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## A Systematic Review of Studies Evaluating the Effectiveness of Horticultural Therapy for Increasing Well-Being and Decreasing Anxiety and Depression

Claudia Lasater  
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## ABSTRACT

This study is a systematic review of published research on the effectiveness of horticultural therapy and related interventions in reducing stress. Since the beginning of time, the great outdoors has been humanity's source of thriving on earth. However, as industrialization, urbanization, technological, and digital advances continue to expand, human life has changed, resulting in many negative outcomes, such as mental health concerns related to stress and lack of outside engagement. The mental health and related health concerns in previous studies show to be depression, rumination, anxiety, mood and salivary cortisol, anger, general health, existential issues, and many more all show to be rising concerns if the world continues to stray from the great outdoors and activities related to horticultural therapy. The purpose of this study is to contribute to the current studies on the effectiveness of horticultural therapy and related interventions, validate the profession as a therapeutic intervention and rehabilitative medium, and encourage collaboration between practitioners, academicians, and research scientists.

A Systematic Review of Studies Evaluating the Effectiveness of Horticultural Therapy  
for Increasing Well-Being and Decreasing Anxiety and Depression

A Thesis

Presented to

The Faculty of the School of Social Work

Abilene Christian University

In Partial Fulfillment

Of the Requirements for the Degree

Master of Science in Social Work

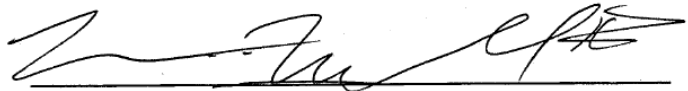
By

Claudia Andrea Lasater

May 2022

This thesis, directed and approved by the committee for the thesis candidate Claudia Lasater, has been accepted by the Office of Graduate Programs of Abilene Christian University in partial fulfillment of the requirements for the degree


Master of Science in Social Work

  
Assistant Provost for Residential Graduate Programs

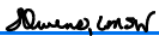
Date

May 4, 2022


Thesis Committee

  
Alan Lipps (May 4, 2022 14:45 CDT)

Dr. Alan Lipps, Thesis Chair

  
Sharon M Owens, LMSW (May 5, 2022 13:33 CDT)

Sharon Owens, Committee Member

  
Erica Vasquez (May 5, 2022 13:45 CDT)

Professor Erica Vasquez, Committee Member

This thesis is dedicated to my professors at Abilene Christian University, Hardin Simmons University, and my family for supporting me as I walked this academic journey.

I am very grateful for the unconditional love and understanding from all those who have been present in my life during this process.

To my husband, for always being available, nurturing, positive, my 24/7 support system, and never letting me believe that I couldn't do this in my times of struggle.

To my friends who always picked up the phone when I needed some words of encouragement.

To Ashley Kennedy, Sharon Owens, and Katherine Hennecke, for being my rocks in my field experience.

To Professor Milliorn and Professor Cantrell, for building my educational social work foundation to what it is today.

To Dr. Lipps, for guiding me through the thesis experience with continuous feedback, support, positivity, and for your many dedicated hours of mentorship.

And finally, to God, for always supplying strength to keep preserving.

## ACKNOWLEDGMENTS

Thank you to every professor who partook in my educational career from the very beginning at Texas State Technical College to Abilene Christian University. All my professors have molded me into the lifelong student learner that I am today. These professors are of the most distinguished and I am forever grateful to have been able to be their student.

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## CHAPTER I

### INTRODUCTION

As people began to modernize farming with new technologies and mechanization, subconsciously people gradually have strayed away from the benefits of the agricultural world of growing their food, raising livestock, and connecting with the land (Chawla, 2015; Hartig & Staats, 2003). According to the economic research service of the United States Department of Agriculture, in 2020 agriculture and its related industries provided 10.2% of U.S. employment, and farming alone accounted for 1.4% of U.S. employment (Economic Research Service, 2021). Since the U.S. was once an agricultural nation that now has become increasingly industrialized and urbanized, this change comes with a cost. Gloria Allred quoted, “there is no change without sacrifice,” and this certainly is the case for humanity as it relates to the distancing of nature (Morrison, 2013, para. 26). The withdrawal from nature has led to a decrease in outdoor exposure (Skår & Krogh, 2009; Turner et al., 2004). There is also evidence demonstrating a rise in the worldwide prevalence of mental disorders coinciding with urbanization (Patel et al., 2007; Whiteford et al., 2015). Both trends may be linked with reduced outdoor exposure causing changes in psychological functioning as indicated by growing evidence (Lederbogen et al., 2011; Lorenc et al., 2012).

A study by Passmore and Holder (2017) examined the interdependent relationship between nature and mankind by comparing two groups with a control group. One group was exposed to nature, another to human-built objects, and the control to business as

usual. The study revealed the soothing effect of nature on humans. Participants who were exposed to nature reported an increased positive affect, elevating experiences, a general sense of connectedness to life as a whole, and high prosocial orientation. Participants also expressed feeling hopeful, rejuvenation, peaceful, freedom, and awe. Participants in the nature condition also expressed two common sentiments: reinforcement of their feelings related to unity with nature and surprise at how, and to what degree, nature affected their emotions. Participants in the human-built condition and control groups, on the contrary, expressed feelings of fatigue, stress, annoyance, disgust, and guilt. For the post-intervention assessments, the majority of participants in both conditions expressed more awareness of the impact that their immediate environments had on their emotions. One-third of participants in the human-built condition stated they gained a further understanding of the impact of nature on the human connection, emotions, and the feeling of completion and unity with nature because when they were exposed to human-built conditions, they were not emotionally moved, pleasant, or happy, and they felt incomplete.

When looking at the COVID-19 pandemic, it is vital to observe the concerns surrounding COVID-19 and the accommodations provided by employers and large institutions. Many people confined themselves to their homes, worked remotely, and distanced themselves from one another for long durations. Many people implemented various precautionary measures in response to the pandemic, such as quarantine, social distancing, self-isolation, and global travel restrictions. People turned to virtual forms of engagement in response to the shutdown for social engagement settings (e.g., employment, schools, restaurants). As a result of this, many people experienced fear,

anxiety, depression, and stress (Brooks et al., 2020; Shigemura et al., 2020). Lack of social engagement and prolonged loneliness can lead to developmental delays and are risk factors for various mental health disorders and concerns such as major depression, post-traumatic stress disorder (PTSD), and schizophrenia (Chaudhury & Banerjee, 2020).

Wang et al. (2020) conducted a study with 2,393 participants who did not have a mental illness history and stayed indoors during the pandemic for a maximum of 67 days. The results indicated 60.11% experienced depression, 53.09% experienced sleep disturbance, 46.91% experienced irritability, 76.12% had sleep and circadian disorders, and 48.2% had decreased libido. The researchers observed the parallels between the frequency and severity of these symptoms to the duration spent indoors.

Additionally, outdoor exposure to natural environments and physical social interactions decreased during the pandemic (Skår & Krogh, 2009; Turner et al., 2004). Excessive artificial stimulation and too much time indoors can lead to exhaustion and a loss of vitality and health (Katcher & Beck, 1987; Stilgoe, 2001, as cited in Maller et al., 2006). The connection to nature is becoming increasingly lost as global stress-related mental health concerns continue to increase (Bratman et al., 2015; Buoli et al., 2018; Salleh, 2008; Srivastava, 2009).

### **Mental Health and Disorders**

Over the last 200 years, while modern westernization has doubled life expectancy—U.S. life expectancy increased to almost 80 years in comparison to 68 years in the 1950s—“it has also created disparities between ancient and present ways of living that may have paved the way for the emergence of new serious diseases” (Department of Economic and Social Affairs, Population Division, 2019; Maller et al., 2006, p. 45;

Ninde, 2017). As humans continue to live longer, the number of older adults will continue to grow, and the prevalence of non-communicable diseases and cancer will increase, which will also increase the number of people in the healthcare system. Further, mental, behavioral, and social health problems are seen to be an increasing health burden in all parts of the world (Desjarlais et al., 1995).

As reported by the World Bank and the World Health Organization, mental health disorders made up 10 percent of the global burden of disease in 2005 (World Health Organization, 2022). Depending on the severity, mental health disorders can result in reduced productivity and an increased reliance on government and medical facilities and systems. Using the Global Health Data tool, the United States' rate of psychiatric disorders in 2019 was 17%, compared to 13% globally (GHDx, 2022). Such rates are concerning, and the U.S. is higher than the global average. Due to these results, interventions are needed to regain healthy levels of mental health, and research on horticultural therapy has proven to alleviate mental health concerns (Clatworthy et al., 2013; Harris, 2017; Page, 2008; Vujcic et al., 2017).

Vujcic et al. (2017) conducted a study to understand the impact of horticultural therapy in specifically designed urban green environments in improving mental health. The participants were 30 psychiatric patients who were randomly selected for the study and a control group. To be included, participants needed to be diagnosed with an adjustment disorder and reaction to severe stress, anxiety, or depression disorders, and be treated both by pharmacotherapy and psychotherapy. The procedure of the study included 12 sessions involving horticultural therapy, art therapy, and relaxation sessions with a specific theme and objectives, and all main activities were related to working with living

plants. The results reveal that participants reported a reduction of stress and anxiety, learned stress coping strategies, and perceived horticultural therapy to have a recuperative effect. The results demonstrate that recuperation from stress, depression, and anxiety is possible and much more complete with participants who were involved in horticultural therapy as a nature-based solution for improving mental health.

The single case studies of Bratman et al. (2015) and Pálsdóttir et al. (2014) recommended nature-based interventions as proven solutions for work-related mental disorders, associated with constant stress exposure, expressing reduced work performance, and frequent sick leave. Pálsdóttir et al. (2014) studied a sample of 43 former clients who participated in a 12-week nature-based rehabilitation, a semi-structured interview, and the data were analyzed according to interpretative phenomenological analysis. The inclusion criteria were to have one of the following stress-related mental disorders of the International Classification of Disease (ICD-10) as the primary diagnosis such as psychiatric diagnosis of adjustment disorder and reaction to severe stress, or depression. The results show that all participants experienced three superordinate themes in nature-based therapy. These themes included prelude, recuperating, and empowerment. The participants experienced a sense of restoration and supportive environmental components such as being away, compatibility, serene, and refuge.

Bratman et al. (2015) conducted a study that showed that brief nature exposure of a 90-minute walk in a natural setting decreases both self-reported rumination and neutral activity. On the other hand, the 90-minute walk in the urban setting had no effect on self-reported rumination or neutral activity. The study reveals that nature exposure may



improve mental well-being and that accessibility to natural areas within urban settings can be a resource for mental health. The study conducted scans of brain activity of the nature walk versus the urban setting related to rumination and blood perfusion. Scans of the brain show the post minus pre-walk self-reported rumination in the natural or in an urban setting and the blood perfusion comparisons. Scans also show the change in blood perfusion (post minus pre-walk) for participants randomly assigned to the 90-minute walk in the natural or urban setting.

