sup> HTNU = Plant use and nutrition (5 possible points).

### ***Institution B***

As shown in Table 5.11, the HORTTEST score of the HT group was significantly higher with 10.07 (*SD* = 2.43) than the score 7.69 (*SD* = 2.55) of the NHT group. The scores of HTGR and HTNU of the HT group were also significantly higher than those of the NHT group.

Although non-significant, the HTAP scores were also higher for the HT subjects. In other words, participating in horticultural therapy program was related with the subjects' high scores in basic horticultural knowledge test.

**Table 5.11 Mean scores on the basic horticultural knowledge test of the HT and NHT groups at Institution B**

	Mean <sup>z</sup> (SD)		t-value (prob.)
	HT	NHT	
HORTTEST <sup>y</sup>	10.07 (2.43)	7.69 (2.55)	2.65 (0.013)*
HTAP <sup>x</sup>	2.53 (1.19)	1.88 (1.15)	1.57(0.127) <sup>NS</sup>
HTGR <sup>w</sup>	3.13 (1.19)	2.06 (1.06)	2.65 (0.013)*
HTNU <sup>v</sup>	4.40 (0.74)	3.75 (0.93)	2.15 (0.040)*

\*  $p < .05$ . <sup>NS</sup> Non-significant.

<sup>z</sup> Mean = average Basic Horticultural Knowledge Score.

<sup>y</sup> HORTTEST= Basic Horticultural Knowledge (15 possible points).

<sup>x</sup> HTAP = Plant anatomy and physiology (5 possible points).

<sup>w</sup> HTGR = Plant propagation and growing (5 possible points).

<sup>v</sup> HTNU = Plant use and nutrition (5 possible points).

In the regression analyses between basic horticultural knowledge test scores and demographics and horticultural background information, none of the demographics and horticultural backgrounds were associated with basic horticultural knowledge scores except age. The association of age was found with the HORTTEST, HTAP, and HTGR scores of total subjects of Institution B. The HTNU score was not associated with age. For the regression test, ages of subjects were grouped into three fields.

Based on the regression analyses results, the Least Significant Difference (LSD) test was conducted. For the total subjects of Institution B, all three basic horticultural knowledge test scores of subjects aged 18 to 20 were significantly higher than the scores of subjects aged 14 to 15. The HORTTEST score of the subjects aged 16 to 17 was also significantly higher than that of the subjects aged 14 to 15 (Table 5.12).

As shown in Table 5.13, the mean differences of basic horticultural knowledge were presented among different age groups of the NHT group. The HORTTEST, HTGR, and HTNU

scores of older subjects were significantly higher than those of subjects aged 14 to 15. It could be interpreted that basic horticultural knowledge of the subjects in NHT group were obtained naturally through their cognitive development.

**Table 5.12 Mean scores on the Basic Horticultural Knowledge Test (HORTTEST) among different ages at Institution B**

	Age			LSD <sup>z</sup>
	14-15 yrs. (n = 10)	16-17 yrs. (n = 17)	18-20 yrs. (n = 4)	
HORTTEST <sup>y</sup>	6.80 <sup>a</sup>	9.47 <sup>b</sup>	11.25 <sup>b</sup>	2.496
HTAP <sup>x</sup>	1.4 <sup>a</sup>	2.47 <sup>ab</sup>	3.0 <sup>b</sup>	1.155
HTGR <sup>w</sup>	1.8 <sup>a</sup>	2.76 <sup>ab</sup>	3.75 <sup>b</sup>	1.168

$\alpha = 0.05$ .

<sup>z</sup>LSD = Least Significant Difference

<sup>y</sup>HORTTEST = Basic Horticultural Knowledge (15 possible points).

<sup>x</sup>HTAP = Plant anatomy and physiology (5 possible points).

<sup>w</sup>HTGR = Plant propagation and growing (5 possible points).

**Table 5.13 Mean scores on the Basic Horticultural Knowledge Test (HORTTEST) among different ages of NHT group of Institution B**

	Age			LSD <sup>z</sup>
	14-15 yrs. (n = 7)	16-17 yrs. (n = 5)	18-20 yrs. (n = 4)	
HORTTEST <sup>y</sup>	5.71 <sup>a</sup>	9.4 <sup>b</sup>	9.0 <sup>b</sup>	2.627
HTGR <sup>x</sup>	1.29 <sup>a</sup>	2.6 <sup>b</sup>	2.75 <sup>b</sup>	1.154
HTNU <sup>w</sup>	3.14 <sup>a</sup>	4.2 <sup>ab</sup>	4.25 <sup>b</sup>	1.092

$\alpha = 0.05$ .

<sup>z</sup>LSD = Least Significant Difference

<sup>y</sup>HORTTEST = Basic Horticultural Knowledge (15 possible points).

<sup>x</sup>HTGR = Plant propagation and growing (5 possible points).

<sup>w</sup>HTNU = Plant use and nutrition (5 possible points).



The horticultural therapy program at Institution B had a goal to improve responsibility of adolescents through horticultural therapy activities. Ortman (1988) reported that internal locus of control is highly correlated with responsibility. Therefore, the regression analyses were conducted to determine the presence of any association between basic horticultural knowledge scores and the locus of control scores. The association of HTGR and locus of control scores was found in the HT group at Institution B ( $t = -2.87, p = 0.013$ ). Locus of control scores were significantly correlated with HTGR scores of the HT group subjects. Considering the goal of the horticultural therapy program of Institution B, it could be understood that the subjects with higher responsibility tend to have better knowledge in HTGR which is critically related with their horticultural activities.

