

Exploring Horticultural Therapy for Neurodivergent Populations Across the Lifespan

by

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Abstract

In this capstone I explored the therapeutic possibilities of horticultural therapy (HT) for neurodivergent populations, specifically autism spectrum disorder (ASD) and attention-deficit/hyperactivity disorder (ADHD). A systematic literature review was conducted of three topics as themes: Benefits of Horticultural Therapy; Understanding Neurodivergent Needs; and Horticultural Therapy Across the Lifespan. The primary research question of this project was: How can HT be adapted to effectively promote social, emotional, and cognitive development for neurodivergent individuals, with attention to autism and ADHD? I hypothesized that HT interventions designed with sensory regulation, executive functioning, and group format accessibility in mind would yield benefits related to emotional wellbeing, social learning, and attention. The methods included a systematic review and thematic synthesis across roughly forty peer-reviewed articles, meta-analyses, feasibility studies, and applied program reports. There was no collection of original human-subject data. The literature reviewed indicated that HT reduces anxiety, depression, and stress across populations, improves executive function and attentional capacity related to ADHD, and promotes social connection and cooperative learning among autistic participants. The research reviewed also indicated that both indoor and telehealth models produced enhanced accessibility to programming, and participation was influenced by both cultural and ecological contexts. This indicates that HT is an adaptable and inclusive intervention that can and does accommodate neurodivergent needs. This study contributes to counselling practice by offering evidenced-based recommendations on how to design accessible, neurodiversity-affirming HT programs. As an application of this research, a 4-session workshop was developed to demonstrate a way of translating these findings into practice.

Keywords: horticultural therapy, neurodivergence, autism, ADHD, sensory processing

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Dedication

To my younger self, who faced hardships with bravery and found relief in slower, deliberate practice; to the child who sought stability in simple, small acts of care—and to everyone who experiences healing in unusual places, such as the simple act of nurturing life—may this capstone remind you that there is possibility for growth nestled within those quiet acts of care and rest.

Chapter 1: Introduction

Horticultural therapy (HT) is beginning to be recognized as an effective intervention to facilitate mental health and well-being in the general population. Horticultural therapy, the structured application of gardening and plant related activities, for therapeutic purposes (Marcus & Sachs, 2013), has been utilized in counselling, rehabilitation, and education settings in several different formats. HT is particularly compelling due to its accessibility and multisensory nature. We engage with plants using our senses of touch, smell, sight, and movement, which guides participants as they can self-regulate their bodies and emotions at a point that feels natural and nonintrusive.

These qualities are particularly important in the delivery of HT to neurodivergent populations, especially those with autism spectrum disorder (ASD) and attention-deficit/hyperactivity disorder (ADHD). Research has shown that autistic and ADHD individuals typically display differences in sensory processing, executive functioning, and social participation (Chapman & Botha, 2023; Soto et al., 2024). These populations may not possess the characteristics often normed in traditional methods of therapy or educational settings, resulting in missed opportunities for care. HT provides flexible possibilities for its delivery: HT can be offered in individual sessions or group therapy, including through telehealth, and it allows participants an opportunity to interact at their own pace, encouraging choices consistent with their autonomy.

The purpose of this capstone was to investigate how horticultural therapy can be modified to effectively support neurodivergent populations, with particular emphasis on autism and ADHD. This capstone had a central research question: How can horticultural therapy be modified to meaningfully support the social, emotional, and cognitive development for neurodivergent individuals, with specific focus on autism and ADHD? This work applies current research and theoretical frameworks (e.g., Acceptance and Commitment Therapy, Person-Centred Therapy, Sensorimotor Integration) to synthesize what we currently know and translate this knowledge into practice. The product is a 4-

session workshop that illustrates how HT can be designed to address neurodivergent needs in a way that provides a meaningful resource for therapists, educators, and caregivers.

Overview of the Topic

Horticultural therapy (HT) is receiving increased attention as a nature-based intervention that supports emotional, physical, and social well-being. Historically, HT has most often been studied in older adults, psychiatric populations, and people with chronic illness—a realm where HT has been connected to reduce depression, reduce stress and reduce social isolation (Briggs et al., 2023; Zhang et al., 2022). These findings develop a solid basis for the field; however, they also leave a significant gap: little research has included neurodivergent populations, particularly autistic and ADHD individuals, despite the importance of HT's multisensory and adaptable nature for these populations.

Autistic and ADHD individuals often experience difficulties related to sensory processing, executive function, and social engagement (Chapman & Botha, 2023; Soto et al., 2024). Typically, when delivered in a therapeutic context there are times in which the environment may lack accommodations to these difficulties and sometimes increase anxiety levels by compelling conformity to normative development; however, HT can provide an alternative. Activities in HT (planting a garden, watering plants, potting plants) allow for regulation via touch, smell, and sight while also facilitating planning and sequencing of tasks—HT can also be delivered in a group format to support cooperative learning while carefully minimizing the stress of verbal and other social performance. These characteristics of HT seem to fit comfortably within the needs of neurodivergent people; however, the body of work is insufficient to adequately explore this opportunity.

This lack of focused research is further compounded by issues of accessibility. Most of the current HT literature refers to an outdoor setting or a community garden, which may not be made available to individuals living in urban contexts or people who are unable to meet the mobility and sensory demands (Yang et al, 2024). Furthermore, research on indoor gardening and telehealth delivery

models have just begun to explore these as options for HT—these represent a way to increase access to HT. Additionally, if the context of horticultural therapy considers cultural and ecological contexts, these contexts will have implications for how gardening is performed and considered, which implies a question to what extent HT can be adapted in effective and sustainable ways for different groups (Home & Vieli, 2020).

In synthesis, this context indicates the requirement for research and practice to intentionally link the established benefits of HT with the development, sensory engagement, and culturally appropriate practices for neurodivergent populations. Filling in this gap represents the intent of this capstone.

Purpose Statement

The intent of this capstone was to examine the therapeutic possibilities of horticultural therapy for neurodivergent peoples, with a focus on autism and ADHD. In this paper I examined the way that structured gardening can promote emotional regulation, executive functioning, and social connectivity skills (Soto et al., 2024; Chapman & Botha, 2023).

This capstone combined current literature and applicable theoretical frameworks, to culminate in the creation of a horticultural therapy workshop. The session structure was inspired by other horticultural therapy programs; however, the structure of this project is novel in that attention will be paid to the sensory and developmental needs of neurodivergent peoples. This work further contributes to the growing area of therapeutic interventions by recommending a strengths-based, accessible, and inclusive nature-based framework within community mental health.

Research Question

Through this process, I aimed to explore the following central research question: How can horticultural therapy be adapted to effectively support the social, emotional, and cognitive development

of neurodivergent people, particularly those with autism and ADHD? To address this overarching inquiry, several sub-questions were considered:

- What therapeutic benefits, such as improvements in emotional regulation, social interaction, sensory processing, and executive functioning, can horticultural therapy offer neurodivergent people?
- How do structured gardening activities (individual and group-based) impact the well-being and engagement of neurodivergent individuals in therapeutic or educational contexts?
- What are the unique considerations when designing a horticultural therapy workshop for individuals with sensory and attentional differences?
- In what ways do theoretical frameworks such as Acceptance and Commitment Therapy (ACT) and sensorimotor integration inform the application of HT in neurodivergent populations?
- What limitations exist in the current research on HT for neurodivergent people, and how can practice-based innovation help bridge these gaps?

By exploring these questions, this project aimed to support the development of inclusive, nature-based interventions that align with neurodivergent strengths while also offering practical guidance for therapists, educators, and caregivers working in this emerging space.

Themes Identified in the Relevant Literature

As I reviewed research related to horticultural therapy (HT) and neurodivergence, I found it an exciting and developing area. Even though there were only a few pieces of research, after synthesizing the research there were several themes or areas that were interrelated or connected and relevant to my topic. I framed my understanding as thematically organizing the research into areas related to the ways HT might enhance various dimensions of well-being for neurodivergent individuals over the lifespan (Detweiler et al., 2015; Spano et al., 2020).

Sensory processing was a theme—exploring how horticultural activities engage the senses in ways that are calming, stimulating, or regulating for those with sensory sensitivities (Fieldhouse & Sempik, 2007; Soga et al., 2017). Executive function was a theme—looking at how structured hands-on garden tasks can serve to strengthen planning, sequencing, and attention in a low-pressure and creative space (Davis et al., 2011; Shih et al., 2022). Finally, social interaction was also identified—how group-based HT can create a sense of connection, cooperation and mutual support without the social demands which can be challenging for many neurodivergent participants (Cipriani et al., 2017; Gonzalez et al., 2010).

All these themes are examined more closely throughout the literature review in Chapter 2. These main take-aways influenced the design of my planned workshop for neurodivergent people, which will emphasize the tactile, hands-on experience of growing and potting plants together. Activities such as creating little succulent gardens, or other participant chosen plants (that are manageable to group together), will provide sensory engagement, skill building, and gentle social connection (American Horticultural Therapy Association, 2024).

Research for this capstone was conducted via a thorough literature review of peer-reviewed articles, systematic reviews, and feasibility studies related to horticultural therapy, neurodivergent populations, and group-based therapeutic interventions. Literature was obtained through academic databases and varied in quantitative and qualitative studies. Findings and conclusions were made by synthesizing and integrating evidence across a range of projects, with common themes and patterns focusing on the therapeutic effects of horticultural therapy, as well as areas in the literature to strengthen future practice.

Theoretical/Conceptual Framework

Neurodiversity Paradigm

The neurodiversity paradigm serves as a foundational framework for this project. Based on the social model of disability, the neurodiversity paradigm asserts that neurological differences like autism and ADHD are not deficits and are simply variations in human cognition and perception. The neurodiversity paradigm moves away from attempting to "fix" individuals to be in line with neurotypicality, instead choosing to aim for environments that accept and are inclusive of the different ways of life, experiencing, and relating to the world.

Horticultural therapy (HT) is consistent with neurodiversity-affirming principles because HT provides flexible, adaptable, sensory-friendly, and interest-based opportunities that do not impose expectations for verbal or social conformity. For example, activities in horticultural therapy such as planting, watering, and observing the growing plants allow opportunities for the individual to engage at their own pace and make decisions based on their own preference and it provides a place to experience feelings of competence without expectations associated with social performance. Notably, this sensory-friendly, interest-based space can also be modified to accommodate the individual's sensory profile and communication mode while maintaining a sense of autonomy and promoting well-being and respect of differences. This project is grounded in neurodiversity, and through the parameters of this capstone, I resist the notion of deficit narratives, instead supporting a strengths-based, identity-affirming approach to therapeutic engagement.

Sensorimotor Integration Theory

The Sensorimotor Integration Theory, stemming from occupational therapy and neuroscience, is a useful framework for understanding how people receive and react to sensory information (Mostafa, 2008). As outlined previously, many neurodivergent individuals find it exceptionally difficult to modulate their sensory input—they may find inputs overwhelming (some people with sensory processing disorder can be overwhelmed by loud noises or strong smells), or they can seem under-responsive to certain sensory inputs. The difficulties associated with modulation can create challenges with emotional

regulation, attention, and behaviour. Horticultural therapy offers multisensory experiences that promote regulation through tactile (soil substrate, leaves), visual (greenery, colour contrast), olfactory (herbs, flowers), and proprioceptive (digging, lifting) inputs. This can stimulate or calm the nervous system, support sensory integration, and reduce distress.

This theory provides a basis for considerations of how to select plants that can be created sensory friendly, consider pacing of activities, and the design of the workshop space which could be predictable with some flexibility. This might mean creating a sensory garden that has soft textures and calming scent for sensory seekers, or the tools and gloves that can assist with regulating overwhelming inputs for sensory avoiding individuals.

Person-Centered Therapy (PCT)

Person-Centered Therapy developed by Carl Rogers (1951) highlights the therapist's role in providing empathy, unconditional positive regard, and genuineness to facilitate a client's capacity for self-directed evolution. In the context of horticultural therapy, this means creating a safe and responsive environment for persons to take initiative, to follow their interests, and to have a sense of autonomy and agency which emerges in the process of nurturing plants.

PCT is consistent with the tenets of neurodiversity, as it reiterates that healing comes not from some sort of externally imposed agency, but unfolds from within the person when given the right conditions. The gardening activities represent such conditions, by providing space for exploration, reflection, and non-verbal expression. The role of the therapist is to be attuned in a way that accompanies the person, respecting their interests and way of being, rather than directing it. For neurodivergent people who may have encountered environments that were fundamentally coercive or exclusionary, just being in a person-centered horticultural space can conjure the entirely new possibility of being seen and affirmed for who they are—a being with agency and acceptance—rather than a being who was pressured to get on and conform.

Acceptance and Commitment Therapy

Acceptance and Commitment Therapy (ACT) is a mindfulness-based behavioural therapy that focuses on promoting psychological flexibility. This is described as the ability to remain in the present moment with difficult thoughts or emotions while acting consistent with one's values (Hayes et al., 2006). ACT has demonstrated increasing promise with neurodiverse populations around emotional regulation, anxiety reduction, and values-based living (Pahnke et al., 2014).

ACT principles and therapies can be embedded in a horticultural therapy framework through nature-based metaphors or experiential activities. Planting a seed and watching it grow slowly could be a metaphor for patience or change. People might be able to participate in exercises that help them label their feelings ("like the weather") or connect values ("What type of garden do you want to grow in your life?"). This type of work can assist in developing emotional vocabulary, self-compassion, or develop tolerance for uncertainty.

One of the key elements of ACT is the emphasis on in the present moment awareness, acknowledgment, and acceptance of internal experiences rather than avoidant strategies. The nature of working in horticultural therapy means that integrating values-based experiences through gardening or growing plants can support developing coping skills without therapeutic threat. Gardening as a purposeful and nurturing activity has good compatibility with the values focused components of ACT and reintegrates meaning and purposeful intention for neuro divergent individuals.

Reflectivity and Positionality Statement

My introduction to horticultural therapy comes from the combination of my practice and personal history. I am a second-generation South Asian Canadian woman, whose ancestral connection is traced to rural Punjab, India. My grandparents, great-grandparents, and their grandparents were farmers, immersing themselves in the cycles of agriculture many years before I was born. I am not a farmer, but I believe my relationship with nature is rooted in my ancestral history.

During the COVID-19 pandemic, I experienced a deep loss when my best friend passed away. At a time when grieving and isolation came heavy, looking after my indoor plants had become my constancy and grounding. The repetitive acts of watering, trimming, repotting, and researching horticulture and botany brought moments of calm, stillness, and focus. My personal practice transitioned to wanting to learn more about how the cultivation and care of plants could lend a hand in supporting one's mental health, and particularly for fellow people who were, like me, finding comfort in slower, intentional practices.