The findings in Bratman et al. (2015) support the approach that natural environments can make a positive impact on mental health and can have psychological benefits. Humanity tends to select nature as their “restorative” environment as a means to transform negative psychological states into more positive ones (Hartig & Staats, 2003; Korpela et al., 2001).

### **Stress**

*Stress* can be defined as a process in which environmental demands strain an organism’s adaptive capacity resulting in both psychological demands as well as biological changes that could place a person at risk for illness (Cohen et al., 1995, as cited in Salleh, 2008). There are two types of stress: eustress and distress (Selyes, 1956, as cited in Salleh, 2008). Eustress has a positive effect on the human body and provides energy, stimulation, and motivation in life (Oh et al., 2020). Distress, on the other hand, produces overaction, confusion, poor concentration and performance anxiety, and low performance (Salleh, 2008). Stress can trigger hormones that can play a role in the protection of the human body in the short run and promote adaptation (Oh et al., 2020). When stress hormones begin to experience overrun or build up in the body without the

opportunity for release, this can cause severe to chronic stress (Oh et al., 2020). Severe to chronic stress may destroy the immune system and cause various ailments (McEwen, 2007). Continual and prolonged periods of stress have negative effects on health (American Psychological Association, 2018; McEwen, 2007). Managing stress can vary for different people, but when people fail to deal with negative and chronic stress, they are more likely to suffer from mental and physical health problems, such as depression and angina (Korte et al., 2005).

Mental, physical, and social health are threatened by stress (Salleh, 2008). In Europe, there is a growing concern about the increased cost and prevalence of stress-related disorders, illnesses, and related dilemmas because according to statistics from Meridian Stress Management Consultancy, almost 180,000 people die each year in the U.K. from some form of stress-related illness (Simmons & Simmons, 1997, as cited in Salleh, 2008). According to the Center for Disease Control and Prevention of the United States, “stress accounts for about 75% of all doctor’s visits” (Salleh, 2008, p. 10). Patients reported stress-related complaints from minor issues such as headaches to major problems such as heart issues and ulcers.

Stress is a common etiological factor in other mental and biological illnesses (McEwen, 2007). Long-term stress can cause an increase in problems such as anxiety, depression, substance use disorders, insomnia, chronic pain, hypertension, and other biological disturbances. Emotional stress is a major contributing factor to the six leading causes of death in the United States: cancer, coronary heart disease, accidental injuries, respiratory disorders, cirrhosis of the liver, and suicide (Salleh, 2008). According to the American Psychological Association, 75% of adults experienced moderate-to-high levels

of stress in a given month, and according to the American Institute of Stress, 80% of adults experience stress at work (as cited in Global Organization for Stress, 2022). According to the American Institute of Stress (2022), people in the United States experience 20% more stress than any other nation, 57% feel paralyzed due to stress, 63% want to quit their job due to work-related stress, 94% feel stressed at work, and on a global level, 35% of people report feeling stressed. The goal of relieving stress is becoming evident and interest in nature-based interventions is increasing due to their positive psychophysical impact (Oh et al., 2020). Studies report that the natural environment has a positive effect on people and the studies reviewed will demonstrate the need for further validation of horticultural therapy's role as an intervention and rehabilitative tool (Kam & Siu, 2010; Kim & Park, 2018; Kim et al., 2020; Makizako et al., 2015; Ng et al., 2018; Pálsdóttir et al., 2020; Siu et al., 2020; Tse, 2010; Vujcic et al., 2017; Yang et al., 2021).

## CHAPTER II

### LITERATURE REVIEW

#### **What is Horticultural Therapy?**

Horticultural therapy evolved alongside, but is differentiated from, several similar activities (e.g., social horticulture, vocational horticulture, therapeutic horticulture).

Therefore, the concept can be defined in many ways, but the definition used here is taken from the American Horticultural Therapy Association (AHTA). AHTA is the only US organization committed to promoting and developing the practice of horticultural therapy as a unique and dynamic human service modality. The AHTA published the first AHTA Definitions and Position Paper in 1997. In this paper, the AHTA defined *horticultural therapy* as “the engagement of a person in gardening-related activities, facilitated by a trained [and registered] therapist, to achieve specific treatment goals” within an established treatment, rehabilitation, or vocational plan (Shoemaker & Diehl, 2012, p. 163).

According to the AHTA, horticultural therapy is an active process that occurs in the context of an established treatment plan where the process itself is considered the therapeutic activity rather than the end product. Horticultural therapy also involves four elements: participants engage in horticultural-related activities; participants have an identified disability, illness, or life circumstance that requires services; a registered horticultural therapist facilitates the activity; and participation occurs in the context of an

established treatment, rehabilitation, or vocational plan (Haller et al., 2019, p. 6). The client is at the center of the intervention to provide a client-centered approach between the goals, which is the treatment plan, the therapist, and the plant activity. The plant element is utilized to represent the nature-based activity that the therapist will assign for the therapy session.

Due to the four elements needed to establish statistical outcome measures, this definition would exclude many US programs and interventions but for this study, horticultural therapy and related interventions will be analyzed due to its versatility and easy implementation with vulnerable groups. The goal of identifying the specific elements of horticultural therapy was to establish the validity of the profession. However, validity is often undermined by confusing the profession of horticultural therapy with similar concepts. Terms such as *social horticulture*, *vocational horticulture*, *therapeutic horticulture*, *community gardening*, and *children's gardening* are often confused and used interchangeably with horticultural therapy (Shoemaker et al., 2012).

As the practice and profession of horticultural therapy continue to evolve around the world, the utilization of horticultural therapy has been used in a variety of settings. These include medical, psychiatric, rehabilitative, and residential settings, as well as nursing homes and prisons, which are all high-stress environments. Horticultural therapy has also been applied in geographical areas such as rural and urban areas, and in high to middle-income countries.

Studies have shown that horticultural therapy can improve cognitive functioning such as psychiatric illness (Kam et al., 2010), Alzheimer's disease, and dementia (Bourdon & Belmin, 2021; Edwards et al., 2013; Liao et al., 2020; Murrone et al., 2021;

Noone et al., 2017; Yang et al., 2021). A systematic review was conducted by Murrioni et al. (2021), which evaluated quantitative studies on the benefits of visiting gardens, horticultural therapy, and related practices for people with dementia with the goal to evaluate the effectiveness of this intervention. The review considered 16 studies, and the improvement areas were engagement, behavior, falls, quality of life, cognition, self-consciousness, agitation, depression/ mood, stress, motivation, anxiety, sleep, and medication. The review confirmed the benefits of horticultural therapy and gardening for people with dementia.

Horticultural therapy can improve medical disorders such as obesity (Heise et al., 2017), functional decline (Berg et al., 2021), and post-surgical recovery (Chaudhury et al., 2020). A study was conducted by (Berg et al., 2021), to evaluate whether the greening of a geriatric facility may reduce the hospital-induced decline in older patients. The study was conducted on 54 participants with 4 months of pre and post-assessments. The study utilized the Katz Index of Independence in Activities of Daily Living (KATS-ADL6; Katz et al., 1963) to measure the degree of independent functioning in six areas (bathing, dressing, toileting, moving indoors, continence and feeding). The results revealed lower rates of decline with 32.1% showing functional decline before greening then 11.5% after greening.

Horticultural therapy can improve mental health concerns (Clatworthy et al., 2013; Harris, 2017; Page, 2008; Vujcic et al., 2017), such as schizophrenia (Liu et al., 2014; Lu et al., 2021), depression (Chaudhury & Banerjee, 2020; Edwards et al., 2013; Kam & Siu, 2010), anxiety (Clatworthy et al., 2013; Edwards et al., 2013; Makizako et al., 2015; Vujcic et al., 2017), and workplace stress (Gritzka et al., 2020). A systematic

review was conducted by Cipriani et al. (2017), to review the benefits of horticultural therapy on people with mental health conditions. The mental health conditions included in this study were Alzheimer's disease, depression, PTSD, stress disorder, dementia, bipolar, alcohol dependence, substance dependence, and chronic schizophrenia. The review reported statistically significant findings in the support of horticultural therapy for at least one dependent variable. Overall, there is evidence to support that horticultural therapy can improve client factors and performance skills. The dependent variables evaluated in this study are affect, agitation, cognitive functioning, interpersonal relationship, physical well-being, psychiatric symptomatology, psychological/mental well-being, quality of life, self-esteem, sleep, social behavior, volition, work behavior, stress and coping.

Horticultural therapy has also been shown to have spiritual benefits such as feeling reconnected to nature and feeling happiness (Chaudhury & Banerjee, 2020; Husk et al., 2016; Passmore & Holder, 2017). And finally, horticultural therapy can have social benefits such as improving physical and psychological well-being and social integration (Christensen et al., 2019; Gregis et al., 2021; Kam & Siu, 2010; Lederbogen et al., 2011; Soga et al., 2017; Spano et al., 2020). The study reviewing the social benefits will be indicated in the community gardens section of this paper. The versatility of horticultural therapy is a vital factor in the utilization and implementation with vulnerable groups.

### **Concepts and Theories**

In researching the benefits of horticultural therapy, many theories, approaches, and concepts emerged within the research that connected humans to nature. Such theories and concepts included: biophilia and topophilia, ecopsychology and ecotherapy, Rogerian

theory, Ulrich's psycho-evolution theory [PET] (Ulrich et al., 1991), social exchange theory, Kaplan and Kaplan's attention restoration theory [ART] (Kaplan & Kaplan, 1989), social-ecological theory, prospect-refuge theory, positive psychology model, wellness model, psychodynamic approach, grounding approach, and mindfulness approaches.

### **Biophilia and Topophilia Hypothesis**

For this study, the focus will begin with Kaplan and Ulrich's two theories which are both related to the biophilia hypothesis. The biophilia hypothesis states that people have a natural desire to seek, relate, and connect to nature (Wilson, 1984). The word *biophilia* originates from the Greek, *bio* meaning "life" and *philia* meaning "love of," which together would mean "love of life and the living world"; this is also defined as "the affinity of human beings for other life forms" (*Oxford Reference*, 2022). The second hypothesis is the topophilia hypothesis. The topophilia hypothesis means the "love for places" formed by experiences. With topophilia, humans can form a bond with the natural environment through acquired learning (*Oxford Reference*, 2022). Topophilia further validates the biophilia hypothesis due to the confirmation that human interests and positive emotions about nonliving components and living elements (*Oxford Reference*, 2022).

When connecting this with humanity, it demonstrates that humanity is naturally inclined to nature and that the human body, mind, and soul yearn to be close to the natural environment. Humans are not meant to live everyday lives in isolated buildings full of manufactured filtering air-conditioning units with little to no outdoor exposure. It is estimated that people typically spend 95-99% of their time indoors (Chalquist, 2009).