### ***Comparisons of three basic horticultural knowledge fields***

As shown in the Table 5.14, scores were presented of the three basic horticultural knowledge fields. At Institution A, the HTNU score was the highest among the three fields in the comparisons within all institution subjects, the HT group, and the NHT group. HTAP scores were second highest and HTGR scores were the lowest for the comparison within all subjects and the NHT group. In the HT group, no significant difference was found between HTAP and HTGR scores.

Also shown in Table 5.15, HTNU scores were higher than the other two scores at Institution B. This result was consistent with the results of comparisons within the HT and NHT groups. The mean difference of HTAP and HTGR scores was not significant. For both institutions, subjects showed better knowledge about plant use and nutrition fields than the other fields.

**Table 5.14 Mean differences among the scores of three fields of basic horticultural knowledge in each group of Institution A and Institution B**

<b>Institution A</b>	HTAP <sup>z</sup>	HTGR <sup>y</sup>	HTNU <sup>x</sup>	LSD <sup>w</sup>
HT	2.69 <sup>a</sup>	2.25 <sup>a</sup>	4.56 <sup>b</sup>	2.0141
NHT	3.18 <sup>b</sup>	1.94 <sup>a</sup>	4.29 <sup>c</sup>	2.0106
Institution	2.94 <sup>b</sup>	2.09 <sup>a</sup>	4.42 <sup>c</sup>	1.9850
<b>Institution B</b>	HTAP <sup>z</sup>	HTGR <sup>y</sup>	HTNU <sup>x</sup>	LSD <sup>w</sup>
HT	2.53 <sup>a</sup>	3.13 <sup>a</sup>	4.40 <sup>b</sup>	2.0181
NHT	1.88 <sup>a</sup>	2.06 <sup>a</sup>	3.75 <sup>b</sup>	2.0141
Institution	2.19 <sup>a</sup>	2.58 <sup>a</sup>	4.06 <sup>b</sup>	1.9867

$\alpha = 0.05$ .

<sup>w</sup> LSD = Least Significant Difference

<sup>z</sup> HTAP = Plant anatomy and physiology (5 possible points).

<sup>y</sup> HTGR = Plant propagation and growing (5 possible points).

<sup>x</sup> HTNU = Plant use and nutrition (5 possible points).

The higher scores of HTNU could be due to the characteristics of the questions of this field. The questions in HTNU such as “Oranges and grapefruits are good sources of?” could be easily answered and learned without special education or experience. Compared to this, the HTGR question “Which part of the plant should you hold when you transplant seedlings?” might be difficult to answer without special knowledge in plant growing. In fact, the above HTNU question was 79.69% correctly answered while only 12.50% of subjects chose the correct answer for the HTGR question cited above. Clearly, this HTGR question requires specific learning or experience to get the correct answer.

***Basic Horticultural Knowledge and Vegetable/Fruit Consumption and Preferences***

***Institution A***

Regression analyses were conducted to determine the existence of association between basic horticultural knowledge scores and vegetable/fruit consumption frequencies and preferences. In the HT group, vegetable consumption frequency and the HTGR score were significantly associated ( $t = -3.83, p = 0.002$ ). In the NHT group, fruit consumption frequency was associated with the HORTTEST score ( $t = -2.46, p = 0.027$ ) and the HTGR score ( $t = -2.97, p = 0.010$ ).

Because there was only one subject in vegetable consumption frequency 3 (two to three times a week) in the HT group, this frequency group was eliminated from the mean comparison. As shown in Table 5.15, the HTGR score was higher for the subjects who consumed vegetable more frequently.

**Table 5.15 Mean difference of the HTGR scores between the groups with different vegetable consumption frequencies in HT group of Institution A**

	Mean <sup>z</sup> (SD)		t-value (prob.)
	Veg. Freq. 1 <sup>y</sup> (n = 10)	Veg. Freq. 2 <sup>x</sup> (n = 5)	
HTGR <sup>w</sup>	2.7 (0.83)	1.8 (0.45)	2.24 (0.042)*

\*  $p < .05$ .

<sup>z</sup>Mean = average HTGR score.

<sup>y</sup>Veg. Freq. 1 = vegetable consumption frequency of 2-3 times / day.

<sup>x</sup>Veg. Freq. 2 = vegetable consumption frequency of 1 time / day.

<sup>w</sup>HTGR = Plant propagation and growing (5 possible points).

In the NHT group, the fruit consumption frequency was reported in two consumption frequency groups. There was no subject in fruit consumption frequency 2 (one time a day) and

frequency 4 (one time a week). The scores of HORTTEST and HTGR were significantly higher in the group with higher fruit consumption frequency (Table 5.16).

Based on the result above, it could be assumed that in the HT group, subjects with better knowledge in propagation and growing tended to consume vegetables more frequently. In the NHT group, subjects with better knowledge in this field tended to consume fruit more frequently.