I also bring my perspective as a neurodivergent person to this work. My lived experiences shape how I think about accessibility, sensory needs limitations and the possibilities of other modalities for expression—not always through the spoken word. This not only informs how I would imagine horticultural therapy for neurodivergent individuals, but how I approach therapeutic relationships in general. While I was writing this paper and considering the approach of the accompanying workshop, I was acutely aware of my positionality; I hold personal and cultural ties to land, I am a practicing mental health worker and am a person whose neurodivergence deeply colours my understanding and concern for people seeking spaces of regulation and connection. These perspectives are a constant part of me that influence the way I read the literature, my focus of inquiry, and my hopes for horticultural therapy in practice.

I also recognize that being able to physically engage with nature is a privilege that not everyone has. I have the necessary resources, time, and physical ability to care for plants. Additionally, I have had the opportunity to connect with nature which has been an important part of my own personal well-being. I acknowledge that I must remain reflectively critical of my assumptions of privilege in my readings on accessibility and impact of horticultural therapy for populations with vastly different lived experience.

My training, and experience in trauma also carries its own bias. When we know that trauma can have a powerful impact on certain populations based on socio-political constructions in society, I may unconsciously romanticize the power of nature-based intervention as a solution to complex, deeply rooted psychological turmoil. While I have experienced the therapeutic impact of horticulture in my own practice, I am also mindful that horticulture-based therapy does not equate the same healing for everyone. My origin and personal journey with trauma and healing may contribute to my belief in the healing of these approaches—this is why I considered it necessary to remain as critical and reflexive as I could through the literature and research.

Lastly, I am personally inclined to a more holistic healing perspective, whereby inclusion of mind, body and spirit is necessary for tying all aspects of recovery into wholeness. Within my beliefs, I understand the interconnectedness of all things and feel the healing associated with nature. I recognize the need for my beliefs to be complemented by evidence, as a responsible practitioner, in promoting interventions that are clear, accessible, and sustainable for everyone regardless of individualized context or access to nature.

Definition of Terms

Adults

In this capstone, adults are defined as individuals aged 25 to 64 years, encompassing early to middle adulthood. This developmental stage is often characterized by stability in identity, the pursuit of career and family goals, and ongoing engagement in community and social networks. It also includes periods where stress, work-life balance, and mental health challenges may emerge. Horticultural Therapy research with adults has shown benefits in promoting resilience, reducing stress, and fostering social connection across cultural and ecological contexts (Erikson, 1997; Ambrose et al., 2023). Defining adulthood in this way allows this capstone to highlight how HT supports well-being during a stage marked by both productivity and psychosocial demands.

Anxiety

In this capstone, anxiety refers to a mental health condition characterized by persistent feelings of worry, fear, and apprehension, often accompanied by physical symptoms such as restlessness, increased heart rate, and muscle tension. Anxiety can interfere with daily functioning, relationships, and overall well-being. From a holistic perspective, anxiety is understood not only as a psychological state but as a disruption of the interconnected balance between mind, body, and spirit. This definition draws on the Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR), which describes anxiety disorders as marked by excessive fear and behavioural disturbances (American Psychiatric Association, 2022), as well as the World Health Organization, which emphasizes the global health burden of anxiety as a condition that impacts both emotional and physical functioning (World Health Organization, 2022).

Attention-Deficit/Hyperactivity Disorder (ADHD)

ADHD is a neurodevelopmental condition marked by patterns of inattention, hyperactivity, and/or impulsivity that interfere with functioning or development (APA, 2022). Symptoms can include difficulty sustaining attention, disorganization, impulsive decision-making, and restlessness. In this capstone, ADHD is understood within a strengths-based framework, recognizing the creativity, divergent thinking, and energy that can accompany the condition; while acknowledging the challenges it can present in traditional learning or social environments (Hallowell & Ratey, 2021).

Autism Spectrum Disorder (ASD)

Autism is a neurodevelopmental condition characterized by differences in social communication and interaction, alongside restricted and repetitive patterns of behaviour, interests, or activities (APA, 2022). The term “spectrum” reflects the wide variation in strengths, needs, and support levels among autistic individuals. In this paper I approached autism from a neurodiversity-affirming perspective, emphasizing acceptance, strengths, and the value of diverse cognitive and sensory processing styles.

Depression

Depression is defined as a mental health condition marked by prolonged periods of sadness, hopelessness, and a diminished interest or pleasure in life. It often impacts emotional, physical, and cognitive well-being, leading to disruptions in daily functioning (American Psychiatric Association, 2022; World Health Organization, 2022).

Elderly

In this capstone, elderly refer to individuals aged 65 years and older, consistent with definitions used in gerontology and global health research (World Health Organization [WHO], 2015). This stage of life is marked by transitions in health, independence, and social roles, with many older adults experiencing increased risk of chronic illness, social isolation, or cognitive decline.

Executive Functioning

Executive functioning refers to a set of cognitive processes that enable individuals to plan, organize, manage time, regulate emotions, and execute goal-directed behaviours (Diamond, 2013). Difficulties in executive functioning are common among neurodivergent individuals and can impact daily living, academic achievement, and social participation.

Horticultural Therapy

HT is the intentional use of plant-based activities, such as planting, watering, or caring for greenery, as therapeutic interventions to promote mental, emotional, social, and physical well-being (American Horticultural Therapy Association [AHTA], 2022). It draws on principles of ecotherapy, which emphasize the healing benefits of reconnecting with nature, and can be adapted to meet diverse cognitive, sensory, and physical needs (Buzzell & Chalquist, 2009).

Mental Well-Being

Mental well-being refers to a state of emotional, psychological, and social health, where an individual can manage stress, maintain positive relationships, and experience a sense of purpose and fulfillment. It involves the ability to cope with life's challenges, contribute to one's community, and

realize personal potential. Mental well-being is not merely the absence of mental illness but a holistic experience of balance across mind, body, and spirit (Dodge et al., 2012).

Neurodivergence

Neurodivergence refers to natural variations in human brain functioning and cognition, encompassing conditions such as autism, ADHD, dyslexia, and other learning or processing differences (Walker, 2021). In this paper I adopt a neurodiversity-affirming lens, viewing neurodivergent traits as part of normal human variation rather than deficits to be corrected.

Sensory Processing

Sensory processing is the way the nervous system receives, organizes, and responds to sensory input from the environment and the body (Miller et al., 2007). Differences in sensory processing—such as hypersensitivity to light, sound, or touch—are common among autistic and ADHD individuals and can influence participation in horticultural therapy activities.

Telehealth Delivery

The use of digital platforms such as Zoom or Microsoft Teams to provide horticultural therapy remotely, often through a combination of mailed gardening materials and virtual facilitation (Meore et al., 2024). This approach allows participants to engage in plant-based activities from their own homes while maintaining therapeutic support and interaction.

Youth

In this capstone, youth refer to individuals between the ages of 6 and 24 years. This definition extends Sawyer et al.'s (2018) widely cited framework, which identifies adolescence as spanning ages 10 to 24 to reflect ongoing developmental, social, and neurological changes. For the purposes of this project, I have broadened the lower age range to 6 years to include younger children who are particularly relevant to therapeutic and educational contexts where HT may be applied. This extended range allows the workshop design and literature review to address children, adolescents, and emerging

young adults, all of whom may experience challenges related to sensory processing, attention, and social learning.

Outline of Capstone Project Chapters

Chapter 2 reviewed the horticultural therapy (HT) literature as it relates to neurodivergent populations, organized into three themes: the Benefits of Horticultural Therapy, Understanding Neurodivergent Needs (Autism/ADHD), and Horticultural Therapy Across the Lifespan. As I was writing on these themes, I started to realize how the research continually pointed to the ability of HT to facilitate both internal regulation—e.g., sensory processing, executive function, emotional well-being—and external growth in a social learning context, relationally. I was also struck by the flexibility of HT. It can be offered in group, individual, and even telehealth formats in which participants still receive therapeutic benefits. I was mindful of the limitations in the literature, such as small sample sizes, descriptive accounts, and the lack of longitudinal data, especially as an indicator of an emerging area of research.

In Chapter 3, I swapped from analysis to application—this chapter considers how the literature propelled my thinking toward therapeutic design imagining what HT could look like in practice. I point out the gaps I encountered, most specifically the lack of human-subject research for neurodivergent populations and make proposals for future research. Specifically, I view this opportunity for empirical research to examine how HT can offer direct support around sensory regulation, executive functions, and anxiety for autistic populations and ADHD populations.

Lastly, in the Appendix, I have included a sample 4-session workshop that I created from this process. The workshop is intended to be for neurodivergent people across the lifespan, focused on accessible indoor plant activities centered on sensory engagement, executive skill development, and anxiety regulation. I hoped that this workshop demonstrated one way to put the findings from Chapter 2 into practice, offering therapists, educators, and caregivers a tangible tool to adapt to their own work.

Chapter 2: Literature Review

My goal for this chapter was to address existing research on horticultural therapy (HT) and its utility for neurodivergent populations, specifically autism and ADHD. While HT has been extensively researched as an intervention that promotes mental health and well-being, social connections, and physical health and well-being, there is limited research studying specific impacts on neurodivergent needs. To place my capstone in the broader scholarly conversation, I reviewed benefits of HT regardless of format (by reviewing what has been studied: group delivery, individual delivery, emotional well-being delivery, telehealth delivery), how the benefits of HT align with the sensory, executive function, and social needs of neurodivergent individuals, and how the HT could be delivered throughout the lifespan for accessible and relevant application. The review was organized into three major themes: (1) the benefits of HT for groups, individuals, in terms of emotional well-being, and in terms of telehealth delivery; (2) understanding neurodivergent needs in terms of sensory processing, executive function, and social learning; and (3) the potential of HT through the lifespan with youth, adults, and elderly with neurodivergent needs, issues relating to accessibility, and culturally relevant ideas. Collectively, these three themes form the foundation to inform how HT can be adapted to be practised as a form of therapy for diverse populations, and for neurodivergent communities.

Benefits of Horticultural Therapy

Horticultural therapy (HT) has garnered increased attention in counselling as well as allied health fields as an approach that promotes psychological, social, and physical well-being through structured plant-based activities. HT can involve experiential gardening tasks of planting, watering, or caring for plants that result in reductions in stress; mood improvement; and increased possibilities of connecting with others (Marcus & Sachs, 2013; Rosa et al., 2023; Zhang et al., 2022). The strength of HT is its adaptability across populations and activity delivery settings; therefore, research has demonstrated benefit in group contexts, which involved engaging in shared gardening activities promoting

collaboration and belonging; in individual therapy, through structured practical gardening routines that support stress regulation and personal development; and, most recently, via telehealth with augmented accessibility for remote delivery. Within this section, different modes of delivery were discussed, and I describe how HT can contribute to emotional and mental well-being while laying the groundwork for the use of HT with neurodivergent populations.

Emotional and Mental Well-Being

Panțiru et al. (2024) published an umbrella review and meta-analysis that examined how gardening related to well-being, mental health, and quality of life in various contexts and among different populations. A primary strength of this research was the breadth of the work: by presenting the work of the whole, through evidence from combined systematic reviews and meta-analyses, it provided a high-level overview that consistently related gardening to reductions of depression and anxiety, as well as improvements in subjective well-being and quality of life. The review of methodological rigor increased confidence in the overall direction of effects. At the same time, Panțiru et al. (2024) identified common challenges across this area, including heterogeneity in intervention formats, outcome measures, and participant characteristics, which constrained specificity or causal interpretation. Despite those limitations, the study provided evidence for the conclusion that gardening-based interventions exhibited a replicable pattern of psychological benefit rather than isolated occurrences. Relevant to this capstone, these findings bolstered the framing of HT as a valid, evidence-supported avenue for emotional and mental well-being that could be modified to fit the needs of neurodivergent individuals while retaining the core therapeutic purpose.

Rosa et al. (2023) narrowed the evidence base to randomized controlled trials (RCT) and concluded that horticultural interventions were associated with a reduction in depressive symptoms in adults. Emphasizing RCT as the basis of their review offers methodological strength by prioritizing designs that allow for stronger inferences about the putative effect of the intervention on mood. It was

acknowledged that trials pooled into the review came from multi-contextual, variable settings, thus reinforcing the idea that HT has at least some promise that goes beyond an isolated context or specific setting. However, Rosa et al. (2023) also identified variation related to the length and intensity of the program, outcome measures, and measurement approach as a barrier to making and interpreting a direct comparison and generalizations from the evidence. Nevertheless, the evidence presented across RCT aligned closely with this chapter's argument. Thus, HT could be seen as targeted intervention that could easily be added to other evidence-based practices for emotional health. For counselling practitioners, especially for clients presenting with co-occurring anxiety or low mood, these findings corroborated the use of plant-based, value-supportive practices in conjunction with usual care within a person-centered perspective.

Zhang et al. (2022) focused on older adults and conducted a meta-analysis and systematic review which found a pattern of reduced depressive symptoms associated with HT in older adult populations. The strength of the meta-analytic approach was that it aggregated the effects across studies to estimate an overall effect and therefore added quantitative heft to the assertion that HT helped mood in later life. Additionally, the emphasis on an aged group highlighted how HT could be used in a way that was conducive to developmental needs and capacities. A limitation of this study was the age of its populations, which leaves questions about how well the benefits may carry to younger or neurodivergent groups. Still, Zhang et al.'s evidence for the reliable positive benefits of HT with depression in older adults contributes a lifespan perspective: gardening supports emotional well-being across age cohorts, when potential environmental variations were appropriately adapted. Zhang et al.'s conclusion reinforced the larger position of this capstone that HT's core mechanisms of predictable routines, sensory experience, and mastery opportunities mapped onto emotional regulation targets were relevant across neurotypes.

Han et al. (2018) conducted a more in-depth exploration of an HT program for older adults with mental health challenges in a structured multiple session HT intervention and reported decreases in salivary cortisol and increases in physical functioning and affect. The connection to physiological biomarkers represents an important strength, as it provided converging evidence for stress reduction, and was an effect beyond self-report measures. Also, the programmatic feature (i.e., repeated, stepwise, time-based activities) represented how HT intervention was often delivered in practice.

At the same time, the study also had limitations on sample size and cultural considerations for generalizability, and the short duration (i.e., it was unclear whether longer-term effects were maintained). Even with the limitations I have described, the combination of biological and psychological outcomes supported the emergent claim that horticultural therapy attended to emotional health in several ways. From a practice perspective, it illustrated that routine, graded plant-care tasks could be organized within a timeline to target stress recovery aims that were prevalent for many clients, including clients who are neurodivergent who leaned into predictable pacing and choice.

Suyin Chalmin-Pui et al. (2021) reported a few months after implementation, an increase in a self-reported sense of well-being and a biologically indicated improvement in healthier diurnal cortisol patterns after a frontal garden intervention for a residential address. The ecological validity to assess change within an everyday home environment makes this research substantive, along with the mixed-methods orientation assessing perceived and biological indices of stress. These two aspects of ecological validity and mixed methods are especially relevant to facilitate scale opportunities with real-world HT implementation. Despite limitations with randomization and potential self-selection bias, Suyin Chalmin-Pui et al. (2021) indicated comparable shifts across outcomes, underscoring the potential emotional impact even with small, aesthetic changes to personalization of green space. For this capstone, the findings suggest a practical implication: when formal therapy gardens were not available, scaled back,

home-based HT elements could still support emotional regulation and well-being—including clients who preferred familiar sensory controlled contexts.