The long-term effects of containment in manufactured buildings and lack of natural environments have led to mental health concerns. In support of those statements, current studies following the COVID-19 pandemic show a rise in mental health concerns due to social isolation and containment (Chaudhury & Banerjee, 2020). Social connection and engagement are vital to human health and development. Research shows that humans now engage less in the natural world and socialize virtually (Oproiu et al., 2019). When utilizing a horticultural therapy-related activity, such as gardening, social interaction between people and nature can occur at a simple level, but this simple step provides many opportunities. These opportunities include: offering a simple way for people to interact outdoors, enabling them to engage in meaningful activities, encouraging physical exercise, and/or promoting a sense of belonging, and enhancing social inclusion for people experiencing mental health concerns (Diamant & Waterhouse, 2010; Dunn & Jewell, 2010). This intervention can impact mental, physical, and social wellbeing (Abraham et al., 2010).

Keniger et al. (2013) conducted a qualitative review with 57 studies and confirmed the positive impact nature has on humanity. The results of beneficial outcomes were physical health, cognitive performance, psychological well-being, social, and spiritual. Table 1 (below) shows the findings grouped into the appropriate benefits for categorization.

**Table 1***Typology of the Benefits of Interacting with Nature*

<b>Benefits</b>	<b>Description</b>	<b>Examples</b>
Psychological well-being	Positive effect on mental processes	Increased self-esteem Improved mood Reduced anger/frustration Reduced anxiety Improved behavior
Cognitive	Positive effect on cognitive ability or function	Attentional restoration Reduced mental fatigue Improved academic performance Education/learning opportunities Improved ability to perform tasks Improved cognitive function in children Improved productivity
Physiological	Positive effect on physical function and/or physical health	Stress reduction Reduced blood pressure Reduced cortisol levels Reduced headaches Reduced mortality rates from circulatory disease Factor healing Addiction recovery Perceived cardiovascular, respiratory disease, and long-term illness Reduced occurrence of illness
Social	Positive social effect at an individual, community, or national scale	Facilitated social interaction Enables social empowerment Reduced crime rate Reduced violence Enables interracial interaction Social cohesion Social support
Spiritual	Positive effect on individual religious pursuits or spiritual well being	Increased inspiration Increased spiritual well-being
Tangible	Material goods that an individual can accrue for wealth or possession	Food supply Money

## **Attention Restoration Theory**

Kaplan and Kaplan's attention restoration theory refers to cognitive functioning and suggests humans have two types of attention. One type is directed attention, which requires effort. The second type is fascination, which is non-goal-oriented and effortless attention (Clatworthy et al., 2013). Directed attention is limited, and when it experiences an overload, it can produce stress. When this occurs, people need to use fascination to reduce the overload in directed attention (Clatworthy et al., 2013).

Fascination attention is strongly connected to natural environments, and these environments can be gardens, arboretums, and national parks. These environments have three qualities that contribute to a restorative setting. These three qualities are: being away (allowing a person to mentally and physically move to a different place), extent (providing a sense of being connected to a larger world), and compatibility (the ability of an environment to meet the needs and interests of the person) (Kaplan & Kaplan, 1989). The contribution to a restorative state can be highly effective for people experiencing mental health concerns associated with mental distress (Adhemar, 2008). The publication of Kaplan and Kaplan's work provided a framework for research on why people find nature appealing. A systematic review was conducted by Ohly et al. (2016) to evaluate the theory's validity. Utilizing meta-analysis, evidence revealed some support for attention restoration theory, with significant positive effects on exposure to natural environments.

## **Stress Reduction Theory**

Ulrich's stress reduction theory refers to "the effect of nature on emotional and physiological functioning" (Clatworthy et al., 2013, p. 215). Stress reduction theory

suggests that people are inclined to seek (non-threatening) natural stimuli which results in a relaxing response (Clatworthy et al., 2013). When an individual experiences a natural non-threatening setting, their affect is impacted and “triggers a parasympathetic nervous system response, leading to enhanced wellbeing and relaxation” (Clatworthy et al., 2013, p. 215). Ulrich and Kaplan and Kaplan’s theories are rooted on the biophilia hypothesis, which is the notion that people have an inherent desire to connect with the natural environment (Wilson, 1984). Both theories are two core theoretical models of nature’s ability to relieve stress in people and can provide restoration through various mechanisms (Clatworthy et al., 2013).

### **The Concepts of Personal Growth and Hope**

Two concepts utilized in gardening are personal growth and hope. Through nature, people can experience new meaning to life, accept their struggles, accept their values, and change their perspective on life which in turn brought hope and personal growth in their own lives (Oh et al., 2020). Burls and Caan (2004) and Burls (2005) discuss the process of “embracement,” which is described as social and personal growth. This process is linked with gardening activities and the growth of a seedling is used as a metaphor for a person’s own. Pat Deegan’s poem “The Sea Rose” was written to convey strength, resiliency, courage, stability, and, most of all, hope during dark and challenging times (Hogg Foundation, 2014). Pat Deegan uses the poem to illustrate how people can grow and regenerate in nurturing environments in which they can become rooted and secure. The concept of hope is vital in recovery and overcoming trials. Suggested by Miller (1992), hope is the

anticipation of a continued good state, or a release from a perceived entrapment.

The anticipation may or may not be founded on concrete real-world evidence.

Hope is an anticipation of a future that is good and which is based upon mutuality, a sense of personal competence, coping ability, psychological well-being, purpose and meaning in life, as well as a sense of “the possible.” (as cited in Page, 2008, p. 2)

There is a metaphoric relationship between gardening and hope because when a person plants a seed, the person must pass on a sense of hope that the seed will grow with their encouragement. Hope is the greatest benefit gardening can give to humanity.

Gardening may symbolize for a person the mark of a new personal journey. Even though gardening may not be for everyone, all humans have a strong connection with the earth, which started when people were placed in the garden in Genesis. Gardens are therapeutic and have a connection with hope for new life. People with mental health concerns walk into a program, therapy, facility, etc., with the hope that they will gain a sense of freedom. Encouraging people with mental health concerns to participate in activities to improve their well-being is based on hope for better outcomes. The social aspect comes with a sense of community and unity.

Holistic interventions fit within the ethos of the recovery model of mental health (Jacobson & Greenley, 2001). In Jacobson and Greenley (2001), the recovery model of mental health incorporates two concepts. The first concept is referred to as internal conditions experienced by the person in recovery. The internal conditions are hope, healing, empowerment, and connection. The second concept is referred to as the external conditions that facilitate recovery, which can implement the principle of human rights, a

positive culture of healing, and recovery-oriented services (Jacobson & Greenley, 2001). In the model, recovery is linked to specific strategies that systems, agencies, and individuals can use to facilitate recovery.

## **Practices of Horticultural Therapy**

### **Gardening as an Intervention**

The use of gardening as an intervention is naturally therapeutic, due to its ability to meet the needs of the specific use or population when designed in a way to accommodate the participant's goals and to facilitate people-plant interactions (AHTA, n.d.). Gardening has been shown to increase emotional satisfaction such as quality of life (Edwards, et al., 2012; Sommerfeld et al., 2010), self-esteem and mood (Wood et al., 2016), facilitates relaxation and restorative effects (Milligan et al., 2004), and positive affect (Gigliotti & Jarrott, 2005). Gardening has physical benefits such as improvement of bone mineral density (Park & Shoemaker, 2009), body mass index (Zick et al., 2013), and functional decline (Han et al., 2018). Gardening has mental health benefits such as reducing mental disorder symptoms (Chaudhury et al., 2020), depression, and anxiety (Clatworthy et al., 2013; Maskizako et al., 2015)

Gardening and gardening-related contexts have also been shown to increase social capital, build relationships, increase trust among individuals, build social networks outside one's comfort level, remove communication barriers associated with socialization, and promote a bridging and bonding function (Glover et al., 2005). Through the use of horticultural therapy, practitioners can facilitate this process by establishing a self-sustaining community garden, producing social gatherings, and assisting individuals to meet their personal goals (Glover et al., 2005; Litt et al., 2015).

Gardening experiences may affect participants' health status indirectly by contributing to social engagement with one's community, perceived aesthetic appeal of one's neighborhood, and perceived collective efficacy (Litt et al., 2015). Gardening also stimulates a range of interpersonal and social responses that are supportive of positive ratings of health (Litt et al., 2015)

### **Community Gardens**

Community gardens are a great example of the benefits of connecting humans with nature. Not only do people gain social capital, but social barriers can also be removed. Community gardens or related activities offer an open safe place for socialization, building friendships, and allowing people to connect with others who they wouldn't normally connect due to assumptions on dissimilarities, and other social fears. "This [context] aids community cohesion by dissolving prejudices about race, and economic or educational status (Lewis, 1990; Lewis, 1996, as cited in Maller et al., 2006, p. 49). At an annual gardening event in New York, the research found an increase in community cohesion, a reduction in graffiti and violence, and an increase in participants' positive attitudes about themselves and their neighborhood. This event resulted in personal and neighborhood transformation (Lewis, 1990; Lewis, 1992; Lewis 1996, as cited in Maller et al., 2006)."

Glover et al. (2005) discovered that one community gardening project increased social connectedness among citizens who likely would have not otherwise connected. A participant by the name of Loraine shared some words from her experience during her participation: "it's weird groups sitting around our picnic table. I wouldn't have collected those folks together! [laughs]" (Glover, et al., 2005, p. 464). Then Vivian described it,

I never would have been friends with or even met these people if it hadn't been for the community garden . . . [I learned] that I can find common interests with people that I wouldn't ordinarily be friends with because our other interests are so dissimilar, but [community gardening is] a real connecting thing. (Glover et al., 2005, p. 464)

In short, the community garden functioned as a bridge to connect individuals to others.

### **Connection to Nature**

According to the story of creation in Genesis chapters 1 and 2, humans were created and placed outdoors and were given a job to tend to a garden. As the Biblical story of human history progresses, the humans chose to disobey God and were banished from God's garden and forced into a world where they would have to work hard for little reward. In fact, throughout history, humans have battled against harsh environments but found ways to survive. Humans adapted to environmental conditions by developing various forms of indoor and outdoor housing settings. From the caves of the caveman, the huts of Native Americans, the Egyptian temples, to modern-day homes that resemble a box, humans have managed to construct dwelling places to make life on earth survivable and even comfortable. Humans have been so successful in constructing buildings that in the 21st century, one hardly needs to venture outdoors.

On average, Americans spend 90% of their time indoors, where the concentrations of various air pollutants are higher than outdoors concentrations (US EPA, 2014). Research demonstrates that spending too much time indoors is associated with a variety of physical and mental problems (e.g., sleep deprivation) (Chaudhury & Banerjee, 2020; Oh et al., 2020; Wright et al., 2013). With this being said, it is also important to



acknowledge the increase in mental health conditions worldwide, the two most common of which are depression and anxiety (Earl E. Bakken Center for Spirituality & Healing, 2022; World Health Organization, 2018), both of which are seen to decrease with nature-based therapy. Research has shown that having contact with nature is psychologically and physiologically effective in relieving stress, reducing depression and negative emotions, and increasing positive emotions, which as a result improves mental health (Oh et al., 2020). People who spend time in nature tend to be healthier overall. In the long run, indirect impacts of time spent in nature include increasing levels of satisfaction with home, job, and life in general (Kaplan & Kaplan, 1989, as cited in Oh et al., 2020).