**Table 5.16 Mean differences of the scores of the Basic Horticultural Knowledge Test (HORTTEST) and HTGR between the groups with different fruit consumption frequencies of NHT group of Institution A**

	Mean <sup>z</sup> (SD)		t-value (prob.)
	Fr. Freq. 1 <sup>y</sup> (n = 12)	Fr. Freq. 3 <sup>x</sup> (n =5)	
HORTTEST <sup>w</sup>	10.08 (1.83)	7.8 (1.48)	3.55 (0.027)*
HTGR <sup>v</sup>	2.33 (0.89)	1.0 (0.71)	2.94 (0.010)**

\*\*  $p < .01$ . \*  $p < .05$ .

<sup>z</sup> Mean = average basic horticultural knowledge score.

<sup>y</sup> Frt. Freq. 1 = fruit consumption frequency of 2-3 times / day.

<sup>x</sup> Frt. Freq. 3 = fruit consumption frequency of 2-3 times / week.

<sup>w</sup> HORTTEST = Basic Horticultural Knowledge (15 possible points).

<sup>v</sup> HTGR = Plant propagation and growing (5 possible points).

### ***Institution B***

Regression analyses were conducted to determine the presence of association between basic horticultural knowledge scores and vegetable/fruit consumption frequencies and preferences. For analyses, vegetable preference was organized into three groups. They were the vegetable preference group 1 with one to five preferred vegetables, the vegetable preference group 2 with six to 10 preferred vegetables, and the vegetable preference group 3 with 11 to 14 preferred vegetables.

From the analyses of the NHT group, no association was found. In the HT group, vegetable preference was significantly associated with HORTTEST and HTGR scores ( $t = 2.67$ ,  $p = 0.019$ ,  $t = 3.04$ ,  $p = 0.010$ , respectively). As presented in Table 5.17, for both the HORTTEST and HTGR scores, subjects with higher vegetable preference showed higher scores in basic horticultural knowledge. The mean HORTTEST score of the subjects who reported 10 or more preferred vegetables was significantly higher than that of the subjects with less than six preferred vegetables. The mean HTGR score of the subjects that reported six or more preferred vegetables was significantly higher than that of the subjects reported less than six preferred vegetables. Subjects with better horticultural knowledge especially in propagation and growing field tend to show more preference on various vegetable.

**Table 5.17 Mean differences of the scores of the Basic Horticultural Knowledge Test (HORTTEST) and HTGR among the groups with different range of vegetable preference in HT group of Institution B**

	Mean <sup>z</sup>			LSD <sup>y</sup>
	Veg. Pref. 1 <sup>y</sup> ( $n = 6$ )	Veg. Pref. 2 <sup>x</sup> ( $n = 7$ )	Veg. Pref. 3 <sup>w</sup> ( $n = 2$ )	
HORTTEST <sup>u</sup>	8.17 <sup>a</sup>	11.28 <sup>ab</sup>	11.50 <sup>b</sup>	3.160
HTGR <sup>t</sup>	2.17 <sup>a</sup>	3.71 <sup>b</sup>	4 <sup>b</sup>	1.480

$\alpha = 0.05$ .

<sup>z</sup>Mean = average basic horticultural knowledge score.

<sup>y</sup>Veg. Pref. 1 = Vegetable preference group 1. Numbers of preferred vegetable ranged 1-5.

<sup>x</sup>Veg. Pref. 2 = Vegetable preference group 2. Numbers of preferred vegetable ranged 6-10.

<sup>w</sup>Veg. Pref. 3 = Vegetable preference group 3. Numbers of preferred vegetable ranged 11-14.

<sup>y</sup>LSD = Least Significant Difference.

<sup>u</sup>HORTTEST = Basic Horticultural Knowledge (15 possible points).

<sup>t</sup>HTGR = Plant propagation and growing (5 possible points).

## Discussion

Studies on garden related nutrition education programs reported significant improvement of vegetable and fruit consumption (McAleese & Rankin, 2007; Morris & Zidenberg-Cherr, 2002; Parmer, Salisbury-Glennon, Shannon, & Struempfer, 2009). However, in this study, the vegetable and fruit consumption frequencies of the adolescents in two behavioral health service institutions were not related with subjects' history of horticultural therapy treatment or previous horticultural experience. The horticultural therapy programs of both institutions did not describe the vegetable and fruit consumption improvement as a therapy goal. Horticultural therapy activities were aimed to give an understanding of the crops through the experience of growing real vegetables. No separate nutrition education was given during therapy sessions. Therefore, the difference between the results of this research and that of other nutrition education research could be interpreted that horticultural activities without nutrition education were not effective enough to improve vegetable and fruit consumption.

Another factor to consider for the vegetable and fruit consumption of adolescents in these institutions is the availability and accessibility of vegetables and fruits. Research on the determinants of vegetable and fruit consumption among adolescents consistently concluded that the availability of vegetables and fruits was most strongly related with their consumption (Blanchette & Brug, 2005; Lorson, Melgar-Quinonez, & Taylor, 2009; Neumark-Sztainer, Wall, Perry, & Story, 2003). Because of the strict restriction for the confidentiality of the adolescents at institutions, very limited information was asked about vegetable and fruit consumption in this study. Most subjects at Institution A were in a residential treatment while most subjects at Institution B were in daytime school-based treatment. There was no direct information about the

availability and accessibility of vegetables and fruits. However, based on the percentage difference of vegetable consumption frequency between the two institutions, it could be assumed that the subjects at Institution A had access to vegetables consistently from their everyday meal plan at the institution while the accessibility to vegetables of the subjects at Institution B depended on each individual.