Finally, Hassan et al. (2018), exhibited using a controlled lab comparison found a brief transplanting task had less state anxiety and physiological indicators associated with relaxation relative to a mobile-phone task. The controlled experimental quality and multi-method analysis (including psychophysiological indices) of Hassan et al. (2018) raised internal validity through equating time and demonstrated the immediacy that plant tasks can influence affect. Limitations included the limited exposure duration and a non-clinical convenience sampling approach, which bounded generalizability; however, the evidence aligned with the broad themes detected across the reviews and trials: even brief, structured horticultural activities may promote acute stress modulation and mood stabilization. For this capstone, Hassan et al. (2018) provided additional evidence for HT to be employed flexibly, as short grounding practices or longer programs, to support emotional and mental well-being in a way congruent with person-centred and ACT consistent counselling.

The studies outlined thus far indicated a contribution by horticultural therapy to positive emotional health by broadly improving mood, or bodily stress regulation, or overall well-being, but other research highlighted how individualized programs could individually improve these experiences in structured and individualized ways. The next section extends this through an in-depth lens on individual therapy within horticultural practice, focusing on how one-to-one interventions created opportunities for autonomy, sensory-regulation, and ongoing therapeutic engagement.

Individual Therapy

Joubert et al. (2024) conducted a randomized controlled trial RCT using psychiatric inpatients to examine the impact of horticultural therapy on anxiety. They found much greater reductions in anxiety scores for participants who participated in HT than participants receiving normal care. One of the key strengths of their study was the use of RCT, strengthening the causal relationship between HT and

anxiety. The study was not without its limitations; the inpatient psychiatric context limits generalizability, as patients' daily structures and routines were carefully controlled. Yet notwithstanding these limitations, their study was an important research note corroborating the therapeutic value of HT for emotional regulation, as with Acceptance and Commitment Therapy (Hayes et al., 2006), one of the central questions of this capstone. The structured and repetitive tasks found in gardening provided these patients predictable ways to engage, as well as opportunities for mastery. From a person-centered standpoint, they were part of an experience where they cared for plants in a non-judgmental framework, facilitating Roger's (1995) concepts of autonomy and unconditional positive regard. The results indicated that if the intervention was mindful to sensory sensitivity, and flexible to attentional mobilities, similar HT projects were transferrable to reduce anxiety in neurodivergent individuals and /or groups.

Han et al. (2018) conducted research with older adults who had mental health concerns, finding that the structured 10-session HT program yielded reduced salivary cortisol, and improved physical functioning, as well. A strength of their work was the use of biological markers, providing objective evidence of their participants declining stress levels. The organized and stage-based structure of the program revealed how potency gains could be developed through the repetition of individual gardening tasks. The small sample size and the cultural particulars of the participants were notable limitations to the generalizability of the findings. Nevertheless, the findings provided robust support for how HT could facilitate emotional regulation and physical health at the same time. For neurodivergent individuals, repetitive actions, such as plant watering regimen, or sequenced planting tasks, can support executive function by developing executive skills such as organization and planning, while also permitting sensory regulation through tactile engagement with soil, plants, and water. Mechanisms such as these directly tie into the research questions and imply that HT programs could be designed accounting for sensory processing and attentional individual differences and provide multi-faceted benefits.

Shen et al. (2022) conducted an intervention with older adults to examine HT on mental status, sleep quality, and salivary markers of mucosal immunity. The authors found that older adults reported changes in sleep quality and reported changes in psychological and physiological biomarkers of stress following a series of six HT sessions. In addition to psychological and physiological outcome measures, Shen et al. (2022) also benefitted from both types of measurements, given that it enhanced specificity in understanding the findings. Like the limitations of Hu et al. (2022), the limitations of Shen et al. (2022) were a small sample size and the lack of a longer-term follow up in what was already an investigation of short-term benefits. Shen et al. (2022) presented a particular example of how HT might create changes in sensory regulation and attentional states because of the repetition and calming nature of the gardening tasks. Improved sleep quality had a direct relationship with decreased anxiety and improved emotional regulation, both outcomes that many neurodivergent individuals struggled with. Structured HT tasks gave the participants experiences similar to sensorimotor integration principles by utilizing controlled, multi-sensory engagement that participants can tailor to their own tolerance and, thus, support the therapeutic potential of HT in individually tailored counselling situations. Kim and Park (2018) evaluated a horticultural program with middle aged women and concluded that depression and anxiety decreased while participants also reported improved self-identity. The collective program structure used over multiple sessions was a strength in which the participants could engage in gardening repeatedly over an ongoing basis and build relational connections with plants. Notably, the lack of a randomized control group diminished the authors' ability to exclusively associate improvement from the program or intervention. The authors focused on a specific demographic group, thereby reducing the generalizability of the findings to other potential populations. Nevertheless, the findings were quite relevant to the broader construct of emotional and mental well-being implied in HT with greater relevance for neurodivergent participants again as repetitive plant-care tasks could similarly assist with identity formation and self-efficacy while also being supportive of person-centred principles to provide

autonomy from and for growth with individuals as persons. The results indicated that structured and tailored gardening programs could be leveraged to build confidence and coping skills in counselling situations but also serve as a safe space to self-express that did not require discussion or reliance on social interactive skills to explore and develop perspectives on wellness.

Hassan et al. (2018) conducted a controlled laboratory study to understand transplanting plants' impact on stress and anxiety in young adults. The participants who performed the plant task reported reduced state anxiety and demonstrated physiological indications of relaxation, connecting with EEG measures to support potential relaxation levels. One major strength of the study was the experimental design of the study, which allowed for strong inferences about the immediate effects of engaging in horticultural activity. However, the short-term nature of the intervention and the non-clinical sample size, although minimally invasive, limited the scope of the findings. Notwithstanding their noted limitations, Hassan et al. (2018) provided evidence that even structured, short episodic periods of HT activities or tasks could still produce brief emotional regulation benefits. For neurodivergent individuals that are challenged by prolonged attention to or become overwhelmed with prolonged task-based interventions, short task-based activities provide a pragmatic approach for building coping strategies. Doing so shows that individualized HT could serve to not only address differences in attention from and for the task, but also to provide short, immediate grounding with multi-sensory engagement within the context of HT and while also supporting the contributions offered with present moment awareness to attention with ACT approaches or reminding oneself and others of integrated body-mind practices to calm the nervous system.

Together, these studies demonstrated the effectiveness of individualized horticultural therapy to support emotional regulation, aid with stress reduction, and encourage personal growth across several populations. Individual programs and their facilitators highlighted autonomy, routines, and tailored sensory experiences to their participants, though numerous researchers studied the social

elements of horticultural therapy that offered participants opportunities for further connection and social well-being through shared experiences. The next section considers group-based horticultural therapy and the evidence of collective human interaction and social resilience.

Group Therapy

Briggs et al. (2023) carried out a systematic review and meta-analysis of group gardening interventions to evaluate their effectiveness on adult mental health. They found evidence across the studies that participation in group-based gardening lowered participant mental ill-health symptoms such as anxiety and depression and improved mental well-being. The broadness of this meta-analysis was a strength, as it integrated evidence across several different settings and populations, allowing for a holistic view of the evidence base to date. However, there was a significant amount of heterogeneity across studies in intervention lengths, outcome measures, and characteristics of the populations studied, which limited the overall precision of the pooled results. Despite these limitations, the findings from Briggs et al. (2023) underscored the possible role for group horticultural therapy (HT) to become a credible evidence-based intervention for emotional regulation and social connectedness. The group offered participants opportunities to work together on shared tasks and to provide one other with encouragement, in an atmosphere of community. In terms of study participants being neurodivergent, the group gardening context has the added benefit of providing pressure-low social interaction and socially co-regulated together while also being able to regulate attunement for attentional and sensory demands.

Jarrott and Gigliotti (2010) compared methods of participant responses to horticultural-based activity to traditional activity programming in dementia care facilities. Their findings demonstrated that HT-based sessions produced even higher levels of adaptive engagement than group-based, crafts-type activities, even though affect states did not differ across the two comparison conditions. The randomized site design and observational behaviour methods used in this study provided the strength

of increasing internal validity and ecological authenticity overall. At the same time, both the short length of the intervention and its specific focus on a small, population-specific group limited generalization of the findings to other groups.

Nonetheless, the study was important in demonstrating the unique potential of group HT for engaging participants into a more involved manner than conventional activity formats. The social aspect of a shared responsibility for a plant coupled with sensory engagement and physical tasks of gardening help to promote continued participation. These elements aligned with therapeutic work on promoting inclusion and a sense of belonging to a group, providing learning for the design of HT that aimed to enhance social interaction while appreciating varied ability and cognitive diversity.

Kotozaki (2014) investigated the effects of individual HT and group interventions with participants to address issues of anxiety/depression, illustrating how group interventions offered additional strengths in social functioning and overall well-being. A comparative research design was a strength as it helped to more clearly understand how features of group participation enhanced therapeutic effects that could not be observed when gardening interventions were done in individual formats. Limitations were small sample size and lack of long-term follow-up, reducing conclusions about long-term durability of the effects. While group HT provided similar outcomes to individual therapy for reducing stress and improved mood, there was added value through social engagement and collaboration. The study also highlighted how shared responsibility for plant care could promote cooperation and communication among participants, which also align with therapeutic aims of group HT. These findings related closely to the research questions that were guiding this capstone, in terms of illustrating how structured gardening in a group context promoted emotional regulation and social interaction skills. McGuire et al. (2022) collected qualitative data through interviews with community garden organizers to examine the contributions of gardening to well-being at the community level. They emphasized the concept of community gardening as a socially embedded practice to develop resilience,

creativity, and collective health. A strength of this study was the detailed and qualitative data that described valuable experiential learning on community gardening. However, the sample was limited (a small sample that was also regionally specific), and therefore the perspectives of the organizers may not reflect the perspectives of participants in other contexts.

In terms of the focus of this capstone, McGuire et al. (2022) showed that group gardening was more than a health intervention, it could also be viewed as a social infrastructure that provided an opportunity for belonging and mutual support. These outcomes correlate closely with person-centered principles of creating an environment that engenders feeling valued and belonging in relationships. For neurodivergent clients, community programs that involved gardening provided therapeutic value from working with vegetation and plant material and suggested an opportunity for clients to practice social skills within a safe and accommodating group context.

Bieri et al. (2024) explored trends in urban community gardens before, during, and after the COVID-19 pandemic. They discovered an increased demand for shared gardening spaces, with participants using them for relational and resilience-building possibilities when they faced experiences of social isolation. The primary strength of this study was that it captured changing behaviours and adaptations during a global pandemic, but it primarily focused on descriptive trends instead of clinical outcomes. Despite this limitation, their findings showed the relevance of group HT as a mechanism for building collective resilience and positively contributing to social wellbeing in times of upheaval. Specifically, shared gardening spaces became socially relevant sites for people to maintain their social connections and feelings of social isolation were reduced, and the social capital of communal, plant-based, activities were made visible. In terms of counselling, these findings demonstrated that group HT can engage not only individual mental health but larger relational and community needs, modelling therapeutic workshop formats that honour both an individual's growth and the group's growth.

Corley et al. (2021) explored home gardening in older adults during the COVID-19 pandemic and found that older adults who continued to garden reported to have better physical and mental health, compared to those who did not. While this study examined individual homes, the relational aspect of gardening with one's home can be extended to put a sense of group relevance out into the world. The study had strengths, due to large sample size and focus on the older adult population, but the cross-sectional design limited claims of causality. The results emphasized that gardening could enhance well-being in smaller group units such as families, again showing the breadth of HT across social levels. From a practice perspective, this highlighted the need for designing HT workshops that promoted family or caregiver involvement where shared tasks provided possibilities for relational connection. In this way, the study showed how gardening acted to support emotional and physical health, on both an individual and collective level.

Finally, Garrido-Cumbrera et al. (2022) reported on the contribution of access to nature from home during the COVID-19 pandemic, where they found those with views of greenness had well-being scores that were higher. While the study was not an intervention study, it was nevertheless a strength to have a large-scale cross-national data study that highlighted the psychosocial area for everyday access to natural features. Limitations included it being observational and relying on self-reported well-being measures. Nonetheless, the study reinforced the idea that collective experiences of nature even when mediated through shared home environments added to the psychological resilience of the garden participants. It was easy to consider how this idea of collective experiences in gardening would be applicable in a therapeutic context, reinforcing the use of HT intervention in groups where shared sensory stimulation and access to nature supports both social connection and emotional regulation.

While the use of group-based horticultural therapy presents the power of shared activity, belonging, and collective resilience, this does not negate the value of accessibility and flexibility for these interventions' delivery. For example, for many individuals, particularly those who experience

mobility limitations, sensory sensitivities, or access barriers to in-person participation, traditional group participation is not always an option. As telehealth expands, the potential to reposition horticultural therapy for virtual contexts has possibilities for expanding the therapeutic benefits and meeting participants in their own environments. The next section details emerging findings for telehealth delivery of horticultural therapy and will discuss how these interventions extend access into emotional regulation, stress-relief, and connection and social networks beyond in-person experiences.

Telehealth Delivery

Meore et al. (2024) conducted a pilot study of telehealth provision for horticultural therapy (TeleHT) in veterans to assess feasibility and acceptability, as well as the potential effect of TeleHT on mental health outcomes. Meore et al. used mailed gardening kits as part of the remote facilitation of participants' plant-care activities, which each participant could do from their homes. Results, at 1-month follow-up, indicated a moderate reduction in factors of stress, loneliness, and risk factors for depression, as well as significant participant satisfaction and retention. A key strength of this study was the innovative remote delivery of HT which extended access to HT while meeting therapeutic goals. Limitations of the study were its small sample size and reliance of self-reported outcomes which inhibited the strength of any causal claims.

Despite these potential design issues, Meore et al. (2024) demonstrated that TeleHT could retain many of the therapeutic benefits of in-person HT while overcoming barriers and facilitators such as mobility restrictions, transportation issues, or discomfort in group settings. These considerations are of heightened importance for neurodivergent populations, many of whom will find that remote participation affords greater sensory predictability and control of their environment. The findings of the study positioned TeleHT as a potential mechanism to promote opportunities for emotional regulation, social connection, and participation in meaningful activity when in-person participation may be restricted.