### **Empirical Support for Horticultural Therapy**

Several recent systematic reviews and meta-analyses document both the increasing interest in horticultural therapy as an intervention and the efficacy of horticultural therapy with several different populations. Clatworthy et al. (2013) evaluated the evidence-base for the benefits of gardening-based mental health interventions. The ten articles reviewed were published between the years of 2003 and 2013. Table 2 shows the ten articles examined in this review and shows the type of gardening intervention utilized, and the main findings.

The findings demonstrated positive effects of gardening as a mental health intervention. Significant effect-sizes showed overall reductions in symptoms of depression and anxiety. Other benefits reported ranged from enhanced emotional, social, vocational, physical and spiritual functioning. The emotional benefits included the reduction of stress and the improvement of mood. The social benefits included the development of a social network, the improvement of social skills, and an increase in

social inclusion. The vocational benefits included the learning of new skills and the altering of attitudes toward work. The physical benefits included the improvement of sleeping complications and physical health. The spiritual benefits included the increase of nature connectedness and an increase fascination with plants. Participants expressed the enjoyment of being outdoors, breathing fresh air, and partaking in meaningful activities.

**Table 2**

*Brief Overview of Systematic Review of Horticultural Interventions*

Study	Gardening Intervention	Main Findings
Gonzalez et al. (2011a)	Farm-based horticultural intervention	Significant reduction in depression, maintained at 3-month follow-up. No significant increase in existential outcome measure. Positive feedback from clients
Gonzalez et al. (2011b)	Farm-based horticultural intervention	Significant reduction in depression, anxiety and stress-only the reduction in depression maintained at follow-up. Participants reported that the social aspects of the intervention were important.
Parkinson et al. (2011)	Variety of gardening-based interventions	Participants said a wide range of factors supported their motivation to engage in the gardening project, including personal appeal and meaningfulness of the activity and social factors
Gonzalez et al. (2010)	Farm-based horticultural intervention	Significant reduction in depression and brooding and significant increase in perceived attentional capacity
Kam and Siu (2010)	Horticultural program as part of work skills training	Horticultural group experienced significantly greater reduction in depression and anxiety than control. No difference in wellbeing/work behavior. Interviews revealed a range of perceived benefits.
Gonzalez et al. (2009)	Farm-based horticultural intervention	Significant reduction in depression scores, maintained at follow-up. Trend (p=0.06) for increase in attentional capacity.
Rappe et al. (2008)	Allotment-based project	Participants said that they felt calmer/better able to concentrate after visiting the plot.
Parr (2007)	Two gardening projects	Benefits including enhanced mood, sense of belonging, meaningful work. One project facilitated greater social inclusion than the other. Paper also highlighted challenges of the projects.
Stepney and Devis (2004)	Intervention at a horticultural site	Reduction in anxiety and depression. In interviews, all but one participant felt that their mental health had improved.
Son et al. (2004)	Horticultural therapy program	Significant increase in self-esteem, interpersonal relationships and social behavior and decrease in depression/anxiety only in intervention group.

The systematic review and meta-analysis by Coventry et al., 2021 aimed to systematically review the controlled and uncontrolled studies of outdoor nature-based interventions. The review evaluated 50 articles and revealed that nature-based interventions were effective for improving depressive mood  $-0.64$  (95% CI:  $1.05$  to  $-0.23$ ), improving positive affect  $.95$  (95% CI:  $.59$  to  $1.31$ ), reducing anxiety  $-0.94$  (95% CI:  $.94$  to  $-0.01$ ), and reducing negative affect  $-0.52$  (95% CI:  $.77$  to  $-0.26$ ). In addition, gardening, green exercise, and nature-based therapy improved mental health outcomes in adults and those with pre-existing mental health problems. These findings are significant because the review evaluated fifty articles and produced large effect sizes for mental health outcomes.

The review reported a significant effect size of nature-based interventions for depressive mood versus control at post-intervention across eight trials in all populations. For anxiety, the review evaluated five trials and showed the significant effect size of nature-based interventions for decreasing anxiety symptoms versus control at post-intervention across five trials in all populations. For positive affect, the review evaluated five trials and showed the significant effect size of nature-based interventions for enhancing positive affect across five trials and in all populations. For negative affect, the review evaluated four trials and showed to have moderate effects in reducing negative affect across all populations. The strongest effects were observed in one study that consisted of university student volunteers. In addition, green walks revealed to have large effects compared to indoor exercise, there was little to no effect when compared to observing nature on television. There were high levels of heterogeneity due to the difference in populations that included older non-clinical populations and older adults

with long term conditions. In addition, the differences in controls played a role in the high levels of heterogeneity.

Nicholas et al., 2019 systematically evaluated the evidence for the therapeutic effects of horticulture therapy on older adults. The twenty articles reviewed were between the years 2008 and 2018. The findings of this review revealed significant pre-post improvements in quality of life, anxiety, depression, social relations, physical effects, and cognitive effects.

### **Conclusion**

This literature review examined horticultural therapy because of the potential usefulness of this intervention across a wide-range of social work settings and populations. Theoretically, human beings have innate needs to interact with nature and modernization has greatly decreased the time those living in industrialized settings spend in contact with nature. Horticultural therapy is a client-centered form of psychotherapy that uses interaction with nature as a method for helping people restore wellness. Numerous studies reviewed demonstrated correlations between lack of contact with nature (or time spent indoors) and adverse consequences across numerous variables. Such variables included mental health variables, physical health variables, and social and spiritual wellbeing. A review of systematic reviews and meta-analyses indicated that horticultural therapy is an effective intervention for numerous populations on a wide range of outcome variables. The following systematic review and meta-analysis builds on existing knowledge by studying the effectiveness of horticultural therapy and its potential usefulness as a social work intervention.

## CHAPTER III

### METHODOLOGY

This study was approved by the Abilene Christian University Institutional Review Board (see Appendix A). Studies evaluating the benefits of horticultural therapy interventions for adults experiencing stress or other mental health difficulties were identified through an electronic database search. Peer-reviewed outcome studies pertinent to the selected topic and in the last 10 years were gathered using several methods. In addition to searches of the Abilene Christian University Library online academic databases, studies were identified from the references sections of published systematic reviews or meta-analyses.

#### **Search Strategy**

To facilitate the search process, an effectiveness question was formulated using a process similar to that described by (Gibbs, 2003). The basic search question was: Is horticultural therapy an effective intervention for stress-related problems? From this search question, several keywords were identified (see Table 1). Keywords and phrases were entered into CINAHL, Medline, and PsychInfo using the EBSCOHost search interface. Utilizing keywords and phrases, the CINAHL database provided eight articles that were relevant to the topic. Twenty-four articles were identified using Medline, and one additional study was identified using PsycInfo. Methodological filters were used to limit search results to randomized clinical trials or treatment outcome studies. Limiters

were also used to limit search results to studies published between 2012 and 2022 in peer-reviewed journal articles.

### Screening and Selection

All articles retrieved by initial searches were screened for relevance and methodology. To be included in this review, all studies had to use horticultural therapy (or one of its synonyms) as an intervention. Furthermore, all studies selected reported statistical evaluations of the effect of horticultural therapy on a mental-health-related, or mental-illness-related, outcome. Only studies using an experimental or quasi-experimental design were included. From a total of thirty-three articles, nine articles were eliminated because they were systematic reviews and meta-analyses. After applying the selection criteria to the remaining 24 studies, 11 were selected for data extraction and meta-analyses. A summary of these articles is included in Table 4.

### Table 3

*Search Planning Terms for Effectiveness Studies of Horticultural Therapy*

Problem	Intervention	Methodological Limiters
(“symptoms of mental illness” OR anxiety OR stress OR depression OR panic)	AND (Horticultural Therapy OR Gardening OR Nature-based therapy OR Ecotherapy OR Therapeutic horticulture OR Green Therapy OR Greening)	AND (Random* OR Controlled Clinical trial* OR blind OR placebo OR RCT)

\*Indicates truncation – i.e., all words with the initial root retrieved

### Data Extraction

Data was extracted from the studies by use of a modified study quality rating form developed by Gibbs (2003). The Quality of Study Rating Form (QSRF) allowed for the

computation of an overall study quality score. The study quality score is essentially a measure of adherence to principles of experimental research design. Study quality scores can range from a low of 0 to a high of 90 with higher scores indicating higher study quality. The three sections of the QSRF allowed for the collection of pertinent study-related background information, study quality assessment, and collection of effect size data (e.g., means, standard deviations, sample sizes, statistical test values, etc.). A copy of the modified QSRF is provided in Appendix B. To score the quality of the study, the points of questions 1 through 18 were tallied.

### **Methodology of Meta-Analysis**

This description of methodology was generated using R version 4.0.4 with the metafor package version 3.0.2 (R Core Team, 2020; Viechtbauer, 2010). The analysis was carried out using the standardized mean difference as the outcome measure. A random-effects model was fitted to the data. The amount of heterogeneity (i.e.,  $\tau^2$ ), was estimated using the restricted maximum-likelihood estimator (Viechtbauer, 2005). In addition to the estimate of  $\tau^2$ , the Q-test for heterogeneity (Cochran, 1954) and the  $I^2$  statistic (Higgins & Thompson, 2002) are reported. A prediction interval for the true outcomes is also provided (Riley et al., 2011). Studentized residuals and Cook's distances were used to examine whether studies may be outliers or influential in the context of the model (Viechtbauer & Cheung, 2010). Studies with a studentized residual larger than the  $100 \times (1 - 0.05 / (2 \times k))$  th percentile of a standard normal distribution are considered potential outliers (i.e., using a Bonferroni correction with two-sided  $\alpha = 0.05$  for  $k$  studies included in the meta-analysis). Studies with a Cook's distance larger than the median plus six times the interquartile range of the Cook's distances are considered to be influential.

The rank correlation test (Begg & Mazumdar, 1994) and the regression test (Sterne & Egger, 2005), using the standard error of the observed outcomes as the predictor, were used to check for funnel plot asymmetry. The analysis was carried out using R version 4.0.4 and the metafor package version 3.0.2 (R Core Team, 2020; Viechtbauer, 2010).



## CHAPTER IV

### RESULTS

Table 4 presents information about each of the studies included in the meta-analysis. As the table shows, there was considerable variation among the included studies. Treatment populations studied included Korean white-collar workers (Cha & Lee, 2018); Hong Kong adults with severe mental illness (Kam & Siu, 2010); South Korean, middle-aged, post-menopausal women (Kim & Park, 2018), caregivers of elderly persons with dementia (Kim et al., 2020), elderly people with memory problems and depressive symptoms (Makizako et al., 2019), elderly Asians with no history of severe medical or psychiatric diagnoses (Ng et al., 2018); recovering Swedish stroke patients (Pálsdóttir et al., 2020); people with mental illness (Siu et al., 2020), elderly nursing home residents (Tse, 2008); Serbian psychiatric patients (Vujcic et al., 2017); and 60-year-old people diagnosed with Alzheimer's-type dementia and apathy (Yang et al., 2021).