In Institution A, the two research groups did not show difference on vegetable and fruit preferences as well. A correlation of vegetable consumption frequency and vegetable preference was found. This is consistent with the study of Harvey-Berino et al. (1997). From the result of the correlation of vegetable consumption frequency and preference, it could be explained that vegetable consumption could be improved if preference is improved. In addition, the positive correlation between vegetable consumption frequency and fruit consumption frequency was found at both institutions. Therefore, the increase of consumption of vegetable or fruit could be expected to lead to the increase of consumption of the other. To increase the preferences of vegetables and fruit through a horticultural therapy program, there should be more exposure to a variety of vegetables and fruits. This is especially important as the subjects preferred fruit and vegetable choices were relatively common and consumed frequently. The top five preferred vegetable and fruit choices of the subjects of this research were sweet corn, lettuce, carrot, bean and pea, broccoli, grape, banana, apple, strawberry, and orange. Introduction to more varieties of vegetables and fruits might increase their preferences for new vegetables and fruits.

For the improvement of vegetable and fruit consumption and preference of the adolescents at these institutions, it is recommended that the horticultural therapy program develop activities for nutrition education and increase exposures to various vegetables and fruits. The horticultural therapy program could use activities that include growing new vegetables and

fruits from seeds. Even though Institution A described an increase of basic horticultural knowledge as one goal of the horticultural therapy program, no significant differences were found between the HT group and NHT group. For Institution B, the difference of basic horticultural background knowledge scores of two groups may be the result of the horticultural therapy program. It is assumed that the basic horticultural knowledge in plant propagation and growing field was obtained through the hands-on experience of plant growing at the horticultural therapy program. The same effect was expected in horticultural therapy program at Institution A because of the similarities of the basic goals and activities with the horticultural program in Institution B. The biggest difference between the two programs was the frequency of therapy sessions. That is more an institutional issue and cannot be changed simply in a short time. Goal focused activity could be effective for expansion of horticultural knowledge.

The positive correlation between the HTGR score and locus of control from the horticultural therapy group in Institution B was a unique find. Horticultural therapy program at Institution B had a goal to improve adolescents' responsibility through horticultural activities. For the subjects at HT group, plant propagation and growing knowledge was directly related with and required for their horticultural activities including growing and caring of the plants. Therefore it could be described that the requirement of plant propagation and growing knowledge for their horticultural activities were positively related with internal locus of control which is considered as having responsibility.

The result of the comparisons of three horticultural knowledge fields revealed the characteristics of the source of the obtaining basic horticultural knowledge. Only considering the basic level of horticultural knowledge tested in this research, it is assumed that adolescents obtained basic plant use and nutrition knowledge from everyday life rather than from specific



education or experience. Comparatively, the knowledge in the fields of plant anatomy and physiology and plant propagation and growing tended to be obtained through specific education and experiences. For an accurate result, it is recommended that the source of horticultural knowledge information should be obtained directly from the research subjects. That information could be useful for developing specific horticultural therapy activities appropriately for target horticultural knowledge.

From the correlation analyses between vegetable and fruit consumption frequencies and HTGR score, the HT group of Institution A showed a strong negative correlation ( $r = -0.7153$ ) of vegetable consumption frequency and HTGR score which meant the more frequent vegetable consumption was related with higher HTGR score. The HT group of Institution B showed a significant correlation between vegetable preference and the HTGR score. It could be interpreted that because the HTGR score is assumed to be obtained through hands-on experience, a horticultural therapy program with hands-on activities could be effectively used for the improvement of vegetable consumption and preference.

In conclusion, participating current horticultural therapy programs at the behavioral health service institutions was not significantly related with vegetable/fruit consumption and preference. The relationship of participating horticultural therapy program and basic horticultural knowledge was presented differently at both institutions. Evidence was found supporting relationships that exist between basic horticultural knowledge and vegetable/fruit consumption. Using this evidence, horticultural therapy program should set goals to incorporate nutrition education when appropriate.

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## **CHAPTER 6 - Conclusion**

The levels of self-esteem and locus of control of the subjects in horticultural therapy group and non horticultural therapy group were not significantly different at two behavioral health service institutions. Because the score of competence factor of self-esteem was higher than the score of worthiness factor, to improve self-esteem of adolescents, horticultural therapy programs focused on the improvement of worthiness factor are required.

Environmental attitude and previous horticultural experience were strongly related. Horticultural therapy programs emphasizing diversity and abundant opportunities of horticultural experiences are recommended to improve positive environmental attitude.

Direct relationships of the horticultural therapy programs with vegetable/fruit preference and consumption were not found in this research. However, basic horticultural knowledge of adolescent subjects was significantly correlated with vegetable and fruit consumption. To improve consumption of vegetables and fruits, adding nutrition education to horticultural activities and teaching horticultural knowledge are recommended to current horticultural therapy programs. In addition to current research, the study on vegetable/fruit consumption amount is also recommended.

The responses of adolescents at the two behavioral health service institutions were inconsistent rather than showing one trend. Many possible variables could influence the subjects' responses but access was limited for this research. For more accurate understanding of the relationships of participating horticultural therapy programs and adolescents' responses on various factors, it is recommended that the staff of the institutions should conduct study with full access to the information of research subjects. The study with pre- and post-test is strongly

recommended to find clearer relationships of specific treatments and adolescents' responses.