Spano et al. (2021) offered useful insights about the relevance of home and indoor greenery in the context of the COVID-19 lockdown in Italy. In their cross-sectional research study, Northrop and Whitaker (2021) established that for individuals who reported access to indoors/outdoors with green features, they also reported improved psychological health status. The value of the research study design choice was a considerable sample size recruited from a nationally representative sample, which enhanced the generalizability of the findings. However, the cross-sectional nature of the study means that no inferences could be made regarding the causal relationship between green access and mental health. Overall, the results highlighted the psychological significance of incorporating natural elements into the residence and indicated the potential of TeleHT and home gardening to buffer stress in limited environments.

Similar to the study by Northrop and Whitaker (2021), Wu et al. (2022) considered the house garden approach in Taiwan while monitoring COVID-19 and found that perceived stress associated with the restrictions connected to the pandemic increased the intentions to garden and those that gardens saw improvements in health. The strengths of this study included addressing behavioural change in a relevant time frame, during a significant stress event, and having a large sample number that enhanced the robustness of the results. However, the study also suffered from using only self-report measures and it was also not an experimental study. Nevertheless, the results supported how home-based gardening, whether independently (which is possible within TeleHT) or with a telehealth model, facilitated the ability to regulate emotion and wellness for the people during an isolated state.

Suyin Chalmin-Pui et al. (2021) evaluated the outcomes of the residential front-garden intervention in the UK, which reported self-reported improvement in well-being and stronger cortisol patterns three months after the intervention. While this was not a telehealth intervention, the results were clearly relevant in demonstrating even relatively small gardening activities in domestic environments can have far-reaching psychological impacts. Strengths of the study included the mixed-

methods and biological measures, although the lack of a randomized control group limited identifying causal relationship conclusions. The results of the study demonstrated that principles of the HT could be adopted and used within home environments, justifying how telehealth or remote-guided adaptations could be conveniently and effectively applied.

Together, these studies demonstrated how home-based and telehealth models of HT were admissible and effective modes of intervention for providing therapeutic benefits especially when access to conventional in-person sessions is limited. For practitioners in counselling, this work showcased the flexibility of HT for supporting clients in predictable, accessible environments while still promoting emotional regulation, the reduction of stress, and social connection. This evidence provided a robust foundation for considering how HT could be adapted for supporting the needs of neurodivergent populations where remote or home-based therapeutic engagement is often successful.

Understanding Neurodivergent Needs (Autism/ADHD)

Sensory Processing and Executive Function in HT

Barakat et al. (2019) examined the therapeutic properties of nature contact for autistic children and emphasized how sensory experiences occurring in nature contributed to changes in attention, behaviour, and communication. A strength of this publication was the focus on the sensory element of nature interventions, contributing to an understanding of how sights, sounds, smell, and tactile experiences could be therapeutic. Due to the descriptive nature of this work, it was limited in its ability to illustrate causal pathways between exposure and outcomes. Barakat et al. (2019) identified the importance of creating HT activities designed to incorporate the senses in ways that may be regulating and not overwhelming, establishing a clear connection between sensory processing and emotional wellbeing for neurodivergent participants.

The Healis Autism Centre (2024) provided further evidence of this connection, documenting how therapeutic horticulture may be effective at alleviating sensitivity to sensory experiences of

individuals with autism. The report emphasized that a controlled amount of exposure to the earth, textures, scents, and colours in the context of gardening interventions created both stimulation, and regulation, depending on the needs of the individual. The strength of the report was the applied lens, showing how to build practical strategies when adapting HT with different sensory profiles/sensitivities; the limitation was the lack of empirical research as the document showed findings presenting in a professional opinion, rather than controlled research. Nonetheless, the presented perspective advanced knowledge for counsellors looking to demonstrate how HT could be structured to achieve balance between sensory seekers and sensory avoiders potentially creating increasing access to HT.

Wagenfeld (2019) reviewed sensory gardens as a form of therapeutic intervention for autistic people. The authors note that the attributes of sensory gardens included varied textures, calming scents, and involvement in interactions that reduce anxiety, supporting the idea that the attributes of sensitive gardens could facilitate exploration. The advantage of this study was its design-oriented approach that offered specific suggestions about the design of environments which support sensory integration. The drawback was that the study did not focus on outcomes, so the evidence was limited. Nevertheless, Wagenfeld's contribution illustrated the necessity that HT environments be deliberately designed to support a variety of sensory needs which adhered to the ideas from sensorimotor integration theory (Mostafa, 2008), and therapeutic approaches to lessen distress and enhance engagement.

Taylor et al. (2001) took this conversation one step further in their study on ADHD in children. They noted that having a green play space was correlated with improved attention and decreased attentional symptoms for children who faced attentional difficulties. One of the study's strengths was the comparisons across play environments, and a limitation was reliance on parent report for the attentional outcomes. Nonetheless, I suggest these results were significant to this capstone's

considerations of executive function: that access to natural elements within a play context, including gardening, are restorative and support attention and self-regulation in children with ADHD.

Soto et al. (2024) offered additional insights into ADHD by investigating the relationships among hyperactivity and executive functioning. The results of their study indicated that hyperactive behaviour in children with ADHD may be better regarded as compensating as a response to executive function demands that should not simply be seen as a disruptive symptom. The strength of the study was its nuanced consideration of ADHD behaviours, and its limitation was its reliance on experimental tasks rather than applied interventions. Thus, the implications for HT were clear that structured gardening tasks that scaffolded planning, sequencing, and task completion could provide a means of channelling hyperactivity into purposeful activity, while addressing executive functioning rather than inhibiting it.

Fortunately, Mostafa (2008) offered a theoretical angle through her work on the sensory architecture for users with autism they used to show how environments designed with sensory predictability and choice assisted with regulation. While it was not specific to horticulture, it offered a conceptual platform for HT, imbued with knowledge specifically about the contexts and concerns for decreasing sensory overload but creating opportunities for sensory adventure as deemed safe. The limitations of this work are that it is theoretical, rather than based on empirical research, but it offered important insights for HT design practices. Counsellors and practitioners could draw from principles from Mostafa that adapted HT environments to be aligned with neurodivergent sensory profiles and enact sensorimotor theory in practice.

In sum, these studies and perspectives demonstrated that horticultural therapy has unique potential to positively affect sensory processing and executive functioning in neurodivergent populations. While limitations regarding small samples, descriptive nature of studies and concepts framed the strength of causal claims, the combined evidence indicated that HT offers predictable multisensory activities that increased attention, decreased anxiety, and supported skills development.

This information not only reinforces the therapeutic affordances of HT, but it also provides important insights into design considerations for interventions that follow through with the sensory and cognitive experiences of participants that are autistic or with ADHD diagnosis.

While the evidence described the ways horticultural therapy may support regulation through sensory engagement and structured tasks that enhanced executive functioning, research also indicated the ways HT may have singular roles in building social connection. Beyond personal benefits, gardening provides environments for cooperation, communication, and building shared knowledge that could exist as therapeutic ways to develop relational skills for neurodivergent populations. The following section discusses how HT has been utilized in this manner within research.

Social Learning and Interaction

Barakat et al. (2019) claimed that nature connection fostered sensory regulation for autistic children and provided potential opportunities for social behaviour and communication. These children demonstrated through their gardening, and by being in a natural setting, the opportunity to share focus, imitate and collaborate with others. One of the strengths of this study was that it was explicit about the multidimensional ways nature impacts individuals, extending beyond the localized consideration of self-regulation to attentional/self-regulation, as well as interpersonal development. Although this study was predominantly descriptive in nature and did not offer any rigorous empirical measurement, hence limiting the quality of the claims made, it emphasized the idea that HT could provide contexts that, although structured, avoided the stresses and demands of traditional social environments within which children are often expected to engage.

Gallup et al. (2016) evaluated conditions for socialization amongst autistic adolescents within massively multiplayer online role-playing games (MMORPGs). Although not strictly a horticultural study, the findings are relevant to horticulture since they presented environments that provided shared tasks with flexible rules that allowed friendships and collaborative learning to develop. One of the strengths of

the research was drawing attention to environments that shared negotiated terms, and interest-based cooperative social skills in young people who often found traditional modes of interactions challenging. However, there was no exploration of environments based in nature, instead focusing on online environments. Yet, the transferable lesson was that HT, like MMORPGs, could act as a low-pressure, task-oriented arena for building peer relationships, particularly when that socialization was scaffolded through gardening specifics instead of a direct expectation to talk.

What were small sample sizes and no clear timeline, Cipriani et al. (2017) studied group horticultural therapy for psychiatric patients. Benefits to participation were mood improvement and social engagement. The strong aspect of this research was intervention-based, applied design, and measured psychosocial outcomes directly. The weakness of the study was the small sample size and no long-term follow up to consider effects. The study showed how the group format of HT fostered cooperation, collaboration, and belonging—relevant outcomes for neurodivergent people, in particular. HT was a therapeutic activity for self-regulation of mood and emotions—in addition, it was a space for building relational skills.

McGuire et al. (2022) were in line with this relational aspect, where they demonstrated how community gardening was seen by the organizers as a socially embedded practice that built resilience, creativity, and collective well-being. The qualitative approach was an advantage for this research because it was able to capture the subjective lived experiences and meanings participants placed on gardening. The disadvantage of their study, one which has implications for generalizability of results, was the participants studied were not the same as the organizers; the organizers were presumably left with their own characterization of the participants' experiences. However, what was important is that their results were able to point to how gardening created social infrastructure—spaces that fostered individual wellness, but also a group identity and connectedness. From a neurodivergent participant

perspective, community-based HT programs could offer inclusive, non-stigmatizing places for developing social confidence and social skills.

The Melbourne Disability Institute (2023) described the benefits of gardening therapy for people with autism and focused on how it was facilitated through organized group gardening where skills were developed at the same time as relationships. Although this report did not have as much methodological rigor as peer-reviewed trial studies, the applied perspective did offer local and practical evidence from community-based programs. The report illustrated that gardening tasks (e.g. planting, weeding, and caring for a common plot) encouraged a structure for collaboration, turn-taking, and non-verbal ways of talking, which were especially useful for participants who were autistic. This type of work emphasized that HT could be mediated as a relational practice and could offer opportunities for gentle social exposure and shared achievement, while not forcing into verbal interactions.

Together, these studies indicated how HT might offer a unique context for social learning and interaction, with possible outcomes of cooperation, communication and belonging to a group. Limits such as the small sample sizes, descriptive designs, and limited timeline data, restrict the strength of conclusions, but overall, the evidence points towards gardening as an inviting or accessible space to grow relational outcomes. This specific aspect of HT is significant for neurodivergent populations because it aligns with important person-centered practice principles of autonomy and acceptance, while offering opportunity to practice engagement socially in a less pressurized environment.

HT consistently provides opportunities beyond the social dimension, whereby neurodivergent people can have supportive opportunities to self manage stress, minimize emotional distress, and build resilience through consistent, predictable, and meaningful interaction with nature. The next section will discuss evidence around the emotional regulation and HT in the context of the autistic and ADHD populations by addressing the co-occurring instances of anxiety and depression.

Emotional Regulation in Neurodivergent Populations

Rosa et al. (2023) did a systematic review of randomized controlled trials (RCTs) on the impact of horticultural interventions on depressive symptoms. The articles they reviewed provided consistent evidence that gardening can reduce symptoms of depression, and it reaffirmed the potential of horticultural therapy (HT) as a therapeutic intervention for emotional regulation. It can be said that a strength to this review was the emphasis on RCTs since they can make more powerful causation claims than studies using observational designs. Variability in sample characteristics and intervention designs in controlled trials, however, hindered the strength of a universalized finding. For neurodivergent populations, the results were especially pertinent since co-morbid anxiety and depression is common with autism and ADHD. In conclusion, Rosa et al. (2023) provided compelling evidence for the inclusion of HT as a complementary intervention for those experiencing difficulties with emotional regulation in neurodivergent populations.

Zhang et al. (2022) also supported these findings when they conducted a meta-analysis of HT interventions on older adults and identified consistent findings of reduced depressive symptoms because of the HT activity. Zhang et al.'s (2022) focus was on older adults, however, their meta-analysis used strong methodological processes to provide a reliable estimate of how HT may provide outcomes that improve mood. One of the benefits of a meta-analysis is that it aggregates several trials and provides an estimate of pooled effects, thereby increasing the degrees of freedom and reliability of an outcome. One limitation of the Zhang et al. (2022) review was the narrow age cohort under review, which leaves an unfulfilled inquiry regarding the applicability of these findings to age cohorts younger than adults, e.g., children or adolescent populations. Regardless, the identified consistent finding in both studies was that engagement in the garden tasks led to improved emotional well-being, a finding that has relevance throughout the life span and especially for neurodivergent groups, who may be at heightened vulnerability to difficulties with mood.

Barakat et al. (2019) explored the therapeutic role of nature for autistic children, highlighting how natural environments led to decreased stress and improved behavioural regulation. One strength of this study was its attention to the intersection of autism and therapeutic engagement with nature, providing a population-specific study. However, it was descriptive in its design and therefore causal connections could not be established. Nonetheless, the findings indicated that structured nature engagement could promote external social outcomes and internal emotional regulation. The study proposes that for autistic children the therapeutic potential of gardening afforded opportunities for grounding and self-soothing and could be considered a flexible intervention for stress and anxiety management.

The Healis Autism Centre (2024) confirmed findings and provided details about the sensory-related potential of therapeutic horticulture to reduce the impact of sensory stressors for autistic individuals and enable emotional regulation. Their observations noted that organized and controllable exposure to multisensory plant-based activities helped to mitigate emotional overwhelm and allow recipients to calm. The lack of rigorous empirical data in their report weakens definitive conclusions, but the applied reflections provided some useful considerations for practitioners developing HT programs for people who are neurodivergent. The report provided indications of how HT could still be organized to afford regulation and predictability, whilst maintaining the aspirations of accessible interventions for individuals undergoing increased emotional sensitivity.

The Melbourne Disability Institute (2023) provided further evidence with a community-based report on the benefits of horticulture with autistic participants. They indicated improvements to mood and emotional wellbeing as outcomes of structured gardening initiatives. One advantage to this source was it was informed through lived experience, demonstrating practical knowledge and application from program delivery; however, similar to the Healis report, the absence of peer-reviewed rigorous methods limited drawing definitive conclusions. Still, the implications were valuable in suggesting accessible,

community-focused gardening practices contributed to a reduction in emotional distress, and demonstrating the capacity of horticultural therapy to meet emotional regulation objectives in inclusive, real-world spaces.

Yang et al. (2024) contributed to the evidence base by conducting a feasibility study on indoor horticultural therapy for anxiety and sleep difficulties. They suggested indoor gardening, especially with calming plant choices and other structured program options, were able to significantly reduce anxiety and improve sleep quality. A strength of the study was the emphasis on controlled spaces indoors, making the results particularly applicable for urban populations, or individuals with little access to outdoor gardening. Limitations that include small sample sizes and the exploratory purpose of the feasibility design restrict generalizing results. Notably for neurodivergent urban populations, the study utilized indoor horticultural therapy to provide predictable, comprehensible, and manageable environments to decrease overstimulation while still allowing space for grounding and relaxation.