While all of the included studies used some type of horticultural component, interventions varied. In some cases, a trained horticultural therapist conducted the intervention, while other studies made no mention of therapist training. Some studies used a horticultural activity as a component of a larger intervention (e.g., Kam & Siu, 2010), while other studies used a well-defined horticultural therapy activity. However, a lack of standardization of the horticultural therapy intervention was apparent across all of these studies. The number of sessions varied from as few as eight sessions to as many as

20 sessions. Session length also varied from one-hour sessions to 3.5-hour sessions. Most of the interventions were conducted weekly; some occurred twice per week; and in one study, the intervention was carried out 10 times within two weeks (Kam & Siu, 2010).

Variation also existed in the type of control condition used with several studies using a standard care treatment as a comparison group, and other studies using a no treatment group as a control group. As the table indicates, variation also existed in outcome measures used. In all cases, the overall study quality rating was moderately high. The quality rating scores ranged from 62 to 76 on a 90-point scale.

By entering the data obtained from the Comprehensive Meta-Analysis V 2 software for analysis, three outcome variables were analyzed. To generate Forest and Funnel plots, R (version 4.0.4) (R Core Team, 2020) with the metafor package (version 3.0.2) (Viechtbauer, 2010) was used. Figure 2 demonstrates a meta-analysis of treatment vs. control studies using well-being as an outcome variable. The following five articles show an overall fixed effect of 0.54 for well-being which shows that horticultural therapy and related interventions have an effect on well-being.

**Table 4***Summary of Articles Included in Meta-Analysis*

<b>Author ID</b>	<b>Client Type</b>	<b>Intervention</b>	<b>Control</b>	<b>Psychosocial Outcome</b>	<b>Quality Rating</b>
Cha & Lee, 2018	Korean White-collar Workers	experimental group was treated with Horticulture Activity Caring Program weekly for 90 minute per session.	The control group wasn't treated.	Stress Depression	*
Kam & Siu, 2010	Adults with Severe mental illness in Hong Kong	10 sessions within 2 weeks including conventional work-related skills training on weekdays, including indoor industrial activities tasks (like packaging) and outdoor horticulture tasks such as vegetable production, processing, as well as vegetable delivery and conducting farm tours.	12 participants in the control group received conventional sheltered workshop training.	Chinese version of Depression Anxiety Stress Scale 21 (DASS21) Chinese version Personal Wellbeing Index (PWI-C).	70
Kim & Park, 2018	Participants were 36 post-menopausal women aged 40–59 years who attended D Culture Center in Incheon, South Korea.	12 sessions, twice weekly, planting plants, making crafts with plants, flower arrangements, etc. Based on Kohut's self-psychology.	Control condition-article does not state any additional details.	Self-rating Depression Scale (SDS) State-trait anxiety inventory (STAI) Self-identity scale	66

<b>Author ID</b>	<b>Client Type</b>	<b>Intervention</b>	<b>Control</b>	<b>Psychosocial Outcome</b>	<b>Quality Rating</b>
Kim et al., 2020	caregivers taking care of the elderly with dementia	The experimental group was given eight horticultural therapy programs twice a week for a total of 4 weeks.	Wait list. The same program was provided for the control group as a reward for participation after the experimental group was done with the entire program.	Korean version of the Center for Epidemiologic Studies-Depression Scale (CES-D), WHO QOL-BREF (Quality of Life) Caregiver burden scale for dementia	69
Makizako et al., 2019	Older adults with memory problems and depressive symptoms	20 weekly 60- to 90-min sessions involving nature-based group activities.	Attended two 90-min non-HT related education classes during the six-month trial period	Geriatric Depression Scale 15	62
Ng et al., 2018	Elderly Asian between 61 and 77 with no history of severe medical or psychiatric diagnoses and no concurrent therapy.	15, 1-hour, weekly, then monthly (after 3 months), horticultural therapy sessions.	Waitlist control	Zung Self-Rating Depression Scale (SDS) Zung Self-Rating Anxiety Scale (SAS) Ryff's Scales of Psychological Well-Being Friendship Scale Satisfaction with Life Scale	76

<b>Author ID</b>	<b>Client Type</b>	<b>Intervention</b>	<b>Control</b>	<b>Psychosocial Outcome</b>	<b>Quality Rating</b>
Pálsdóttir et al., 2020	Patients, 50–80 years old, who had been admitted to Skåne University Hospital (SUS) at the acute stroke stage; and who were independent in personal activities of daily living (ADL).	51 stroke patients (37 sub-acute phase, 14 chronic phase) participated in 10 weeks of biweekly 3.5 hr. Nature Based Rehabilitation, which was grounded in horticultural therapy. A multimodal rehabilitation team oversaw the program. The intervention program was managed by the OT and horticulturalist, along with the psychotherapist and physiotherapist.	50 stroke (36 sub-acute phase, 14 chronic phase). Received standard care, which is highly individualized, and can comprise physiotherapy and or occupational therapy, and interventions addressing mental health at the primary care level, speech therapy and/or comprehensive outpatient stroke rehabilitation by an interdisciplinary team at the specialist level.	Mental Fatigue Scale (MFS) The HAD (Depression and Anxiety)	67
Siu et al., 2020	82 people with mental illness recruited from vocational rehabilitation services	During the 8 weekly 1.5-hour HT activities, therapists encouraged participants to share their interest in and experiences with plants and talk about their past horticulture experiences.	During the study period, participants in the comparison group continued usual training in work-related tasks (craft or manufacturing work), simulated work training, and coaching.	Depression Anxiety Stress Scale (DASS21) Short Warwick-Edinburgh Mental Well-Being Scale (C-WEMWBS) Social Exchange and Support Measure (SESM)	73
Tse, 2010	Nursing home residents 60 years or older, able to communicate in Cantonese and being cognitively intact.	The researcher and research assistants visited the older participants once a week for eight weeks, with the protocol for the gardening program.	Older people in other nursing homes were treated as the control group; they received regular care without the eight-week indoor gardening program.	Life Satisfaction Index–A Revised UCLA Loneliness Scale Lubben Social Network Scale (LSNS) Modified Barthel Index	66

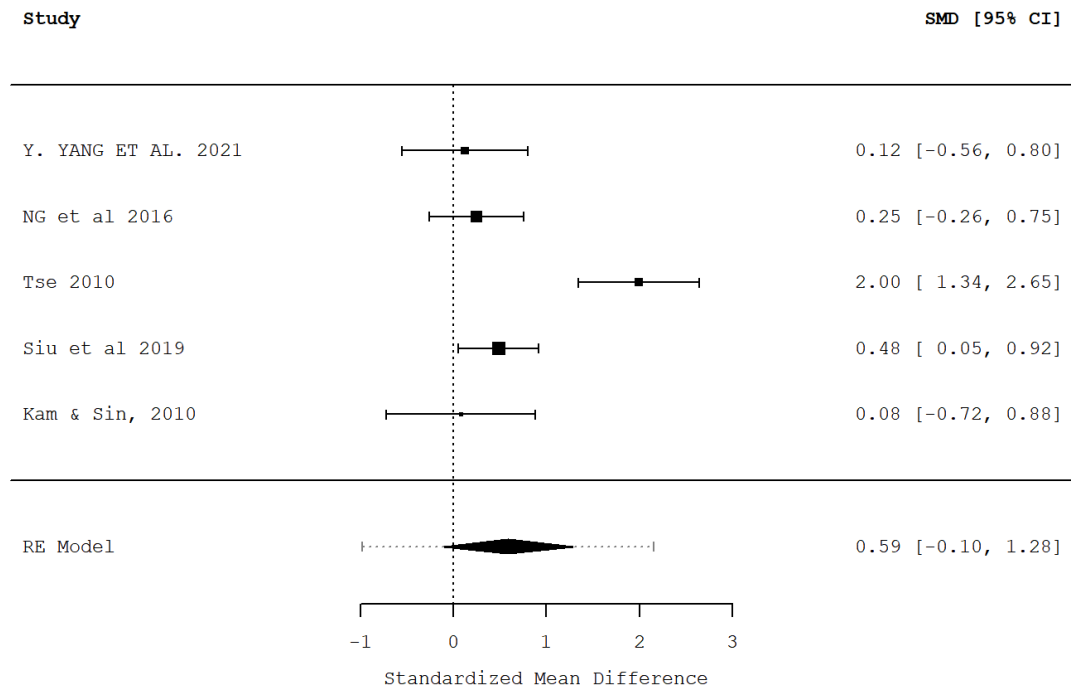
<b>Author ID</b>	<b>Client Type</b>	<b>Intervention</b>	<b>Control</b>	<b>Psychosocial Outcome</b>	<b>Quality Rating</b>
Vujcic et al., 2017	30 Serbian psychiatric patients, 70% being female patients aged 25–65 years, from the Day Hospital of the Institute of Mental Health.	12 sessions of a horticultural program, that included art therapy and relaxation sessions. Each session had a specific theme and objectives. The main activities were all related to working with living plants.	The control group was included in occupational art therapy while it continued to receive conventional therapy.	The Depression Anxiety Stress Scale (DASS21)	63
Yang et al., 2021	60 years old with a diagnosis of Alzheimer's type dementia and apathy	10 weekly, 60-minute sessions, including four planting sessions, four handicraft sessions, and two dietetic sessions. A master's level nurse who completed a professional HT skill workshop was activity directing. Activity assistants were four registered nurses and four social workers, who worked in the nursing homes and were familiar with the participants.	Usual care activities such as singing, calisthenics, and puzzle games were provided regularly for all residents in the dementia care unit twice a week on weekdays. These usual activities were one-hour long and were led by a social worker in a well-lit classroom.	Apathy Evaluation Scale informant version (AES-I) Mini-Mental State Examination (MMSE) Quality of Life in Alzheimer's disease (QoL-AD) scale Barthel Index (BI) (Functional Capacity)	72

*\*Quality of Study was not completed because the study text was published in Korean*

Five studies were included in the well-being meta-analysis. The observed standardized mean differences ranged from 0.0800 to 1.9964, with the majority of estimates being positive (100%). The estimated average standardized mean difference based on the random-effects model was  $\mu^{\wedge}=0.5881$  (95% CI:  $-0.1015$  to  $1.2778$ ). Therefore, the average outcome did not differ significantly from zero ( $z = 1.6716$ ,  $p = 0.0946$ ). A forest plot showing the observed outcomes and the estimate based on the random-effects model is shown in Figure 1. According to the  $Q$ -test, the true outcomes appear to be heterogeneous ( $Q(4) = 23.1778$ ,  $p = 0.0001$ ,  $\tau^{\wedge}2 = 0.5190$ ,  $I^2 = 85.2603\%$ ). A 95% prediction interval for the true outcomes is given by  $-0.9832$  to  $2.1595$ . Hence, although the average outcome is estimated to be positive, in some studies the true outcome may in fact be negative. An examination of the studentized residuals revealed that one study (Tse, 2010) had a value larger than  $\pm 2.5758$  and may be a potential outlier in the context of this model. According to the Cook's distances, one study (Tse, 2010) could be considered to be overly influential.