## **Appendix A - Instruments for Chapter 3**

(Appendix A-1)

## Demographic Information

(COMPLETED BY STAFF)

1. Gender: Male \_\_\_ Female \_\_\_

2. Age: \_\_\_\_\_

3. Racial background:

\_\_\_ European

\_\_\_ African

\_\_\_ Hispanic or Latino

\_\_\_ Asian

\_\_\_ Native American

\_\_\_ Multiple racial backgrounds (Check all that apply)

\_\_\_ Other

4. Length of treatment:

Institution \_\_\_\_\_

Horticulture program \_\_\_\_\_

Other programs (List)

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(Appendix A-2)

## **Rosenberg Self-Esteem Scale**

◆ Choose the best answer that is closest to how you feel about the sentence.

1. On the whole, I am satisfied with myself.  
( Strongly Agree, Agree, Disagree, Strongly Disagree )
2. At times I think I am no good at all.  
( Strongly Agree, Agree, Disagree, Strongly Disagree )
3. I feel that I have a number of good qualities.  
( Strongly Agree, Agree, Disagree, Strongly Disagree )
4. I am able to do things as well as most other people.  
( Strongly Agree, Agree, Disagree, Strongly Disagree )
5. I feel I do not have much to be proud of.  
( Strongly Agree, Agree, Disagree, Strongly Disagree )
6. I certainly feel useless at times.  
( Strongly Agree, Agree, Disagree, Strongly Disagree )
7. I feel that I am a person of worth, at least on an equal plane with others.  
( Strongly Agree, Agree, Disagree, Strongly Disagree )
8. I wish I could have more respect for myself.  
( Strongly Agree, Agree, Disagree, Strongly Disagree )
9. All in all, I am inclined to feel that I am a failure.  
( Strongly Agree, Agree, Disagree, Strongly Disagree )
10. I take a positive attitude toward myself.  
( Strongly Agree, Agree, Disagree, Strongly Disagree )

(Appendix A-3)

### **Nowicki-Strickland Locus of Control Scale for Children**

1. Do you believe that most problems will solve themselves if you just don't fool with them?  
( YES, NO )
2. Do you believe that you can stop yourself from catching a cold? ( YES, NO )
3. Are some kids just born lucky? ( YES, NO )
4. Most of the time do you feel that getting good grades means a great deal to you? ( YES, NO )
5. Are you often blamed for things that just aren't your fault? ( YES, NO )
6. Do you believe that if somebody studies hard enough he or she can pass any subject?  
( YES, NO )
7. Do you feel that most of the time it doesn't pay to try hard because things never turn out right anyway? ( YES, NO )
8. Do you feel that if things start out well in the morning that it's going to be a good day no matter what you do? ( YES, NO )
9. Do you feel that most of the time parents listen to what their children have to say?  
( YES, NO )
10. Do you believe that wishing can make good things happen? ( YES, NO )
11. When you get punished does it usually seem its for not good reason at all? ( YES, NO )
12. Most of the time do you find it hard to change a friend's (mind) opinion? ( YES, NO )
13. Do you think that cheering more than luck helps a team to win? ( YES, NO )
14. Do you feel that it's nearly impossible to change your parent's mind about anything?  
( YES, NO )

15. Do you believe that your parents should allow you to make most of your own decisions?  
( YES, NO )
16. Do you feel that when you do something wrong there's very little you can do to make it right? ( YES, NO )
17. Do you believe that most kids are just born good at sports? ( YES, NO )
18. Are most of the other kids your age stronger than you are? ( YES, NO )
19. Do you feel that one of the best ways to handle most problems is just not to think about them? ( YES, NO )
20. Do you feel that you have a lot of choice in deciding who your friends are? ( YES, NO )
21. If you find a four leaf clover do you believe that it might bring you good luck? ( YES, NO )
22. Do you often feel that whether you do your homework has much to do with what kind of grades you get? ( YES, NO )
23. Do you feel that when a kid your age decides to hit you, there's little you can do to stop him or her? ( YES, NO )
24. Have you ever had a good luck charm? ( YES, NO )
25. Do you believe that whether or not people like you depends on how you act? ( YES, NO )
26. Will your parents usually help you if you ask them to? ( YES, NO )
27. Have you felt that when people were mean to you it was usually for no reason at all?  
( YES, NO )
28. Most of the time, do you feel that you can change what might happen tomorrow by what you do today? ( YES, NO )
29. Do you believe that when bad things are going to happen they just are going to happen no matter what you try to do to stop them? ( YES, NO )

30. Do you think that kids can get their own way if they just keep trying? ( YES, NO )
31. Most of the time do you find it useless to try to get your own way at home? ( YES, NO )
32. Do you feel that when good things happen they happen because of hard work? ( YES, NO )
33. Do you feel that when somebody your age wants to be your enemy there's little you can do to change matters? ( YES, NO )
34. Do you feel that it's easy to get friends to do what you want them to? ( YES, NO )
35. Do you usually feel that you have little to say about what you get to eat at home?  
( YES, NO )
36. Do you feel that when someone doesn't like you there's little you can do about it?  
( YES, NO )
37. Do you usually feel that it's almost useless to try in school because most other children are just plain smarter than you are? ( YES, NO )
38. Are you the kind of person who believes that planning ahead makes things turn out better?  
( YES, NO )
39. Most of the time, do you feel that you have little to say about what your family decides to do? ( YES, NO )
40. Do you think it's better to be smart than to be lucky? ( YES, NO )

## **Appendix B - Instruments for Chapter 4**

(Appendix B-1)

## Horticultural Background Questionnaire

◆ Choose or write the best answer to the following questions.