One complementary source was provided by Hassan et al. (2018) complying with a laboratory-based study of young adults, finding state anxiety and physiological indicators of relaxation were decreased for participants completing the transplanting plants task compared to participants completing a phone task. Two methodological strengths were the experimental design and use of EEG data, offering objective measures of emotional regulation. Experimental design short duration and limited sample plan were limitations, but results were useful in demonstrating even brief horticultural tasks might provide immediate stress relief. For neurodivergent participants who might benefit from short, structured interventions, these results featured the potential for horticultural therapy to offer support for regulation and coping.

Cumulatively these articles suggested horticultural therapy was consistently associated with improvements for emotional regulation by reducing anxiety, depression, and stress in diverse populations and settings. Although some articles relied on qualitative or feasibility designs, the

comprehensive evidence including systematic reviews, randomized trials, biomarker studies, and applied program reports demonstrated the flexibility of horticultural therapy as a therapeutic modality. This literature suggested that horticultural therapy could be structured to include support for co-occurring emotional difficulties in a predictable, values-based, and accessible approach for neurodivergent populations, with reference to a broader counselling framework, which emphasized regulation, autonomy, emotional well-being, and resilience.

Even though most literature demonstrated horticultural therapy could reduce stress, anxiety, and depression, little evidence was found regarding how horticultural therapy should be designed and structured to support the sensory and cognitive differences in neurodivergent individuals. For autistic and ADHD populations, often the success of HT is reliant not just on the physical horticultural activity, but also how the environment, pacing, and sensory factors are structured. In the next section, design considerations are discussed to make horticultural therapy accessible and effective for individuals with sensory sensitivities and attention differences, including how adjustments could maximize therapeutic opportunities.

Design Considerations for Sensory and Attentional Differences

Mostafa (2008) proposed a sensory architecture framework for autistic users with a series of proposed design principles that minimized potential sensory overload and allowed opportunities for safe, structured stimulation. She suggested that predictable spatial layouts, reduced acoustic distractions, and manageable lighting levels increased access to the environment for those with autism. One positive feature of Mostafa's work was its theoretical grounding in topics such as neuroscience and occupational therapy. However, being a conceptual article, it was not walked through empirical testing; as such, it was impossible to consider generalizing this work and recommendations. Regardless, Mostafa's framework had a direct application to horticultural therapy (HT). If architectural design modulates sensory experiences, HT environments could be organized with straightforward routines,

calming sensory stimuli, and opportunities to make choices to accommodate preferred and appropriate sensory experiences. A consideration towards the future design of the workshop was creating horticultural activities that presented sensory opportunities and engagement, while allowing self-regulation or reprieve from initiating sensory stimuli, was especially important to support participants.

Chapman and Botha (2023) organized a neurodivergence informed position that identified that environments are best designed to validate and accommodate neurological differences rather than correct and "fix" them. Their analysis, framed by the neurodiversity paradigm, suggested that therapy must acknowledge identity and provide useful accommodations when considering sensory sensitivities and attentional difficulties. A strength of this paper was the theoretical reference to the social model of disability, making a shift in the focus from deficits of the individual to the adjustments to the environment. Limitations were to not be able to empirically evaluate horticultural settings directly. The framework offered by Marra et al. (2011) stipulated three important features of workshop activities for HT design: autonomy, offers of choice, and flexible participation. Each workshop must recognize autonomy, offer choices in activities, and options for participation. These guidelines harmonized with the principles of person-centred therapy that emphasise the process of planning horticultural sessions is as important as the activities that are planned for the sessions.

Similarly, Healis Autism Centre (2024) offered practical insights into the ways horticultural interventions can be modified to suit autistic individuals who may be dealing with sensory sensitivities. The report provided an example of how sensory distress could be alleviated in the context of engagement using controlled exposure to textures, smells, and visual stimuli. The practical strength of this document was in contextual recommendations around modification of activities like potting plants or herb manipulation. The limitation of this source was there was no peer reviewed method. Even so, these insights illustrated that HT could be made more accessible through careful planning of plants, tools, and activity structures. In the context of a workshop, this would require considering flexible

participation, that actively facilitated multiple entry points for participation for participants who could seek sensory avoidance, and those who sought sensory engagement.

Finally, Taylor, et al. (2001) contributed to the design discussion by demonstrating that green play settings enhanced attention and reduced ADHD symptoms in children. The study's outcomes focused on play, rather than horticultural therapy. What was strong about their work was the notion of a natural environment as restorative for attentional capacity. Limitations included parental reporting that may have introduced bias in the study. Nonetheless, it was clear what it meant for HT; activities carried out in a natural or plant-based environment supported executive function through their ability to provide attentional restoration. Though not identical, the implications of their findings for a workshop design could be considered when structuring gardening tasks with clear sequencing, opportunities for movement, and breaks for sensory rest that would complement attention differences while also building in opportunities for planning and follow-through.

In summary, the studies referred to in this section made it clear that the effectiveness of HT for neurodivergent participants is sensitive to design features that consider sensory and attentional needs. Given some of the literature cited in this section remained conceptual or even descriptive, the insights from the combined studies provided a map for adapting HT activities to optimize therapeutic benefit, and relevant considerations were at the forefront of designing the workshop described in Chapter 3, ensuring accessibility, flexibility, and affirmation for neurodivergent participants.

Horticultural Therapy Across the Lifespan

Although much of the literature regarding horticultural therapy (HT) has focused on limited populations such as older adults or specific diagnoses, there is ample literature that highlights the positive impacts across the span of human development. Gardening activities delivered in clinical, educational, or community contexts have been shown to effectively facilitate emotional regulation, social affiliation, and cognitive functioning in children, adolescents, adults, and older adults. In addition,

considerations around accessibility including options for indoor gardening, and social, cultural, or ecological relevance important contextual factors also impact how HT may be intentionally used and meaningfully developed. This theme explores how HT may be facilitated across developmental stages, with attention to the implications of age and accessibility, as well as cultural factors for therapy delivery.

Adults

Ambrose et al. (2023) investigated the outcomes of happiness from household gardening and community gardening both before and during the COVID-19 pandemic from an urban perspective. While both modalities of gardening were correlated with positive well-being outcomes, community gardening also provided additional social outcomes through community connection and belonging. The study was a comparative study, and one strength of this study was that it demonstrated that the process of gardening can contribute to well-being outcomes in a multitude of different circumstances. The study's one limitation was that it relied heavily on self-reported measures of happiness, which misses representation of longer-term outcomes or physiological measures. Nonetheless, even with this limitation, the findings showed that for adults, HT may be a flexible means for improving well-being through either an individually based restorative engagement at home, or through the shared experience and social engagement in public greenspace. Home and Vieli (2020) conducted a cross-cultural study on psychosocial outcomes of urban gardening with Swiss and Chilean adults. They found that the gardeners in both cultures presented restoration, emotional well-being, and social connection as consistent reasons for gardening. The strength of the study was the cross-cultural design, and that the psychological psychosocial benefits extend across countries and cultures. The limitation cited was self-selected samples subjected to potential bias reflect regarding participants who were pre-disposed to gardening. Nonetheless, the findings supported the overall potential of HT and indicated that adults in both contexts viewed plant-based activities as a positive contribution to their mental health and

community engagement. Regarding counselling practice, this continued to affirm that HT could be integrated into adult interventions and that the approach had implications across cultural settings.

McGuire et al. (2022) provided additional exploration of the adult experience of HT through qualitative interviews of community garden organizers. The authors referred to community gardening as a "bricolage" of practices which supported resilience, creativity, and collective well-being. One of the benefits of the study was the depth of qualitative data that illustrated nuanced perspectives of how gardening contributed to health and identity. However, the voices of organizers may not represent the voices of participants, thus limiting generalizability. Nevertheless, the results illustrated that gardening for adults was not an individual health behaviour but rather a social infrastructure, which created shared meaning and belonging. For the neurodivergent adult, this implies that community-based HT programs might provide accessible thresholds for socialization and identity-building, in supportive spaces.

Young et al. (2020) studied psychological restoration in urban gardens. Their findings implied that garden type, biodiversity, and garden-related stress were significant predictors of restoration. Their findings illustrated that gardens with more biodiversity and cared for features restored better psychological experiences. The strength of this work was consideration of environmental variables, which offered insight into how quality of gardening spaces influences outcomes. Limitations included its observational design, which did not directly intervene. Overall, the results suggested that the regenerative possibilities of HT for adults could be maximized with respect to ecological quality and management and highlighted the role of methods in therapy.

To conclude, Sia et al. (2022) looked at gardening during the COVID-19 pandemic in Singapore, including the application of horticultural therapy on adults and found that those adults who had been gardening went on to have greater levels of mental resilience than their peers who did not garden or engage with nature. This is another distinctive study that assessed gardening as a coping strategy, vis-a-vis a collective crisis, and highlighted its positives, but it lacked the ability to make causal inferences

through cross-sectional data collection. Their results also suggested that gardening acts as a buffer to stress and uncertainty in unfamiliar situations; situations that had either taken on or disrupted virtual or physical expectations. For the adults, the study highlighted the possibilities of horticultural therapy, not just as a therapeutic intervention, but as a concrete resiliency strategy that can be transferable to various life situations.

These studies collectively indicated that HT fostered adult wellbeing across several dimensions, including happiness, resilience, social connection, and restoration. Although each study took on different approaches, there is clear and accumulating evidence to suggest that gardening provided adults compelling ways to modulate emotion, build community, and develop resilience in each of their socio-eco cultural contexts within the pandemic. These studies argue with greater conviction for HT as a transferability across adulthood, for both individuals as well as community access to wellbeing.

Even though the literature indicated that horticultural therapy responds to support adult wellbeing in socio-eco cultural contexts, there also remains a significant body of literature indicating the role of HT in childhood and adolescence. For younger populations, gardening is not merely an opportunity to foster emotional resilience, rather it is a developmental opportunity to support sensory regulation, attention, and social development. The following section highlights the application of HT with youth and the creative ways that horticultural therapy has adapted to meet the demands of youth.

Youth

Barakat et al. (2019) examined the relationship between natural environments and the wellbeing of autistic children and labeled natural environments as a "healer" for autistic children. This exploratory study determined that natural environments were associated with increased communication, decreased stereotypical behaviours, and improved emotional regulation. Barakat et al. (2019) relied upon descriptive analysis and synthesis of previous observational studies, rather than using controlled experimental methods or random intervention design. This restricted the conclusions of their

work because there were no causal inferences made regarding whether exposure to nature created the improvements, or were the improvements affected by extraneous variables such as family engagement, program design, or therapy taking place alongside the therapeutic effects of nature.

Another limitation that Barakat et al. (2019) presented was inadequate information on sample size and participant specifics, reducing transparency and weakening the applicability of the findings to large populations of autistic children. Additionally, Barakat et al. made broad statements about nature exposure without isolating horticultural therapy (HT) as an intervention (HT was just one dimension of nature exposure). While this work had shortcomings, one of its strengths was the focus on the sensory and emotional effects natural environments had on autistic youth, consistent with theories of sensory regulation that validated including gardening in therapeutic practice. Barakat et al. offered a point of reference to depict nature as a tool for regulation and social development in autistic children, even if there is more empirical research to be done to clarify the mechanisms of change.

Wagenfeld (2019) explored the role of sensory gardens in the support of autistic youth, indicating how various interactive features such as textures, calming scents, and pathways could mitigate anxious responses and promote engagement. Although this work did not put forth any new empirical data points, it drew from design principles and related practice in therapeutic contexts. The method was descriptive, providing conceptual networks and recommendations based on practitioner experience for how to create gardens that addressed sensory considerations. This was a strength as it provided practical guidance for structuring horticultural spaces that practitioners could implement in clinical, educational, and community program settings. However, the lack of any systematic data collection or outcome measures was a major drawback, and without participant level data, the reach of sensory gardens as interventions for emotional regulation and social engagement could not be measured or compared to control conditions. The lack of attention to variability among autistic individuals (i.e., determining sensory profiles, communication style, co-occurring conditions, etc.) also

limited the conditional transferability of the recommendations. Nevertheless, Wagenfeld (2019) provided a meaningful contribution by situating HT within a design focused framework and underscoring the importance of developing therapeutic environments that are predictable, calm, and flexible. For researchers and practitioners, the work illustrated the need for future studies around sensory garden interventions to evaluate their outcomes empirically; meanwhile, it provided practical design considerations that remain relevant for developing HT workshops with youth.

A research study conducted by Taylor et al. (2001) compared children with ADHD on how attentional outcomes were impacted by play in two contexts, green outdoor environments or built indoor environments. The findings related to the green play setting associated with reductions in ADHD attentional symptoms, and specifically inattention when compared to built environments. A strength of the study was the cross-comparative design, which allowed researchers to not only define the environmental variable of 'green play', but also how it relates to attentional regulation in children. The researchers examined environments as they naturally occurred instead of experimental tasks, which enhanced the ecological validity of the study, and used measures that were representative of the everyday contexts of children with ADHD.

The study did have some limitations. The assessment of attentional outcomes was reliant on parent-report identifying limitations related to some subjective bias from parents who may interpret their child's behaviour with different levels of expectations. The study also did not provide information about any long-term, or follow-up outcomes as it observed associations and not any structured intervention over a period. Furthermore, the relationships cannot be causally attributed because the children were not randomly assigned to the play environment, and it did not maintain participants with ADHD outside of the other children that were studied. Nevertheless, the collection of empirical evidence that clearly illustrates a direct relationship between natural environments and targeted attention improvement of populations with ADHD is rare and valuable. Although this report is over twenty years

old, it remains relevant today given the limited amount of empirical work on ADHD, attentional regulation, and nature-based strategies. Taylor et al. (2001) also continues to be widely cited and is routinely referenced as significant foundational evidence, which initiated previously anecdotal studies and practice-based reports of how natural settings, can help restore attention and reduce hyperactive behaviour. This report provides an example of how horticultural therapy or structured and plant-based activity in a natural or botanical environment could potentially and positively support executive functioning and attentional regulation in youth with ADHD.

The Melbourne Disability Institute (2023) also described the therapeutic horticulture advantages for autistic people, especially when utilizing community-based spaces for children and adolescents. The report cites improved mood, sensory regulation, and engagement in group gardening activities, as benefits of community horticultural therapy to support neuro-divergent youth. One strength of this source is that it is applied and reflects practical experience of community implementation and uncovers how programs get made and participants function together in their environments. The article outlined richer details about activities like planting, weeding, and shared maintenance of group gardens to demonstrate how horticultural therapy potentially provides support for regulation, but also engagement.