## Figure 1

### *Meta-Analysis of Treatment versus Control Studies Using Well-Being as an Outcome Variable*

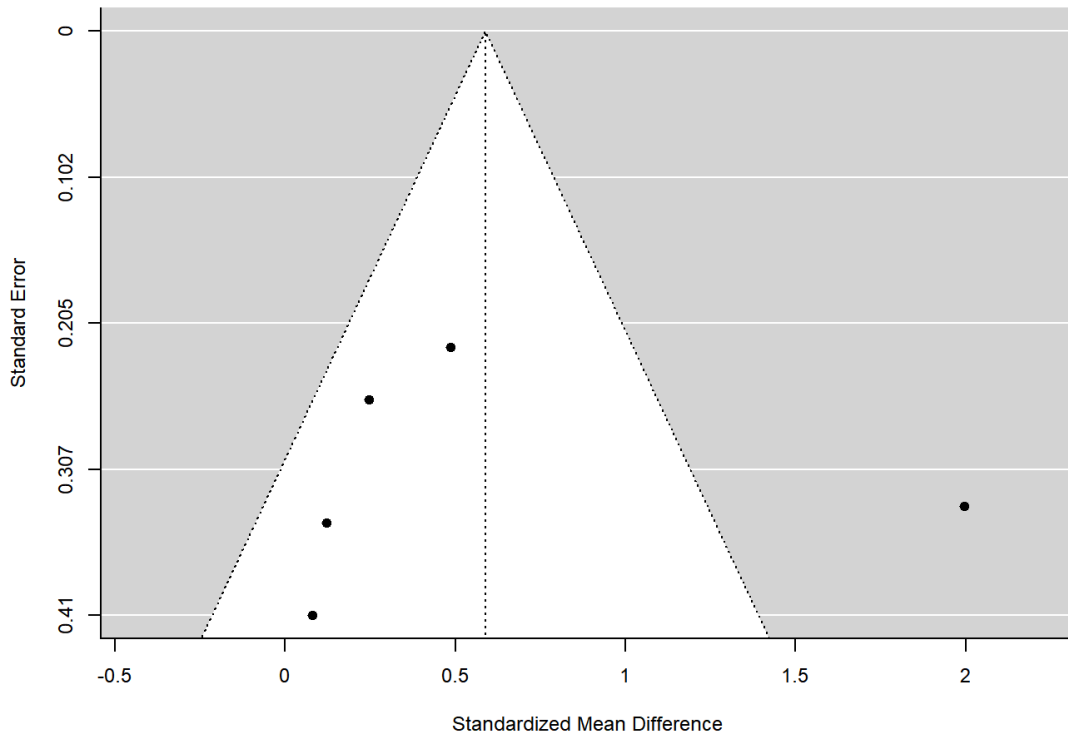


A funnel plot of the estimates is shown in Figure 2. Neither the rank correlation nor the regression test indicated any funnel plot asymmetry ( $p = 1.0000$  and  $p = 0.9822$ , respectively).



**Figure 2**

*Funnel Plot of Well-Being Meta-Analysis Estimates*

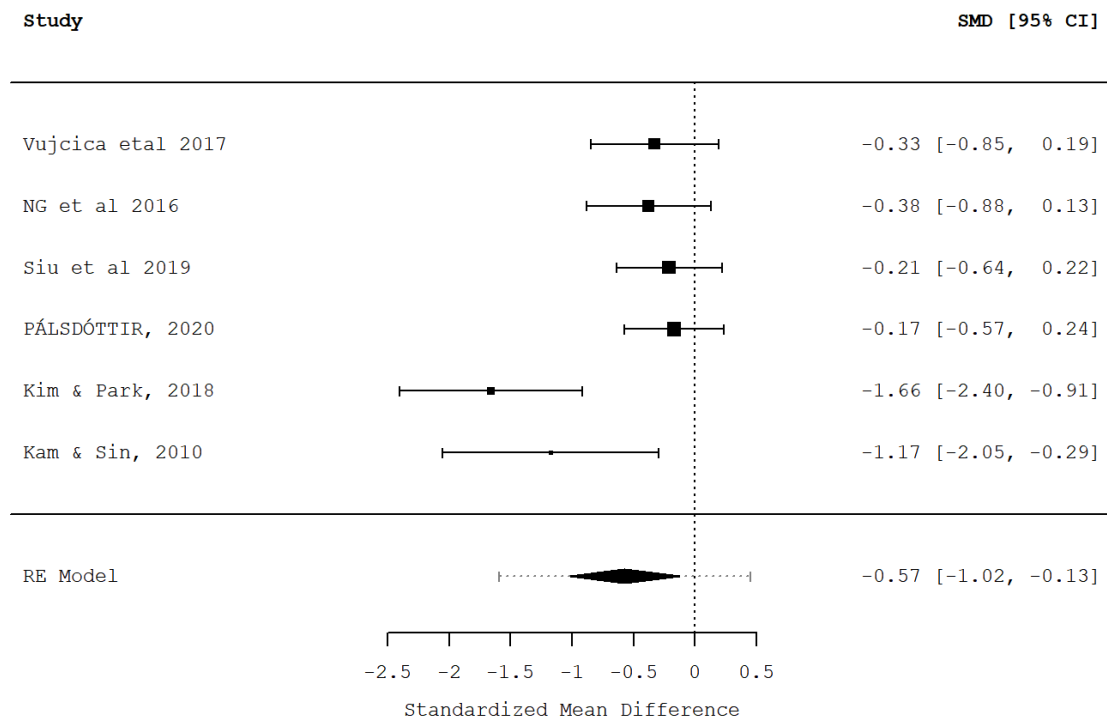


A forest plot showing the observed anxiety outcomes and the effect-size estimate based on the random-effects model is shown in Figure 3. The observed standardized mean differences ranged from  $-1.6589$  to  $-0.1677$ , with the majority of estimates being negative (100%). The estimated average standardized mean difference based on the random-effects model was  $\mu^{\wedge} = -0.5722$  (95% CI:  $-1.0161$  to  $-0.1283$ ). Therefore, the average outcome differed significantly from zero ( $z = -2.5265$ ,  $p = 0.0115$ ). According to the  $Q$ -test, the true outcomes appear to be heterogeneous ( $Q(5) = 15.9839$ ,  $p = 0.0069$ ,  $\tau^{\wedge 2} = 0.2212$ ,  $I^2 = 74.9818\%$ ). A 95% prediction interval for the true outcomes is given by  $-1.5953$  to  $0.4510$ . Hence, although the average outcome is estimated to be negative, in some studies the true outcome may in fact be positive. An examination of the studentized

residuals revealed that one study (Kim & Park, 2018) had a value larger than  $\pm 2.6383$  and may be a potential outlier in the context of this model. According to the Cook's distances, one study (Kim & Park, 2018) could be considered to be overly influential. A funnel plot of the estimates is shown in Figure 2. The regression test indicated funnel plot asymmetry ( $p = 0.0003$ ) but not the rank correlation test ( $p = 0.0556$ ).

**Figure 3**

*Meta-Analysis of Treatment versus Control Studies Using Anxiety as an Outcome Variable*



**Figure 4**

*Funnel Plot of Anxiety Meta-Analysis Estimates*

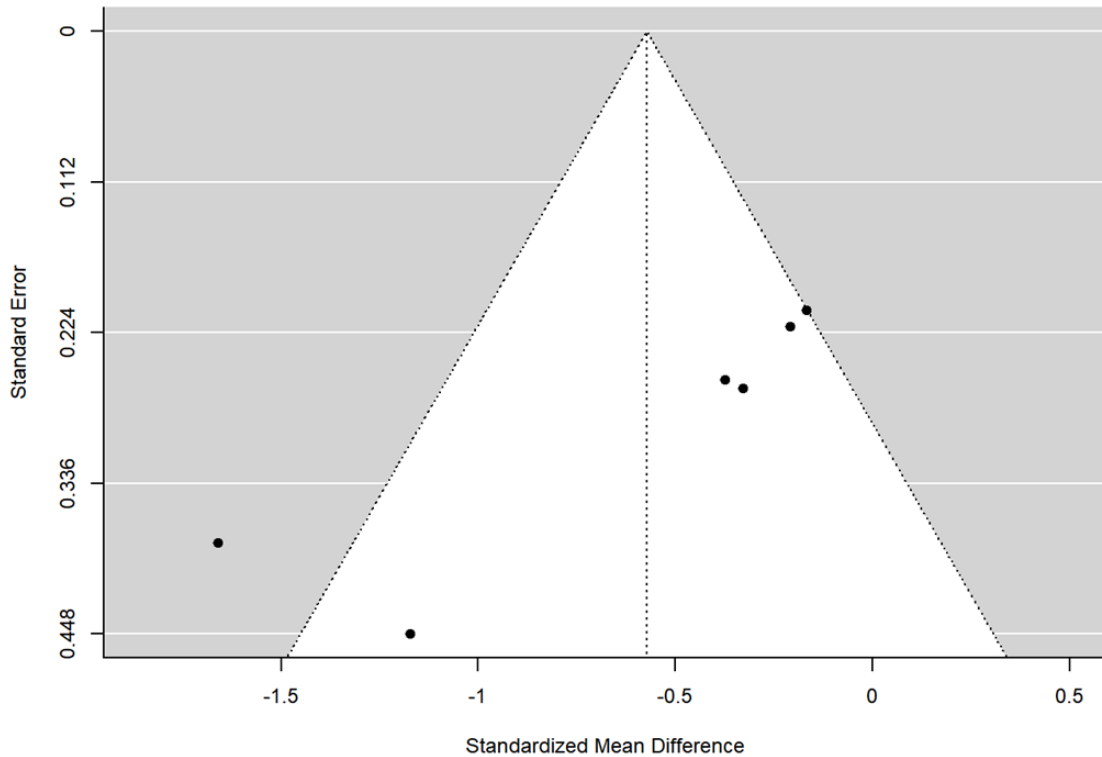
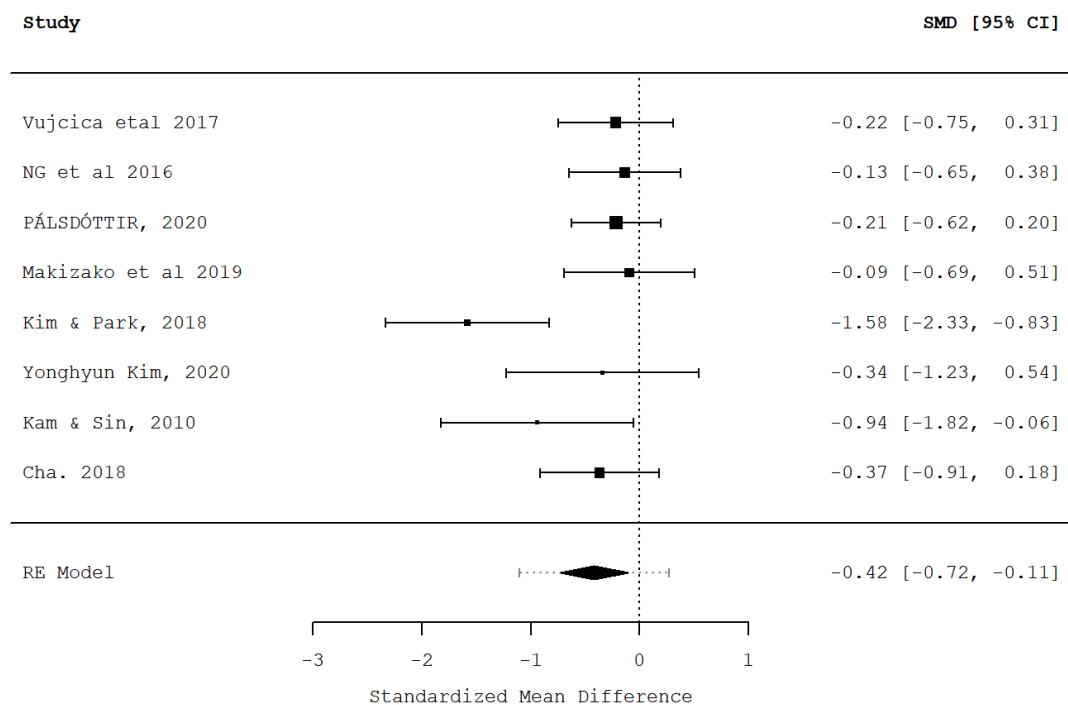