1. Where have you lived most of your life?

- On a farm or ranch
- In a small town
- In suburbs
- In a large city

2. Have you gardened or grown plants before?

- Yes       No

If yes, choose what you have done.

- Growing fruits or vegetables
- Growing flowers or shrubs
- Growing indoor plants
- Mowing grass
- Other \_\_\_\_\_

3. Do you want to garden or grow plants in the future?

- Yes       No

If yes, what do you want to do?

- Growing fruits or vegetables
- Growing flowers or shrubs
- Growing indoor plants
- Mowing grass
- Other \_\_\_\_\_

(Appendix B-2)

## Children's Environmental Response Inventory

◆ Please circle the appropriate numbers using the following scale to indicate your answer.

1 - Disagree very much

2 - Disagree

3 - Don't know, don't care

4 - Agree

5 - Agree very much

1. I really enjoy nature. ( 1 2 3 4 5 )
2. I like places where there are lots of plants and trees. ( 1 2 3 4 5 )
3. I enjoy watching the sky on summer nights. ( 1 2 3 4 5 )
4. I enjoy pictures of birds and animals. ( 1 2 3 4 5 )
5. Factories spoil the look of the countryside. ( 1 2 3 4 5 )
6. I like sitting beside a quiet pond. ( 1 2 3 4 5 )
7. I wish I knew more about nature. ( 1 2 3 4 5 )
8. People should spend even more time out-of-doors. ( 1 2 3 4 5 )
9. It would be fun to go to a nature camp for a weekend. ( 1 2 3 4 5 )
10. I really like the work of looking after animals. ( 1 2 3 4 5 )
11. There are times when I like things to be very quiet. ( 1 2 3 4 5 )
12. I would like to get up very early just to see the sun rise. ( 1 2 3 4 5 )
13. I like TV programs about nature better than most other programs. ( 1 2 3 4 5 )
14. I would like to live in a cabin in the woods. ( 1 2 3 4 5 )
15. I feel good when I come close to nature. ( 1 2 3 4 5 )
16. It is fun to walk in the rain even if I get wet. ( 1 2 3 4 5 )
17. I like the smell of a lawn just after it has been cut. ( 1 2 3 4 5 )
18. I would like to get a job working out-of-doors. ( 1 2 3 4 5 )
19. I like the sounds that a stream makes. ( 1 2 3 4 5 )
20. I like walking through the leaves in the fall. ( 1 2 3 4 5 )
21. Walking in the woods is waste of time. ( 1 2 3 4 5 )
22. Going on a long hike is boring. ( 1 2 3 4 5 )

(Appendix B-3)

## Demographic Information

(COMPLETED BY STAFF)

1. Gender: Male \_\_\_ Female \_\_\_

2. Age: \_\_\_\_\_

3. Racial background:

\_\_\_ European

\_\_\_ African

\_\_\_ Hispanic or Latino

\_\_\_ Asian

\_\_\_ Native American

\_\_\_ Multiple racial backgrounds (Check all that apply)

\_\_\_ Other

4. Length of treatment:

Institution \_\_\_\_\_

Horticulture program \_\_\_\_\_

Other programs (List)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



## **Appendix C - Instruments for Chapter 5**

(Appendix C-1)

## Vegetable and Fruit Preference and Consumption Survey

◆ Choose all the vegetables you like to eat. (If you like other vegetables, please write the names.)

<input type="checkbox"/> Beans and Peas	<input type="checkbox"/> Lettuce	<input type="checkbox"/> Sweet corn
<input type="checkbox"/> Broccoli	<input type="checkbox"/> Onion	<input type="checkbox"/> Tomato
<input type="checkbox"/> Cabbage	<input type="checkbox"/> Pepper	
<input type="checkbox"/> Carrot	<input type="checkbox"/> Spinach	Other _____
<input type="checkbox"/> Cucumber	<input type="checkbox"/> Squash	Other _____

◆ How often do you eat vegetables?

- |                     |                |
|---------------------|----------------|
| a) 2-3 times a day  | b) once a day  |
| c) 2-3 times a week | d) once a week |

◆ Choose all the fruits you like to eat. (If you like other fruits, please write the names.)

<input type="checkbox"/> Apple	<input type="checkbox"/> Orange	Other _____
<input type="checkbox"/> Banana	<input type="checkbox"/> Strawberry	Other _____
<input type="checkbox"/> Grape		

◆ How often do you eat fruit?

- |                     |                |
|---------------------|----------------|
| a) 2-3 times a day  | b) once a day  |
| c) 2-3 times a week | d) once a week |

(Appendix C-2)

### Basic Horticultural Knowledge Test

◆ Choose the best answer for the following questions.