This account has methodological limitations. As a practice-based report, it cannot demonstrate the systematic reliability and rigor of peer-reviewed research: selection criteria for participation, sample sizes, and measures of outcomes were ambiguous or completely lacking, so validity and reliability are not issues we can consider. The report's findings are best considered descriptive and illustrative rather than causal. Regardless, these applied insights are valuable, in part because peer-reviewed literature about horticultural therapy (HT) in autistic youth remains limited. Meaning, in the absence of a large body of rigorous empirical studies, practice reports such as this one are useful for filling important gaps by illustrating practice in situ and how interventions are delivered to research participants. The report

from the Melbourne Disability Institute (2023) is relevant to this capstone not as the authoritative end of a line of evidence, but as an example of becoming a connecting link in a long chain between research and practice. It shows that HT programs can be customized to fit the needs of neurodivergent youth, informing practice by providing models of inclusion alongside the more general findings in the peer-reviewed literature. These applied perspectives link to the workshop design in Chapter 3, demonstrating how community-based and accessible infrastructure can function to provide both therapeutic outcomes and participation opportunities.

An article by Oakley (2015) explains the benefits of HT for children, emphasizing some benefits, including self-esteem, patience, cooperation, and working towards an end goal. It also was written from a practitioner perspective based on experiences of working with children in the garden rather than presenting formal empirical research. The applied orientation was helpful as it provided tangible, developmentally relevant examples of how children might undertake gardening related tasks, including planting seeds, tending to plants, and cooperating to maintain the garden. These descriptions highlighted how HT could function as a therapeutic process, while also a developmental process that could have implications for teaching life skills in an engaged, concrete manner. It is important to highlight that a caveat to this report was its inability to collect systematic data. As the report included no participant demographics, sample sizes, or standardized outcome measures, it is impossible to provide any reliability or generalizability to the claims and conclusions in the report. Moreover, without inclusion of a control group nor a longitudinal design, it was impossible to know whether any benefits observed in the caregiving contexts were due to gardening, or a result of wider contextual influences, such as adults' involvement to encourage students to participate, or that any offered benefits were related to novelty effects. Such limitations are typical of practice-based accounts but revealed the need for further systematic evaluation of HT involving children. Although Oakley's work is a decade old, it remains relevant because of the lack of quality readily available peer-reviewed HT literature focused on children.

In the absence of a robust evidence base with children, reports from practitioners, such as Oakley's study, are experimentally important in terms of understanding HT in child-centered contexts. The reports also concern developmental indicators (e.g. patience, cooperation, and responsibility) that are more relevant for children with attentional or social competencies. For this capstone, Oakley's work provides practical examples carrying the potential to support the co-design of structured, child-centered gardening activities in workshops, and demonstrates and reflects on how HT can be developmentally engaged to promote transformation across therapeutic and developmental domains.

When taken together, the studies suggest horticultural therapy promotes youth's well-being by enabling sensory regulation, attention, emotional well-being, and social learning. Although there are limits to methods, and even more particularly when the conversation is limited to "descriptive and applied" reports, the evidence for child and adolescent gardening as a meaningful intervention is quite strong. The evidence also supports the potential development opportunities of HT, implicating that activities involving plants may promote growth across domains during formative years.

While there is literature addressing youth that suggests horticultural therapy is supportive of developmental competencies, sensory regulation and social learning in formative years, an important field of enquiry addresses HT in later life. At aged care facilities, gardening practice is generally characterized to enhance mental well-being, personal physical functional, and social connection in contexts of aging. The next section addresses HT to support those in late life, and the unique ways in which HT addresses challenges associated with the last stages of the life span.

Elderly

Zhang et al. (2022) reviewed the literature on horticultural therapy interventions for older adults systematically and then conducted a meta-analysis, finding that participation was consistently linked to reductions in depressive symptoms. The quantitative rigor of Zhang et al. (2022) makes it a strong contribution, as the meta-analysis synthesized findings across multiple published trials to provide a

reliable estimate of the effectiveness of HT. The authors sought to include studies examining all types of horticultural program formats and settings, thus extending the applicability of their findings to multiple valuable contexts in elderly care. A limitation included the heterogeneity of studies included in the analysis, as their varying intervention designs, durations and outcomes could not always be meaningfully compared with each other. Additionally, most of the studies were conducted in East Asian contexts, which raises concerns about generalizing results to other cultural contexts. A strength of the review and subsequent meta-analysis was Zhang et al. (2022) showing that HT reliably benefits older adults' moods and emotional regulation, meeting the need for a nonpharmacological intervention option to late-life depression. Han, Park, and Ahn (2018), implemented and evaluated a structured 10-session HT program for elderly participants, examining psychological outcomes and biological markers of stress. They found participants had significant reductions in salivary cortisol levels, improved physical functionality, and elevated mood after participating in the ten sessions. A strength of the study included the author's incorporation of physiological biomarkers with psychological self-report measures, providing an objective means of confirming effects of HT on stress reduction. Much of HT interventions are in a multi-session designed similar to many clinical practice models, with repeated engagement being the key to sustained active change. One limitation, though, was the relatively small sample size due to limitations to statistical power, as well as the cultural specificity of participants which limited generalizability. Nevertheless, this study illustrated how HT could be oriented to address both mind and body, helping aged individuals with stress management and functional independence.

Shen et al. (2022) examined the effects of HT on sleep quality, mental health, and salivary measures of mucosal immunity among aged individuals. They found sleep improvements and stress-related biomarker improvements resulting from six structured HT activities. The strength of this study was its multi-dimensional design and methodological synergies in evaluating psychological and physiological outputs, making it more robust in substantiating findings. The limitations were small

sample size and not having follow-up dates, which limits conclusions about durability of observed effects. That said, the study mattered because sleep disturbance and immune dysfunction are two significant challenges associated with aging populations, and HT offered a non-invasive and attractive way to improve both. Their results further highlighted HT contributions to holistic well-being in aged people, meaning that aspects such as emotional regulation, physiological resilience, and health maintenance are connected.

Jarrott and Gigliotti (2010) compared horticultural activities to traditional recreational programming, in a dementia care context. The authors eventually affirmed that HT elicited higher levels of adaptive engagement, although there were no substantial differences regarding affective state between conditions. The randomization of sites and the use of observational data enhanced the validity of the behavioural outcomes which is a methodological strength. However, these findings were limited in scope by the short duration of the program and dementia-specific population sampling. Nonetheless, this study illustrated how horticultural therapy could promote active engagement and reduce withdrawal among those who are elderly, and experiencing extreme cognitive encumbrance. More specifically, for dementia care the study illustrated that horticultural therapy provided a unique advantage when providing physical engagement by combining sensory stimulation with purposeful engagement opportunities.

Loue et al. (2014) described therapeutic farm communities as an innovative solution for individuals with chronic mental illness including older adults. They found programs to be a fusion of horticulture, a way of life, providing participants with, routine, responsibility, and most importantly social belonging. A methodological strength of this study is the researcher was applying an ecological perspective on the value of incorporating holistic, community-based care in long term care. However, as the study was an observational study, it lacked controlled outcome measures, and therefore, cannot be rated as a higher evidentiary strength. Nevertheless, findings demonstrated how horticulture activities

could provide the support for elderly populations living with mental illness, through providing them with structure, connection, and meaning. The study by Loue et al. (2014) is relevant to this capstone, because it demonstrated the applicability of horticultural therapy through the lifespan which supports its utility as a therapy and community-based integration during later adulthood.

While the studies identified horticultural therapy as supporting elderly populations through lowering depression, better stress regulation, restorative sleep, and immune function enhancement, and promoting engagement for populations with dementia or chronic illness, methodological deficits exist. Methodological issues were discerning limitations of true implication such as using smaller sample sizes and differences in program designs around the vastly different context of horticultural therapy. However, overall evidence began to converge on horticultural therapy use as an efficacious intervention for supporting holistic wellbeing during later life. Slater (2023) and Alexander et al. (2022) exemplify the larger implications of promoting horticultural therapy during elder care practice as a means of promoting emotional resilience, enhancing physical health and social connection to a broader goal of keeping individuals' dignity and quality of life while aging.

Despite highlighting how horticultural therapy may support individuals' wellbeing during later life, the theme of accessibility and its application in broader scope remains an essential feature of horticultural therapy. With some exceptions, not all children, adults, or elderly individuals have the same or consistent access to outdoor or community-based gardens, green spaces, or therapeutic farm communities. Thus, for some, having the opportunity to engage with plants indoors or in a more adapted version of a garden becomes critical to the evolution of equitable therapeutic intervention opportunities. The next section will review research focused upon indoor gardening, accessibility around horticultural therapy, and how we might be able to adopt plant-based interventions inside homes, classrooms, or clinical spaces to help expand horticultural therapy for use with diverse populations.

Indoor Gardening and Accessibility

Yang et al. (2024) examined innovative indoor horticultural therapy to reduce anxiety and improve sleep. Participants engaged in activities involving structured indoor gardening with designated plants, including certain indoor aromatic herbs and ornamentals, and participants reported improvements in both measures of emotional regulation and evidence of sleep quality improvement. The study theoretically highlights two methodological strengths, the indoor venue as populations engaged in HT, and the consideration that the designated specific plants lend to outcomes given the sensory profile of the plants. The study had some important limitations in a small sample size and an exploratory design, which limits comparing potentially similar participants. Despite the limitations, this is an important study to show HT could be adapted to an accessible indoor condition making it especially promising for neurodivergent populations that may benefit from predictable and controlled sensory contexts.

Spano et al. (2021) studied psychological health during Italy's COVID-19 lockdown, and the role of some green features in indoor-outdoor settings. They reported results of a nationwide survey about psychological health in Italy, and findings revealed individuals with access to natural elements at home (i.e., indoor plants, views of greenery, or small gardens) reported better psychological health than individuals without natural access. A strength of this study is its large, cross-national sample, increasing the reliability and generalization of the results. The limitation was the cross-sectional study, which created challenges to claim causality, yet the study highlighted the psychological importance to having access to greenery and during times when the outdoor environment was inaccessible. For HT, this study showed that introducing nature into homes or therapeutic indoor spaces could be a substantial accessibility intervention to help those who experience mobility, environmental, and health barriers. Wu et al. (2022) conducted a study about home gardening intentions in Taiwan amidst the COVID-19 pandemic, in which they discovered that participants that felt higher levels of stress felt higher levels of intentions to garden, and once they engaged in gardening, their health improved. One of the strengths

of the research was that it connected behavioural intentions to health outcomes, establishing a connection between stress and the uptake of home gardening. Further strength was the large sample size, although it was limited by reliance on self-report measures and non-experimental research design. Nevertheless, the research established that participants engaged in gardening as a coping mechanism in times of stress, so it is likely that accessible indoor, or home-based gardening interventions in stressful periods may be effective coping strategies. For this capstone, results apply to show the value of HT in extending accessibility when there are restrictions to outdoor activities.

Corley et al. (2021) researched gardening among older adults during the COVID-19 pandemic, and they found adults who used their home gardens reported better outcomes for physical and mental health than those who did not garden. A strength of this study is that it targeted an older population, thus it helped to understand accessibility needs in groups that often live with mobility restrictions. The observational design does limit causal claims, however, the large sample size demonstrated statistical power. The results support the idea that inexpensive and accessible interventions, such as home gardening, can maintain well-being and resilience in populations who may not have access to outdoor group HT programs.

Suyin Chalmin-Pui et al. (2021) evaluated a front-garden intervention where participants had previously unused garden space converted into productive green space in the United Kingdom. The participants reported enhanced well-being, and they also had healthier diurnal cortisol profiles several months on from the intervention. The use of mixed methods was a strength, providing subjective and biological outcomes, however, a limitation was that there was no randomized control group, which meant causation could not be firmly established. However, the study did demonstrate that even small and simple interventions at the household level can have meaningful improvements on health outcomes. For HT, this demonstrates that physical accessibility could be met not only through formal therapeutic programs but even by modifying domestic spaces.

Collectively this research demonstrates how HT can be successfully adapted to indoor and home contexts and provides some access for those with reduced mobility, those who have no appropriate outdoor space, or those with complex sensory needs. Although noted limitations (self-reports and observational designs) will require consideration, the body of evidence demonstrates that indoor HT do present opportunities for considerable improvements in emotional regulation, resilience, and well-being. It is also important to note that for purposes of this capstone, this evidence is particularly salient to the workshop in Chapter 3 that involves adaptable and accessible plant-based activities of a small-scale and indoor nature.

The literature related to indoor and home-based gardening illustrates that horticultural therapy can be adapted to promote accessibility, another dimension of accessibility is cultural and ecological context. The meaning of gardening, the types of plants, and the social structures around horticultural practice are different amongst communities and regions. Considering these cultural and ecological elements is important to ensure that HT is not just physically accessible, but also meaningful, relevant, and considerate of their lived experiences. In the next section, I explore how cultural background and ecological placement shape the design and effectiveness of HT programs.

Cultural and Ecological Relevance

Home and Vieli (2020) conducted a comparative cross-national survey of urban gardeners from Switzerland and Chile, with the goal of assessing psychosocial outcomes and motivations using questionnaires. Across backgrounds, they found that gardeners described the following key benefits of gardening participation: restoration, emotional benefits, and social connection to others. The authors explained that their specific methodological contribution was the cross-national, comparative approach, as it would allow them to examine universal motivations when gardening and culturally important motivations as well. Though the authors used a survey and a self-selected sample, which may have led to bias towards respondents who were already attempting to garden, the questionnaire did not have

any future follow-up, which limited follow-up potential or sustained benefits. Nevertheless, it helped show that, although gardening benefits might be broadly consistent across cultures, gardening motivations and meanings differ broadly: Chilean urban gardeners emphasized collective or social purpose, while Swiss urban gardeners prioritized personal restoration. These differences indicate any therapeutic horticulture activity should be sensitive to cultural priorities regarding gardening.

Marcus and Sachs (2013) pulled their evidence from design research, case studies, and observational reports in their book *Therapeutic Landscapes: An Evidence-Based Approach to Designing Healing Gardens and Restorative Outdoor Spaces*. Their methodology was not experimental; rather it was integrative, bridging design with the existing body of empirical research on healing environments. The study's merit was in its applied (i.e., a practice-focused distillation of guidelines for creating therapeutic gardens sensitive to cultural symbolism and ecological attributes) and practice-oriented focus. However, the methodological limitation was that, at least throughout the text, there were no prospective or comparative controlled trials or any epistemological evaluation, meaning conclusions were based heavily on secondary evidence. Regardless, the book is important for HT because it showed that therapeutic spaces need to be sensitive to cultural meaning—such as heritage plants, meaningful descriptive features, or ritualized gardening tasks—as well as the ecological effects of things such as biodiversity and native plants.

Ugolini et al. (2021) conducted a nation-wide web-based survey in Italy during the COVID-19 lockdown to examine the relationship between access to urban green spaces and psychological health. The study had a sample of 2,500 participants and used statistical analysis to determine how deprivation of green space was associated with poorer well-being outcomes. This study's strength was the large representative sample which increased the generalizability of the study across the Italian population. This study's weakness was the observational and cross-sectional study design that restricted causal inferences and left potential confounding variables (e.g., socioeconomic status, housing quality)

unconsidered. The study found that ecological accessibility was important: if you did not have nearby or usable green space, it was deprivation; HT needs to consider equity issues related to access to natural environments.