Figure 5 shows a meta-analysis of treatment vs. control studies using depression as an outcome variable. A total of  $k = 8$  studies were included in the analysis. The observed standardized mean differences ranged from  $-1.5830$  to  $-0.0940$ , with the majority of estimates being negative (100%). The estimated average standardized mean difference based on the random-effects model was  $\mu^{\wedge} = -0.4166$  (95% CI:  $-0.7236$  to  $-0.1096$ ). Therefore, the average outcome differed significantly from zero ( $z = -2.6597$ ,  $p=0.0078$ ). A forest plot showing the observed outcomes and the estimate based on the random-effects model is shown in Figure 3. According to the  $Q$ -test, the true outcomes appear to be heterogeneous ( $Q(7) = 14.1702$ ,  $p = 0.0482$ ,  $\tau^{\wedge 2} = 0.0973$ ,  $I^2 = 51.8641\%$ ). A 95% prediction interval for the true outcomes is given by  $-1.1008$  to  $0.2676$ . Hence,

although the average outcome is estimated to be negative, in some studies the true outcome may in fact be positive. An examination of the studentized residuals revealed that one study (Kim & Park, 2018) had a value larger than  $\pm 2.7344$  and may be a potential outlier in the context of this model. According to the Cook's distances, one study (Kim & Park, 2018) could be considered to be overly influential. A funnel plot of the estimates is shown in Figure 6. The regression test indicated funnel plot asymmetry ( $p = 0.0287$ ) but not the rank correlation test ( $p = 0.1789$ ).

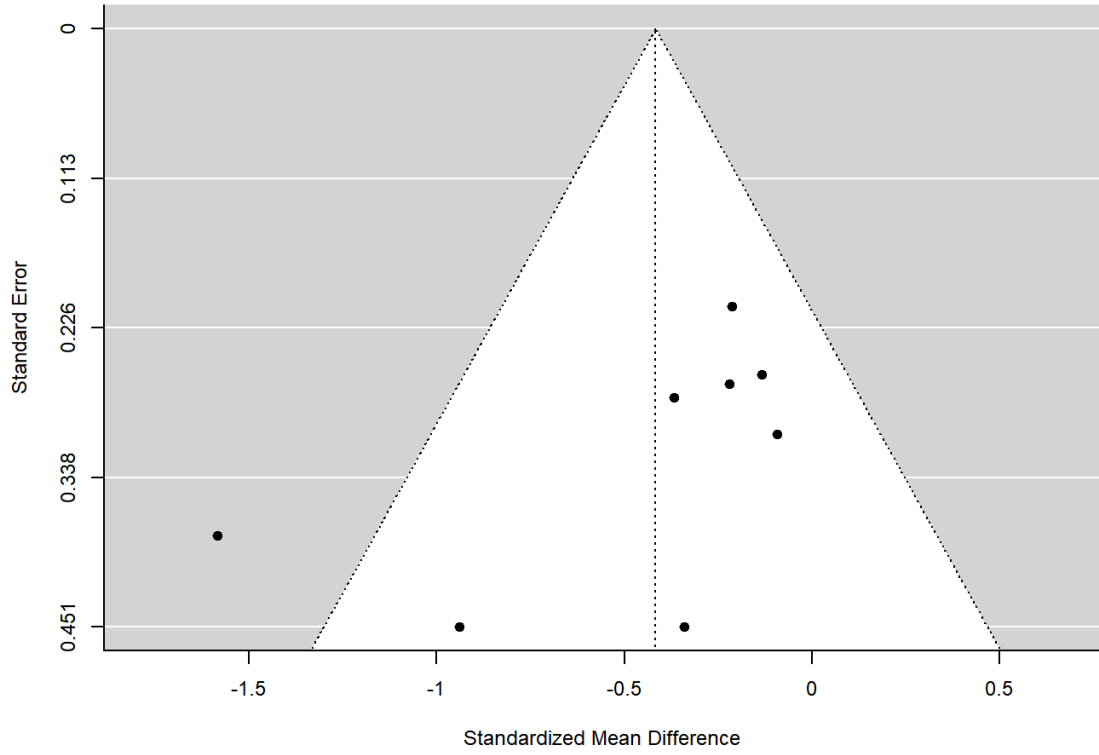
**Figure 5**

*Meta-Analysis of Treatment versus Control Studies Using Depression as an Outcome Variable*



**Figure 6**

*Funnel Plot of Depression Meta-Analysis Estimates*



## CHAPTER V

### DISCUSSION

The purpose of this study was to contribute to the current literature on the effectiveness of horticultural therapy and related interventions. As the literature review demonstrates, horticultural therapy is becoming a widely used therapeutic intervention and rehabilitative medium in parts of the world. By conducting this study, I hope to contribute to knowledge about the effectiveness of horticultural and related therapies and establish collaboration between practitioners, academicians, and research scientists. Therefore, with this systematic review, I evaluated current experimental and quasi-experimental research on horticultural therapy and related interventions to determine whether these interventions are effective at reducing stress and mental health outcomes and at increasing well-being.

A total of 11 articles were identified for the systematic review and meta-analysis. Three outcome variables related to mental health/mental illness (MHMI) were used as selectors to subset studies into three groups used in three meta-analyses (i.e., well-being, anxiety, and depression). The overall effect sizes for anxiety and depression were statistically significant, while the well-being effect size was not. Heterogeneity statistics indicated a significant amount of variation in the effect size estimates.

Importantly, the prediction intervals across all studies showed that horticultural therapy typically produces an effect in the desired direction, but likely produces adverse

consequences for some populations. For example, the 95% prediction interval for the true anxiety outcomes ranged from  $-1.5953$  to  $0.4510$ . This range indicates that in some studies of some populations, horticultural therapy may actually result in a moderately strong increase, rather than a decrease of anxiety. This was also true of depression studies for which the 95% prediction interval ranged from  $-1.1008$  to  $0.2676$ . For well-being, the 95% prediction interval for the true outcomes ranged from a strong adverse effect of  $-0.9832$  to a very strong positive effect of  $2.16$ . Therefore, it appears that for some, the horticultural therapy intervention may actually decrease well-being.

### **Implications for Policy**

The importance of nature in promoting wellbeing has been increasingly recognized in national policy. In 2011, the United Kingdom Department of Health published a policy which demonstrated that vital role in the reconnection between people and nature. The policy stated that increasing human exposure to the outdoors, positively affected physical health, mental health, and social integration. Additionally, it reduced crime and provided opportunities for learning (Department of Health, 2011, as cited in Noone et al., 2017). In 2012, Natural England in the United Kingdom released a complementary strategy to improve access, engagement, and increase understanding of nature. The strategy's aim is to emphasize the health and social benefits of nature (Natural England, 2012). In 2014, the United Kingdom Wildlife Trust set in motion a campaign to introduce a Nature and Wellbeing Act in partnership with the Royal Society for the Protection of Birds (The Wildlife Trusts, 2014).

The implications for policy and practice in the United States are to validate the profession as a therapeutic intervention and rehabilitative medium, create a policy that

requires rehabilitation facilities to provide horticultural programs for clients, and to encourage collaboration between practitioners.

### **Implications for Practice**

This study agrees with previous systematic reviews and meta-analyses (Clatworthy et al., 2013; Coventry et al., 2021; Nicholas et al., 2019) that demonstrate that horticultural therapy is an effective intervention for numerous population groups. Included in this review were studies of the effectiveness of horticultural therapy with white-collar workers (Cha & Lee, 2018), adults with severe mental illness (Kam & Siu, 2010); post-menopausal women (Kim & Park, 2018), caregivers of elderly persons with dementia (Kim et al., 2020), elderly people with memory problems and depressive symptoms (Makizako, et al., 2019), elderly persons with no history of severe medical or psychiatric diagnoses (Ng et al., 2018), recovering stroke patients (Pálsdóttir et al., 2020), people with mental illness (Siu et al, 2020), elderly nursing home residents (Tse, 2008), psychiatric patients (Vujic et al., 2017), and people diagnosed with Alzheimer's-type dementia and apathy (Yang et al., 2021). Regions of the world represented in these studies include Hong Kong, South Korea, Serbia, and Sweden.

Because social workers provide services to all of these populations, horticultural therapy is a viable intervention for use by social work practitioners. Horticultural therapy is likely more appealing to those who do not like traditional psychotherapy and to those desiring more contact with nature. Horticultural therapy seems especially beneficial to those who do not typically experience much contact with nature (e.g., long-term-care patients, persons with agoraphobia or other mental disorders that result in confinement,



etc.). Horticultural therapy is a wellness-based, holistic intervention that can easily be implemented in a variety of social work settings.

None of the studies included in this review occurred within North America. This suggests that horticultural therapy is not a widely used practice among North American therapists. Therefore, before horticultural therapy is widely implemented, training, using a well-defined operational model of HT, should be developed and implemented.

### **Implications for Research**

For future studies and reviews, there is wide range of research that demonstrates the benefits of horticultural therapy and related interventions with people experiencing mental health concerns. Horticultural therapy and related interventions have been used around the world, across many age groups, in various settings, and with people who have major to mild mental health diagnoses. However, because of the wide variety of populations studied and lack of a standardized model of horticultural therapy, there is a lack of replication studies, using a standardized model of horticultural therapy, within population groups. Therefore, replication studies, using a consistent model of horticultural therapy, are needed to study the effect of horticultural therapy on different populations.