1. Which part of a broccoli plant is eaten?  
a) stem      b) leaf      c) flower      d) root
2. Larger seeds are planted deeper than small seeds. Which seed should be planted deeper?  
a) pumpkin      b) tomato      c) pepper      d) eggplant
3. Doctors may advise you to eat one of these fruits every day. It is the \_\_\_\_\_  
a) apple      b) banana      c) melon      d) avocado
4. Ketchup is made from \_\_\_\_\_  
a) peppers      b) tomatoes      c) cucumbers      d) lemons
5. Which one of the following is a root vegetable?  
a) cauliflower      b) lettuce      c) tomato      d) carrot
6. Which vegetable is planted early in the spring on St. Patrick's Day?  
a) sweet corn      b) squash      c) carrot      d) potato
7. Which one of the following is good for your garden?  
a) aphids      b) lady beetles      c) slugs      d) potato beetles
8. Oranges and grapefruits are good sources of \_\_\_\_\_  
a) vitamin A      b) vitamin B      c) vitamin C      d) vitamin E
9. Which one of the following is not the function of roots?  
a) taking up water      b) growing on top of the soil  
c) holding a plant in the soil      d) storing food
10. Where do plants produce their food ?  
a) root      b) leaf      c) flower      d) fruit

11. Which part of a plant should you hold when you transplant seedlings?  
a) root            b) stem            c) true leaves    d) any part
12. Which flowers are the most popular at Valentine's Day?  
a) carnations    b) petunias        c) orchids        d) roses
13. Which one of the following plants can be used to heal a burn?  
a) aloe            b) basil            c) dandelion      d) rosemary
14. Marigolds are an example of a plant that lives for \_\_\_\_\_  
a) one year (annual)                      b) two years (biennial)  
c) many years (perennial)
15. Which one of the following is planted as a bulb?  
a) pansy            b) lavender        c) daisy            d) tulip

(Appendix C-3)

## Demographic Information

(COMPLETED BY STAFF)

1. Gender: Male \_\_\_ Female \_\_\_

2. Age: \_\_\_\_\_

3. Racial background:

\_\_\_ European

\_\_\_ African

\_\_\_ Hispanic or Latino

\_\_\_ Asian

\_\_\_ Native American

\_\_\_ Multiple racial backgrounds (Check all that apply)

\_\_\_ Other

4. Length of treatment:

Institution \_\_\_\_\_

Horticulture program \_\_\_\_\_

Other programs (List)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(Appendix C-4)

## Horticultural Background Questionnaire

◆ Choose or write the best answer to the following questions.

1. Where have you lived most of your life?

- On a farm or ranch
- In a small town
- In suburbs
- In a large city

2. Have you gardened or grown plants before?

- Yes       No

If yes, choose what you have done.

- Growing fruits or vegetables
- Growing flowers or shrubs
- Growing indoor plants
- Mowing grass
- Other \_\_\_\_\_

3. Do you want to garden or grow plants in the future?

- Yes       No

If yes, what do you want to do?

- Growing fruits or vegetables
- Growing flowers or shrubs
- Growing indoor plants
- Mowing grass
- Other \_\_\_\_\_

(Appendix C-5)

### **Nowicki-Strickland Locus of Control Scale for Children**

1. Do you believe that most problems will solve themselves if you just don't fool with them?  
( YES, NO )
2. Do you believe that you can stop yourself from catching a cold? ( YES, NO )
3. Are some kids just born lucky? ( YES, NO )
4. Most of the time do you feel that getting good grades means a great deal to you? ( YES, NO )
5. Are you often blamed for things that just aren't your fault? ( YES, NO )
6. Do you believe that if somebody studies hard enough he or she can pass any subject?  
( YES, NO )
7. Do you feel that most of the time it doesn't pay to try hard because things never turn out right anyway? ( YES, NO )
8. Do you feel that if things start out well in the morning that it's going to be a good day no matter what you do? ( YES, NO )
9. Do you feel that most of the time parents listen to what their children have to say?  
( YES, NO )
10. Do you believe that wishing can make good things happen? ( YES, NO )
11. When you get punished does it usually seem its for not good reason at all? ( YES, NO )
12. Most of the time do you find it hard to change a friend's (mind) opinion? ( YES, NO )
13. Do you think that cheering more than luck helps a team to win? ( YES, NO )
14. Do you feel that it's nearly impossible to change your parent's mind about anything?  
( YES, NO )

15. Do you believe that your parents should allow you to make most of your own decisions?  
( YES, NO )
16. Do you feel that when you do something wrong there's very little you can do to make it right? ( YES, NO )
17. Do you believe that most kids are just born good at sports? ( YES, NO )
18. Are most of the other kids your age stronger than you are? ( YES, NO )
19. Do you feel that one of the best ways to handle most problems is just not to think about them? ( YES, NO )
20. Do you feel that you have a lot of choice in deciding who your friends are? ( YES, NO )
21. If you find a four leaf clover do you believe that it might bring you good luck? ( YES, NO )
22. Do you often feel that whether you do your homework has much to do with what kind of grades you get? ( YES, NO )
23. Do you feel that when a kid your age decides to hit you, there's little you can do to stop him or her? ( YES, NO )
24. Have you ever had a good luck charm? ( YES, NO )
25. Do you believe that whether or not people like you depends on how you act? ( YES, NO )
26. Will your parents usually help you if you ask them to? ( YES, NO )
27. Have you felt that when people were mean to you it was usually for no reason at all?  
( YES, NO )
28. Most of the time, do you feel that you can change what might happen tomorrow by what you do today? ( YES, NO )
29. Do you believe that when bad things are going to happen they just are going to happen no matter what you try to do to stop them? ( YES, NO )