De Meo et al. (2022) used structured questionnaires to assess how citizens utilized public green spaces during the COVID-19 pandemic in Italy. This survey collected information on behaviours, motivations to use the green space, and perceived benefits of using the green space. A methodological strength was that it assessed behaviour change during ecological and social disruption - which allowed for theorizing the variation in access to nature in crisis contexts. However, they also had limitations on the narrow geographic area considered and a reliance on self-reported (e.g., as opposed to observational) data, which could bias their findings. This study is relevant to HT, because it indicated that cultural norms and ecological availability inform how communities engage with and value green space. These findings reiterate to practitioners that local cultural norms and ecological conditions must be considered for therapeutic horticulture programs to succeed.

Similar to Hartig et al. (2014) a narrative review synthesizing the evidence from epidemiology, environmental psychology and public health, Hartig et al. (2014) followed a review methodology to synthesize research findings to frame nature as a health determinant from a viewpoint integrating research findings from large population-based studies, experimental studies and theoretical models. Hartig et al. provides a broader interdisciplinary perspective as it attempts to link three fields of investigation—cultural, ecological and health—into a single body of work with a single theoretical framework. Its weakness lies in its broadness; while it connects multiple forms of inquiry, there is less in the way of examining interventions, specifically horticultural therapy. Nonetheless, Hartig et al. is valuable for placing HT in the international dialogue on equity and public health, and showing that cultural norms related to land use, ecological stewardship, and access to green space factors into the health benefits provided by exposure to nature.

Together, these studies clearly show that cultural context and ecological context informs the design, delivery, and effectiveness of horticultural therapy. While gardening is constantly associated with psychological benefit, the ways people value and engage with plants is influenced by cultural traditions, psychological and physical access or availability of plants, and societal inequities in access to green space. For practice in horticultural therapy (HT), this indicates that interventions need to be varied to account for not only individual sensory and cognitive needs but also the cultural and ecological realities of participants. The research provides considerations for the design of inclusive, culturally relevant HT workshops that are inspired by a recognition of diversity in access and meaning making.

Summary of Findings

The review of literature offered insight into the therapeutic potential of HT as it relates to neurodivergence, with specific emphasis on autism and ADHD. Across the three main domains—benefits of HT, neurodivergent needs, and lifespan applications, the evidence consistently highlighted HT as a flexible and accessible intervention that supported the emotional regulation, sensory processing, executive functioning, and social engagement of participants.

Benefits of Horticultural Therapy established that HT benefit participants in a variety of delivery formats, including in-person or remote as an individual and as a group. Group based interventions fostered collaborations, opportunities for belonging and low-pressure engagement for social engagement, while individual therapy offered structure, autonomy, and familiar routines for participants who typically experience anxiety in new situations. Studies looking at emotional and mental well-being showed reductions in anxiety, depression, and stress for participants engaged in HT, consistent across self-reports and physiological markers. Emerging telehealth research is showing how HT interventions can be successfully delivered remotely, extending accessibility to populations who face mobility or sensory barriers.

Understanding Neurodivergent Needs (Autism/ADHD) addressed the ways in which HT meets neurodivergent needs. Evidence strongly illustrates that sensory engagement with soil, plants, and sensory tactile elements offers both stimulation and regulation for those with autism and ADHD. This reinforces that HT interventions must be tailored to the adults or children identified sensory profile. Research in executive function illustrated that articulated and structured task-based gardening activities provided a basis for attentional control, planning and sequencing—all of which can be a challenge for neurodivergent potential. HT also established a platform for social learning, and activities provided safe spaces with little verbal demand to develop cooperative actions, turn taking and communication. Emotional regulation was assessed across varied populations and environments, all noting reductions in anxiety and mood difficulties. Importantly, as noted in the design considerations, the elements necessary for HT activities to achieve success for neurodivergent participants depend on environmental predictability, pacing, and autonomy—all of which aligned with person-centred and neurodiversity-affirming frameworks.

Horticultural Therapy Across the Lifespan expanded focus to consider HT intervention across the life span. For adults, studies demonstrated increases in happiness, resilience, and community connection across ecological and cultural contexts. For youth, HT had supporting roles in sensory regulation, attention, self-esteem, and even developmental responsibilities such as cooperation and responsibility, though most evidence was offered through descriptive and practice-based reporting. For older adults, HT can result in significant declines in depression through improvements in sleep, increased immune function, and more engagement consistently, even among participants with dementia—evidence would have been furthered by using biological markers in many of the studies. Indoor gardening also showed promise as an area of accessibility and demonstrated that positive therapeutic benefits can be realized through small-scale or home-based interventions when exposure to the outdoors were not available. Finally, insights drawn from cultural and ecological perspectives

revealed that while effects for participants from these diverse contexts were observed and noted, the ways in which people get engaged with gardening and the meanings attached to their participation were formed by their cultural values and the ecology they were exposed to.

The literature illustrates that HT is a versatile, evidence-based intervention that allows for adaptation across settings, stages of development, and cultural contexts. Although many of the studies had methodological limitations (e.g., small sample size, descriptive nature or relying on self-reporting) the cumulative evidence indicates that consistent therapeutic benefits were provided through HT. With respect to this capstone, these findings provide good reasoning for a workshop for neurodivergent populations. The review outlines that HT supports regulation, executive skills, and social participation in ways that are compatible with theoretical frameworks such as Acceptance and Commitment Therapy, Person-Centered Therapy, and the concept of sensorimotor integration. It also identifies the importance of accessible, culturally sensitive design of programs as we move from research to practice.

Chapter 3: Discussion and Application

This chapter shifts from the literature review to discussion and application, exploring how the findings from Chapter 2 can be translated into practice. Although the research indicated that horticultural therapy (HT) provided valuable benefits for neurodivergent populations such as in areas of sensory regulation, executive functioning, socialization, and emotional health, the goal now is to focus on what this means in a counselling and applied context. The following sections discuss the implications from that literature in therapeutic design, indicate ethical considerations as stipulated by the *BCACC Code of Ethical Conduct (2023)*, and describe an example workshop in how HT can be presented in a manner that enhances accessibility and inclusiveness. The focus of the workshop will include session and materials design, as well as ethics of care when working with neurodivergent participants so that practice remains responsive, affirming, and in alignment with professional standards.

Discussion

The findings from the research discussed in Chapter 2 lend support to horticultural therapy (HT) demonstrating therapeutic effectiveness across contexts and populations consistently and with the potential for neurodiverse populations. This review utilized three themes: benefits of horticultural therapy, needs of autistic and ADHD populations, and uses across the lifespan. Collectively these themes supported informing ways of how HT could be utilized within counselling practice in an intentional way, as well as transitioning into planned workshops.

Significant implications for promising research studies show that HT addresses numerous areas of mental health and physical well-being at the same time. Research studies showed consistent decreases in anxiety, depression, and stress; including physiological and self-report results (Han et al., 2018; Zhang et al., 2022). This establishes HT to be a holistic approach—addressing the mind, body, and spirit—while providing an activity-based system for counsellors to sufficiently provide strategies to support emotional regulation.

Another implication was the synergy of HT and neurodiverse needs. Gardening activities provided structure and sensory opportunities to facilitate regulation, attention, and executive function (Taylor et al., 2001; Yang et al., 2024). Additionally, HT did not have heavy doses of verbal integration or processing like conventional therapeutic practices. HT produces low-pressure engagement through touch, movement and choice making. This is an ideational facet particularly for autistic people and those with ADHD, both having unique experiences to challenges of sensory processing and communication that do not meet neurotypical experiences.

Social connection was another component that came through consistently. HT in a group setting created a space for peers to collaborate, share, and connect with each other through asking tasks without the stress of structured social skills groups (Briggs et al., 2023). The findings show again how HT is a valuable medium for its relationally based development and as signified inclusion in workshops balancing individual sensory needs and space for co-regulation and group activities.

Finally, accessibility is a central consideration. Indoor gardening and telehealth delivery demonstrated that HT can be adapted for participants who face barriers to outdoor or community spaces (Spano et al., 2021; Wu et al., 2022). For practitioners, this underscores the importance of flexibility in design—choosing plants, materials, and settings that are manageable, predictable, and culturally relevant.

To summarize, the literature reveals HT to be a multifaceted, neurodiversity-affirming approach that promotes emotional, cognitive, and relational growth. For this capstone, these findings narrated the framing of a four-session workshop and some focus on sensory regulation, executive function, and anxiety. The following sections will discuss the theoretical considerations about potential ethics considerations and the setup of the workshops.

Ethical Considerations

All therapeutic modalities should adhere to ethical principles, and this is true for horticultural therapy (HT) as well. Facilitators need to be mindful of accessibility, inclusivity, and professional responsibility as part of *BCACC Code of Ethical Conduct* (British Columbia Association of Clinical Counsellors, 2023) when using HT with neurodivergent populations.

A primary consideration is informed consent and autonomy. For many persons with autism and ADHD, prior use of formal education and health care may have involved coercion or pressure toward neurotypical expectations. When designing and implementing HT sessions, it is important that participants have meaningful choice in their engagement, what they do, and even the plants used in their HT. This is consistent with BCACC principles of respect for dignity and right to self-determination.

Another ethical commitment is nonmaleficence, or duty to do no harm. Gardening may involve tools, soil, or allergens, and facilitators need to take reasonable precautions about physical safety and assess for sensory sensitivities. Using predictable routines, clearly structured sessions, and some degree of access to sensory support, like gloves or noise cancelling headphones, will help minimize distress and maximize comfort.

Cultural consideration is also an important aspect of ethical HT practice. Plants and gardening practices have different meanings, across cultural contexts. Participants will have their own values, memories, and meanings related to plants and growth in a therapeutic environment. Best practices require practitioners to honour these meanings, and not take one cultural model of gardening as “universal,” etc. This is also aligned with BCACC for cultural competency and respect for diversity.

Finally, professionals need to abide by our duty of competence and boundaries. As a relatively new profession, HT practitioners need to make sure they are trained in, supervised in the practice, and consulted if necessary. Also, a component of ethical practice involves boundaries concerning the boundaries of HT contributions. That is to say, gardening may inform the emotional regulation and be a

healthy activity, but it will not replace specialized medical or occupational therapy that the participant may need to undergo.

In sum, ethical action highlights HT as a practice based in respect, safety, and inclusivity. By incorporating BCACC principles into program design, professionals can ensure that HT not only fosters organizational and regulation but also conceptualizes respect for autonomy and dignity of neurodivergent individuals.

Application

The literature discussed in Chapter 2 contained strong support for horticultural therapy (HT) to promote a multitude of wellbeing domains for neurodivergent individuals, specifically in domains of sensory processing, executive functioning, and emotional regulation. The key question is how these findings are translated into appropriate, relevant, accessible, and ethically sound practice. This section explored practical uses of HT in counselling and present the workshop that was developed for this capstone.

Important applications are HT can create a low-stress, multisensory context that can promote engagement for individuals that might be nervous with having just spoken for instance in talk therapy. Tactile activity may allow for instant sensory regulation through potting on a plant, watering a plant, arranging plants in a particular order, etc. Those same tactile activities offer executive functioning work, as they take planning, sequencing, and focused attention, but allow for leeway and choices (Yang et al., 2024). For counsellors this means careful scaffolding such that the gardening work can promote growth in these areas but meeting the participants where they are.

Another key application is HT supporting relational learning and social connection. Group gardening has the potential to allow for participants to share tasks, see one another gardening, and foster some kind of communal nature without forcing interaction (Briggs et al., 2023). These social dynamics are important for neurodivergent individuals, who can practice social interactions through

incidents in gardening, rather than social skills training sessions. The offer of HT sessions to include both a group and an individual aspect promotes balance between independence and connection.

Finally, the literature demonstrated the value of accessibility and flexibility. Indoor gardening and telehealth HT have shown that HT can be utilized in multiple contexts (Wu et al., 2022). Practically speaking, this means that clinical interventions can be conducted in small offices, a classroom, or via telehealth, opportunities for access for participants delineating from mobility impairments or sensory anxiety in open air environments. Accessibility can also be meant in a culturally sensitive way: with the choice of plants, metaphors, and traditions being particularly important given participant cultural backgrounds, or their involvement in the healing culture.

In this capstone, these concepts are put into play in relation to developing a four-session workshop that has an emphasis on simultaneously addressing sensory, executive, and relational objectives. The next section will describe the four-session workshop, which offers a concrete real-life demonstration of transferring findings from literature into an intervention that meets the standards of evidence-informed practice, supports neurodiversity, and follows ethical principles of care.

Workshop Design

The workshop I created for this capstone is based directly on the evidence in Chapter 2 and the theoretical frameworks in Chapter 1. Research demonstrates that gardening can alleviate stress, support social connections, and support executive functioning (Briggs et al., 2023; Yang et al., 2024), but the question is, how do these effects translate into therapeutic, structured practice for neurodivergent participants? This four-session workshop merges horticultural therapy (HT) activities within Acceptance and Commitment Therapy (ACT) based principles, as well as utilizing Person-Centered Therapy (PCT) and sensorimotor integration as foundations of accessibility and responsiveness.

ACT offers a productively clear base for this design, whose focus on values, mindfulness and committed action closely aligns with gardening tasks. Planting, nurturing, and witnessing growth offer

clear metaphors for developing resilience and becoming behaviorally aligned with what is most important. For instance, Session 1 invites participants to think about what their starter plant symbolizes for them, taking ACT's values process and giving it a tangible and safely introduced activity. The later sessions continue to blend mindfulness and sensory activities (e.g., touching soil, smelling herbs) with thoughtful insights into how growth in a garden represents growth in one's own life. Each activity reinforces ACT's process of psychological flexibility, particularly validating for neurodivergent individuals who may find themselves in rigid routines or experiencing high anxiety related to disruptive behaviour (Hayes et al., 2006).

The design also draws from PCT by empowering participants with autonomy and choice in planned and unplanned sessions. The activities are purposefully flexible in how individuals can participate, meaning they can take their time, forgo sensory activities that are overwhelming, or even select plants that evoke meaning to them. This is in alignment with Rogers' (1951) notion of unconditional positive regard, where the purpose of the facilitator is to offer empathy, safety, and acceptance—without imposed direction. In doing so, choices for engagement and flexibility in the activities of the workshop illustrates that neurodivergent identities will not require neurotypical formatting to be successful.

Finally, Sensorimotor Integration Theory highlights the multi-sensory activity and visual aspects of activity programming. Many neurodivergent individuals have sensory processing weaknesses (Mostafa, 2008), with gardening allowing for safe and structured multi-sensory interventions. Session 3 utilizes mindfulness and even triggering sensory circle time in a sensory, various levels. It invites participants to notice textures, colours, and scents at each level of comfort and safety, which offers an opportunity for regulation, along with practicing awareness and their own responses to sensory input.