This study suggests that some of the interventions used in the meta-analysis are producing effects in the opposite direction from what is desired. Further research is needed to determine the circumstances under which these unexpected, potentially adverse, effects are produced. A larger body of studies are needed to help understand the unique contributions variables such as population type, intervention composition, and therapist training make on the overall effect-sizes. This calls for collaboration between

theorists, practitioners, academicians, and research scientists to more precisely define horticultural therapy and to conduct further research to study the differential effects of horticultural therapy with specific populations.

### **Limitations of the Review**

Only 11 studies meeting the inclusion and exclusion criteria were identified for this review. This led to grouping together of studies that varied widely on the population studied. Study differences also included variation in the intervention offered, variation in the intensity of the intervention, variation in the purity (i.e., fidelity) of the intervention, small sample sizes, and variation in outcome measures. Likely, the existence of subgroups (i.e., heterogeneity) resulted in a wide dispersion of effect sizes.

Among these studies, the interventions varied with some studies using nature-based activities, such as gardening or walking in the park, to those that used intensive horticultural therapy. Additionally, the settings of the interventions varied widely with some occurring in confining settings such as hospitals or nursing homes, and others that occurred in community settings. In addition, some studies used treatment as usual (TAU) groups resulting in ambiguous effect size estimates. Combining TAU studies with no treatment studies introduces additional error into the effect-size estimates. Lumping these studies together without controlling for subgroup differences introduces unexplained heterogeneity.

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APPENDIX A

ACU IRB Approval Letter

ABILENE CHRISTIAN UNIVERSITY

*Educating Students for Christian Service and Leadership Throughout the World*

Office of Research and Sponsored Programs  
320 Hardin Administration Building, ACU Box 29103, Abilene, Texas 79699-9103  
325-674-2885



Dear Claudia,

On behalf of the Institutional Review Board, I am pleased to inform you that your project titled

(IRB# 21-148 ) is exempt from review under Federal Policy for the Protection of Human Subjects as:

- Non-research, and
- Non-human research

Based on:

If at any time the details of this project change, please resubmit to the IRB so the committee can determine whether or not the exempt status is still applicable.

I wish you well with your work.

Sincerely,

*Megan Roth*

Megan Roth, Ph.D.  
Director of Research and Sponsored Programs

## APPENDIX B

### List of Studies Included in Systematic Review

- Chan, H. Y., Ho, R. C.-M [Roger Chun-Man], Mahendran, R., Ng, K. S., Tam, W. W.-S., Rawtaer, I., Tan, C. H., Larbi, A., Feng, L., Sia, A., Ng, M. K.-W., Gan, G. L., & Kua, E. H. (2017). Effects of horticultural therapy on elderly' health: Protocol of a randomized controlled trial. *BMC Geriatrics*, *17*(1), 192.  
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APPENDIX C

Quality of Study Rating Form

Client type(s): \_\_\_\_\_

Intervention method(s): \_\_\_\_\_

Outcome measure to compute ES1: \_\_\_\_\_

Outcome measure to compute ES2: \_\_\_\_\_

Outcome measure to compute ES3: \_\_\_\_\_

Source in APA format: \_\_\_\_\_

**Criteria for Rating Study**

Clear Definition of Treatment					6. Subjects randomly assigned to treatment or control (10 pts.)	7. Analysis shows equal treatment and control groups before treatment (5 pts.)	8. Subjects blind to being in treatment or control group (5 pts.)
1. Who (4 pts.)	2. What (4 pts.)	3. Where (4 pts.)	4. When (4 pts.)	5. Why (4 pts.)			
4	4	4	0	4	10	5	5

**Criteria for Rating Study (cont.)**

9. Subjects randomly selected for study inclusion (4 pts.)	10. Control or non-treated group used (4 pts.)	11. Number of subjects in the smallest treatment group exceeds 20 (4 pts.)	12. Outcome measure has face validity (4 pts.)	13. Treatment outcome measure was checked for reliability (5 pts.)	14. Reliability measure has a value greater than .70 or percent of rater agreement greater than 70% (5 pts.)
0	4	4	4	0	0

**Criteria for Rating Study (cont.)**

15. Those rating outcomes	16. Treatment outcome was measured after	17. Test of statistical significance	18. Follow-up was	19. Total	20. Effect size = (ES1) = SD units = (mean of treatment –
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rated it blind (10 pts.)	treatment was completed (4 pts.)	was made and $p < .05$ (10 pts.)	greater than 75% (10 pts.)	quality (add 1-18)	mean of control or alternate treatment) $\div$ (standard deviation of control or alternative treatment)
0	4	0	0	48	(44-47) + SD

### Criteria for Rating Effect Size

21. Effect size (ES2) = Absolute risk reduction = (percent improved in treatment) – (percent improved in control)	22. Effect size (ES3) = Number needed to treat = $\frac{1}{100 \text{ ES2}}$
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### Instructions for Scoring

Items 1 to 18 assess quality. These are summed in item 19. Item 19 ranges from 0 to 100. The closer to 100, the more confidence the rater can place in the study's findings.

1. *Who*: The author(s) describes who is treated by stating the subject(s)' average age *and* standard deviation of age, *and* sex or proportion of males and females, *and* clearly defines clients' presenting problem(s).
2. *What*: The authors tell what the treatment involves so specifically that you could apply the treatment with nothing more to go on than their description, *or* they refer you to a book, videotape, CD-ROM, article, or Web address that describes the treatment method.
3. *Where*: Authors state where the treatment occurred so specifically that you could contact people at the facility by phone, letter, or E-mail address.
4. *When*: Authors tell the *when* of treatment by stating how long subjects participated in the treatment in days, weeks, or months *or* tell how many treatment sessions were attended by subjects.
5. *Why*: Authors either discuss a specific theory that describes why they used one or more treatment methods, *or* they cite literature that supports the use of the treatment method.
6. *Subjects randomly assigned to treatment or control*: The author states specifically that subjects were *randomly assigned* to treatment groups or refers to the assignment of subjects on the basis of random numbers, computer algorithms, or accepted randomization procedures. This means that the procedure resulted in the subject having an equal chance of being assigned to treatment or control groups.
7. *Analysis shows equal treatment and control groups before treatment*. Even though subjects have been randomly assigned, unequal treatment and control groups can occur by chance; so, to guard against this, the authors need to make comparisons across treatment and control groups on key client characteristics to see that they are similar prior to treatment (e.g., sex, race, age, economic status, condition, strengths).
8. *Subjects blind to being in treatment or control group*: Subjects who know they are in a control group can experience effects of being there including demoralization or competition with experimental. Subjects who know they are in a treatment group can experience powerful healing effects because they expect them. Give points for subjects blinded if two or more groups get some kind of treatment, if controls get some form of sham treatment that is not expected to have an effect but gives

assurance to subjects that something is being done, if subjects serve in a delayed treatment control group where they serve as controls but get treatment later, or if subjects truly do not know whether they are in a treatment or control group.

9. *Subjects randomly selected for inclusion in the study: Selection of subjects is different from random assignment. Random selection means that subjects are taken from some potential pool of subjects for inclusion in the study by using a table of random numbers or other statistically random procedures. For example, if subjects are chosen randomly from among all residents on a psychiatric ward, the results of the study can be generalized more confidently to all residents of that ward.*
10. *Control (nontreated) group used: Members of a nontreated control group do not receive a different kind of treatment; they receive no treatment. An example of a nontreated control group would be a group of subjects who are denied counseling while others are given group counseling. Subjects in the nontreated control group may receive treatment at a later date but do not receive treatment while experimental group subjects are receiving their treatment.*
11. *Number of subjects in the smallest treatment group exceeds 20: Those in the treatment group or groups are those who receive some kind of special care intended to help them. It is this treatment that is being evaluated by those doing the study. To meet criterion 11, the number of subjects in the smallest treatment group must be at least 21. Here, the number of subjects means the total number of individuals, not the number of couples or the number of groups.*
12. *Outcome measure has face validity: Face validity is present if the outcome measure used to determine the effectiveness of treatment makes sense to you. A good criterion for the sense of an outcome measure is whether the measure evaluates something that should logically be affected by the treatment. For example, drinking behavior has face validity as an outcome measure for treating alcoholism.*
13. *Treatment outcome measure was checked for reliability: For this criterion to be met, to merely say that the outcome of treatment was measured in some way is not enough. The outcome measure itself must be evaluated to check its reliability. Reliability refers to the consistency of measurement. The reliability criterion here is satisfied only if the author of the study affirms that evaluations were made of the outcome measure's reliability (for example, inter-rater agreement), and the author lists a numerical value of some kind for this measure of reliability. Where multiple outcome criteria are used, reliability checks of any one of the major outcome criteria satisfy Criterion 13.*
14. *Reliability measure has a value greater than .70 or percent of rater agreement is greater than 70%: The reliability coefficient in Criterion 13 is .70 or greater. Reliability coefficients typically range from -1 (perfect disagreement), through 0 (no pattern of agreement or disagreement), to 1 (perfect agreement).*
15. *Those rating outcomes rated it blind: This criterion concerns the way bias can enter into measurement if the person measuring outcome knows whether the subject being measured is from a treatment or control group, or, worse, the person measuring outcome is in a position to determine the outcome measure. Give the points for this criterion only if the person conducting the outcome measuring did not know which subjects were in treatment or control groups.*
16. *Treatment outcome was measured after treatment was completed: At least one outcome measure was obtained after treatment was completed. Outcome measure both during treatment and after treatment is sufficient to meet this criterion.*

17. *Test of statistical significance was made and  $p < .05$* : Test of statistical significance are generally referred to by phrases such as “differences between treatment groups were significant at the .05 level” or “results show statistical significance for...” *Statistical significance* refers to the probability of obtaining an observed difference between treatment or control groups as great as or greater than by chance alone. Give credit for meeting this criterion only if the author refers to a test of statistical significance for a major outcome variable naming the statistical procedure (e.g., analysis of variance, chi-square, *t-test*) and gives a *p-value*, for example,  $p < .05$ , and the *p-value* is equal to or smaller than .05.
18. *Follow-up was greater than 75%*: The proportion of subjects successfully followed up refers to the number contracted to measure outcome compared with the number who began the study. Ideally, the two should be the same (100% followed up). To compare the proportion followed up for each group studies (i.e., treatment group(s), control group), determine the number of subjects who initially entered the study in the group and determine the number successfully followed up. (If there is more than one follow-up period, use the longest one). Then, for each group, divide the number successfully followed up by the number who began in each group, and multiply each quotient by 100. If the *smallest* of these percentages exceeds 75%, then the study meets this criterion.
19. *Total quality point (TQP) (add 1-18)*: Simply add the point values for Criteria 1-18 and record the value in Box 19. This value will range between 0 and 100.