30. Do you think that kids can get their own way if they just keep trying? ( YES, NO )
31. Most of the time do you find it useless to try to get your own way at home? ( YES, NO )
32. Do you feel that when good things happen they happen because of hard work? ( YES, NO )
33. Do you feel that when somebody your age wants to be your enemy there's little you can do to change matters? ( YES, NO )
34. Do you feel that it's easy to get friends to do what you want them to? ( YES, NO )
35. Do you usually feel that you have little to say about what you get to eat at home?  
( YES, NO )
36. Do you feel that when someone doesn't like you there's little you can do about it?  
( YES, NO )
37. Do you usually feel that it's almost useless to try in school because most other children are just plain smarter than you are? ( YES, NO )
38. Are you the kind of person who believes that planning ahead makes things turn out better?  
( YES, NO )
39. Most of the time, do you feel that you have little to say about what your family decides to do? ( YES, NO )
40. Do you think it's better to be smart than to be lucky? ( YES, NO )

## **Appendix D - Informed Consent Statements and Forms**

## **INFORMED CONSENT STATEMENT**

Dear parents/guardians/case manager:

This informed consent statement is a request for permission to allow your child to participate in a research project to examine the relationship of experience of natural environment and child development. Before your child participates in this survey, you will be asked to read this statement and give permission by signing the informed consent form on the following page. Refusal to participate in this research will not involve any penalty or loss of benefits to your child.

Your child will be asked to complete survey questionnaires about gardening experiences and knowledge, fruit and vegetable preferences, and questionnaires asking feelings about himself/herself and the environment. This is a one-time survey and it will take about 30-40 minutes to complete. Some of the survey questions may be considered personal. Your child should not feel constrained to answer those questions that he/she may find invasive or offensive and can discontinue participation at any time without penalty or loss of benefits.

The questionnaires will be coded with a number and your child's name will not be associated with the survey. All information collected will remain confidential.

Participation of your child will be very helpful to study the relationship of gardening and child development and will be used for developing more beneficial gardening program for children.

If you have questions about this participation, you may contact Richard Mattson at 2021 Throckmorton Hall, Kansas State University, Manhattan, KS 66506, (785) 532-1420 ([mattson@ksu.edu](mailto:mattson@ksu.edu)).

If you have questions about the rights of participants in this survey, you may contact Rick Scheidt, Chair, Committee on Research Involving Human Subjects, or Jerry Jaax, Research Compliance officer, 1 Fairchild Hall, Kansas State University, Manhattan, KS 66506, (785) 532-3224.

Thank you for your time in advance.

## **INFORMED CONSENT STATEMENT**

(for participants)

This is a research project to learn about your experiences of natural environment and feelings.

Before you participate in this research, you will be asked to read this statement, and then sign an informed consent form which is on the following page. You can refuse to participate in this survey without any penalty or loss of benefits.

You will be asked to complete questions about your gardening experiences and knowledge, fruit and vegetable preferences, and questions asking feelings about yourself and the environment. This is one-time survey and it will take about 30-40 minutes to complete. You may feel that some of the survey questions are personal. You need not answer those questions if you feel they are invasive or offensive and can quit at any time without explanation, penalty or loss of benefits.

The questionnaires will be coded with a number and your name will not be associated with the survey. All information collected will remain confidential.

Your participation will be very helpful to study the relationship of nature and people. Results will be used for developing more beneficial gardening program for all.

If you have questions about this participation, you may contact Richard Mattson at 2021 Throckmorton Hall, Kansas State University, Manhattan, KS 66506, (785) 532-1420.

If you have questions about the rights of participants in this evaluation, you may contact Rick Scheidt, Chair, Committee on Research Involving Human Subjects, or Jerry Jaax, Research Compliance officer, 1 Fairchild Hall, Kansas State University, Manhattan, KS 66506, (785) 532-3224.

Thank you for your time in advance.

## INFORMED CONSENT FORM

I understand this study is research, and participation is completely voluntary. I also understand that if my child decides to participate in this study, he/she may withdraw this consent at any time, and stop participating at any time without explanation, penalty, or loss of benefits, or academic standing to which she/he may otherwise be entitled.

I verify that my signature below indicates that I have read and understand this consent form and that my signature acknowledges that I have received a signed and dated copy of this consent form.

Participant Name: \_\_\_\_\_

Participant Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Parent / Guardian

/ Case manager

Consenting Signature: \_\_\_\_\_ Date: \_\_\_\_\_

## **INFORMED CONSENT FORM**

(for participant over 18 years old)

I understand this study is research, and my participation is completely voluntary. I also understand that if I decide to participate in this study, I may withdraw this consent at any time, and stop participating at any time without explanation, penalty, or loss of benefits, or academic standing to which I may otherwise be entitled.

I verify that my signature below indicates that I have read and understand this consent form and that my signature acknowledges that I have received a signed and dated copy of this consent form.

Participant Name: \_\_\_\_\_

Participant Signature: \_\_\_\_\_ Date: \_\_\_\_\_