Collectively, this workshop presents how horticultural therapy can be structured with neurodivergent at-risk populations in an evidence-based and theory-based way. The workshop discusses

calming, restorative and developmentally sound plant-based/ horticultural activities combined with ACT's values-based framework, PCT's values of meekness and autonomy, and sensorimotor integration provides good practices of self-regulation. These all lend themselves together to a program that is accessible, adaptable, and meaningful to participants, all while maintaining simplicity and interaction with self, others, and the earth to sustain themselves through engaging in horticulture. The workshop component of this capstone was designed as a four-session program aimed at supporting neurodivergent participants through horticultural therapy (HT). Drawing on the findings from the literature review, the workshop emphasizes three interconnected domains: sensory processing, executive functioning, and anxiety reduction. The sessions were developed to balance individual engagement with group interaction, creating a safe, flexible, and neurodiversity-affirming environment.

Materials

- Small pots, soil, and gardening tools (adapted for accessibility).
- A variety of plants suited to different sensory profiles (e.g., succulents for tactile resilience, herbs for calming scents, leafy plants i.e., philodendron for visual grounding).
- Accommodations such as gloves, aprons, and noise-cancelling headphones.
- Journals or worksheets and drawing/writing utensils for brief reflection activities.

Participant Recruitment

Participants would be invited through community mental health organizations, schools, or counselling practices, with recruitment materials emphasizing accessibility and inclusion. The invitation process prioritizes informed consent, clear expectations, and optional involvement, ensuring participants understand that engagement with activities is always a choice. Special attention would be given to cultural sensitivity and framing the program in neurodiversity-affirming language.

Structure of Sessions

Each session follows a predictable rhythm to provide comfort and reduce anxiety:

1. Opening Circle: Grounding, group check-in, and review of group agreements.
2. Activity: Plant-based task designed to engage sensory and executive functions.
3. Reflection: Optional sharing or journaling about the experience.
4. Closing: Group summary, cleanup, and preview of the next session.

Session Overview

Session 1: Orientation, creating safety, planting individual starter plants.

Session 2: Building small group projects (e.g., succulent gardens).

Session 3: Focus on sensory exploration (touch, smell, sight) with herbs and textured plants.

Session 4: Reflection, choice-based planting activity, and closing circle.

Ethics of Care

Using HT with neurodivergent participants involves a firm ethical commitment to care. That entails offering psychological safety, honouring autonomy, and providing sensory accommodations. Facilitators must also pay attention to power dynamics so that participants feel in control of opting in or out of activities with minimal judgmental expectations. According to the *BCACC Code of Ethical Conduct* (2023), counsellors must prioritize nonmaleficence, practice cultural humility, and establish professional boundaries in seeking supervision or consultation when adapting HT to respond to participants' unique client needs.

Learning Outcomes

By the end of the workshop, participants are expected to:

- Develop greater sensory regulation through tactile engagement with plants.
- Develop executive functioning skills such as planning, sequencing, and task completion.
- Learn anxiety regulation through mindful and intentional plant care.
- Build relational experiences by working alongside others in shared, low-stakes tasks.

Conclusion

In this capstone, I investigated horticultural therapy (HT) and its implication for neurodivergent populations, specifically those who experience autism and ADHD. Through a literature review, I analysed the evidence of HT within three main themes: the benefits of HT for emotional and mental health, HT with respect to neurodivergent needs such as sensory and executive function, and HT across the lifespan. The research overwhelmingly indicated the benefits of HT as it creates distinct opportunities for regulation, skill development, and social relations, while addressing barriers that neurodivergent individuals face in traditional therapeutic spaces.

The discussion and application section expand upon the benefits of HT by considering how they can be brought to life. Ethical considerations, guided by the *BCACC Code of Ethical Conduct (2023)*, emphasizes the issue of accessibility, autonomy, cultural sensitivity, and professional competence in facilitating HT. The workshop framework created in this project is one of many ways to apply the literature structurally with a neurodiversity-affirming lens. By incorporating Acceptance and Commitment Therapy, person-centered approaches, and social and sensorimotor integration, the four-session workshop illustrates ways that gardening projects can function as therapeutic metaphors and practical pathways for developing.

Although this work illustrates the possibilities of HT, it also provides a healthy dose of caution. The absence of human-subject research in this capstone limits the direct outcome assessment of this project, and the relevant literature on indoor HT, and telehealth delivery is less plentiful. Future research focusing on empirical studies that investigate HT for sensory refining, executive functioning, and reducing anxiety in neurodiverse populations would enhance the research on HT. A comparative research study across a demographic based on user group, cultural relativism and service delivery method (indoor, outdoor, virtual) would add an additional depth of understanding the benefits of HT.

This capstone is a tribute to the possible benefits of horticultural therapy as an inclusive, and accessible intervention for capitalizing on both the variety of strengths and challenges facing neurodivergent people. If practice is based in empirics, ethics, and theory, HT is about finding meaningful therapeutic exchange—to cultivate wellness, connection, and meaning through the simple act of tending to plants.

References

- Ambrose, G., Das, K., Fan, Y., & Ramaswami, A. (2023). Comparing happiness associated with household and community gardening: Implications for food action planning. *Landscape and Urban Planning, 230*(104593), 104593. <https://doi.org/10.1016/j.landurbplan.2022.104593>
- American Psychiatric Association. (2022). Diagnostic and statistical manual of mental disorders (5th ed., text rev.; DSM-5-TR). *American Psychiatric Association Publishing*.
<https://doi.org/10.1176/appi.books.9780890425787>
- Annerstedt, M., & Währborg, P. (2011). Nature-assisted therapy: systematic review of controlled and observational studies. *Scandinavian Journal of Public Health, 39*(4), 371–388.
<https://doi.org/10.1177/1403494810396400>
- Barakat, H. A.-E.-R., Bakr, A., & El-Sayad, Z. (2019). Nature as a healer for autistic children. *Alexandria Engineering Journal, 58*(1), 353–366. <https://doi.org/10.1016/j.aej.2018.10.014>
- Bieri, D., Joshi, N., Wende, W., & Kleinschroth, F. (2024). Increasing demand for urban community gardening before, during and after the COVID-19 pandemic. *Urban Forestry & Urban Greening, 92*(128206), 128206. <https://doi.org/10.1016/j.ufug.2024.128206>
- Briggs, R., Morris, P. G., & Rees, K. (2023). The effectiveness of group-based gardening interventions for improving wellbeing and reducing symptoms of mental ill-health in adults: a systematic review and meta-analysis. *Journal of Mental Health (Abingdon, England), 32*(4), 787–804.
<https://doi.org/10.1080/09638237.2022.2118687>
- Chapman, R., & Botha, M. (2023). Neurodivergence-informed therapy. *Developmental Medicine and Child Neurology, 65*(3), 310–317. <https://doi.org/10.1111/dmcn.15384>
- Corley, J., Okely, J. A., Taylor, A. M., Page, D., Welstead, M., Skarabela, B., Redmond, P., Cox, S. R., & Russ, T. C. (2021). Home garden use during COVID-19: Associations with physical and mental

- wellbeing in older adults. *Journal of Environmental Psychology*, 73(101545), 101545.
<https://doi.org/10.1016/j.jenvp.2020.101545>
- De Meo, I., Becagli, C., Cantiani Maria, G., Casagli, A., & Paletto, A. (2022). Citizens' use of public urban green spaces at the time of the COVID-19 pandemic in Italy. *Urban Forestry & Urban Greening*, 77(127739), 127739. <https://doi.org/10.1016/j.ufug.2022.127739>
- Dodge, R., Daly, A., Huyton, J., & Sanders, L. (2012). The challenge of defining wellbeing. *International Journal of Wellbeing*, 2(3), 222–235. <https://doi.org/10.5502/ijw.v2i3.4>
- Erikson, E. H. (1997). *The life cycle completed* (Extended version). W. W. Norton & Company.
- Garrido-Cumbrera, M., Foley, R., Correa-Fernández, J., González-Marín, A., Braçe, O., & Hewlett, D. (2022). The importance for wellbeing of having views of nature from and in the home during the COVID-19 pandemic. Results from the GreenCOVID study. *Journal of Environmental Psychology*, 83(101864), 101864. <https://doi.org/10.1016/j.jenvp.2022.101864>
- Grant, A. (2020, April 2). Autistic Children And Gardening: Creating Autism Friendly Gardens For Kids. Gardeningknowhow; *Gardening Know How*.
<https://www.gardeningknowhow.com/special/children/autistic-children-and-gardening.htm>
- Han, A.-R., Park, S.-A., & Ahn, B.-E. (2018). Reduced stress and improved physical functional ability in elderly with mental health problems following a horticultural therapy program. *Complementary Therapies in Medicine*, 38, 19–23. <https://doi.org/10.1016/j.ctim.2018.03.011>
- Hartig, T., Mitchell, R., de Vries, S., & Frumkin, H. (2014). Nature and health. *Annual Review of Public Health*, 35(1), 207–228. <https://doi.org/10.1146/annurev-publhealth-032013-182443>
- Hassan, A., Qibing, C., Tao, J., Bing-Yang, L., Nian, L., Li, S., Tng, L. Y., Li, J. Z., Ziyue, S. G., & Tahir, M. S. (2018). Effects of plant activity on mental stress in young adults. *HortScience: A Publication of the American Society for Horticultural Science*, 53(1), 104–109.
<https://doi.org/10.21273/hortsci12447-17>

HEALIS AUTISM CENTRE. (2024, July 16). Therapeutic Horticulture: How Can Plants Relieve Sensory Issues in Individuals with Autism? *Healis Autism Centre*.

<https://www.healisautism.com/post/therapeutic-horticulture-how-can-plants-relieve-sensory-issues-in-individuals-with-autism>

Home, R., & Vieli, L. (2020). Psychosocial outcomes as motivations for urban gardening: A cross-cultural comparison of Swiss and Chilean gardeners. *Urban Forestry & Urban Greening*, 52(126703), 126703. <https://doi.org/10.1016/j.ufug.2020.126703>

Horticultural therapy program in Kerala improves the emotional intelligence of school going children with autism spectrum disorder. (n.d.). Retrieved July 12, 2025, from https://www.actahort.org/books/1330/1330_2.htm

Jarrott, S. E., & Gigliotti, C. M. (2010). Comparing responses to horticultural-based and traditional activities in dementia care programs. *American Journal of Alzheimer's Disease and Other Dementias*, 25(8), 657–665. <https://doi.org/10.1177/1533317510385810>

Joubert, A., Jankowski-Cherrier, B., Rossi, A., Teyssier, L., Suraud, V., Presle, E., Pommier, R., Massoubre, C., & Verot, E. (2024). Impact of horticultural therapy on patients admitted to psychiatric wards, a randomised, controlled and open trial. *Scientific Reports*, 14(1), 14378. <https://doi.org/10.1038/s41598-024-65168-0>

Kam, M. C. Y., & Siu, A. M. H. (2010). Evaluation of a horticultural activity programme for persons with psychiatric illness. *Hong Kong Journal of Occupational Therapy*, 20(2), 80–86. [https://doi.org/10.1016/s1569-1861\(11\)70007-9](https://doi.org/10.1016/s1569-1861(11)70007-9)

Kim, K.-H., & Park, S.-A. (2018). Horticultural therapy program for middle-aged women's depression, anxiety, and self-identify. *Complementary Therapies in Medicine*, 39, 154–159. <https://doi.org/10.1016/j.ctim.2018.06.008>

Kotozaki, Y. (2014). Comparison of the effects of individual and group horticulture interventions. *Health Care : Current Reviews*, 02(02). <https://doi.org/10.4172/hccr.1000120>

Lara's story – neurodiversity and nature. (n.d.). *Thrive*. Retrieved April 10, 2025, from <https://www.thrive.org.uk/get-gardening/laras-story-neurodiversity-and-nature>

Lehberger, M., Kleih, A.-K., & Sparke, K. (2021). Self-reported well-being and the importance of green spaces - A comparison of garden owners and non-garden owners in times of COVID-19. *Landscape and Urban Planning*, 212(104108), 104108. <https://doi.org/10.1016/j.landurbplan.2021.104108>

Loue, S., Karges, R. R., & Carlton, C. (2014). The therapeutic farm community: An innovative intervention for mental illness. *Procedia, Social and Behavioral Sciences*, 149, 503–507. <https://doi.org/10.1016/j.sbspro.2014.08.298>

Marcus, C. C., & Sachs, N. A. (2013). Therapeutic landscapes: An evidence-based approach to designing healing gardens and restorative outdoor spaces [EPUB]. *John Wiley & Sons*. <https://www.wiley.com/en-us/Therapeutic+Landscapes%3A+An+Evidence-Based+Approach+to+Designing+Healing+Gardens+and+Restorative+Outdoor+Spaces-p-9781118231913>

McGuire, L., Morris, S. L., & Pollard, T. M. (2022). Community gardening and wellbeing: The understandings of organisers and their implications for gardening for health. *Health & Place*, 75(102773), 102773. <https://doi.org/10.1016/j.healthplace.2022.102773>

Meore, A., Ganesh, N., Sun, S., Singer, A., Byma, L., Lorenzetti, B., Feder, A., Adams, T., Galfalvy, H., Boyer, J., & Haghghi, F. (2024). Pilot study of telehealth delivery of horticultural therapy (TeleHT) as an acceptable intervention and in reducing suicide risk factors in veterans. *Complementary Therapies in Medicine*, 85(103075), 103075. <https://doi.org/10.1016/j.ctim.2024.103075>

- Moll, A., Collado, S., Staats, H., & Corraliza, J. A. (2022). Restorative effects of exposure to nature on children and adolescents: A systematic review. *Journal of Environmental Psychology, 84*(101884), 101884. <https://doi.org/10.1016/j.jenvp.2022.101884>
- Mostafa, M. (2008). An architecture for autism: Concepts of design intervention for the autistic user. *International Journal of Architectural Research Archnet-IJAR, 2*(1), 189–211. <https://doi.org/10.26687/ARCHNET-IJAR.V2I1.182>
- Naomi Sachs, T. V. (Ed.). (2016). April_v09-p (Vol. 9, Issue 1). *Implications*. <https://www.researchgate.net/publication/280948490>
- Oakley, D. (2015, January 27). The Benefits of Horticultural Therapy for Children. *EmpowHER*. <https://www.empowher.com/parenting/content/benefits-horticultural-therapy-children>
- Owen, A., Cruz, S., Pozo-Rodriguez, M., Conde-Pumpido, S., Tubío-Fungueiriño, M., Sampaio, A., Carracedo, A., & Fernández-Prieto, M. (2024). Sensory processing, executive function, and behavior in children with ADHD. *Child Neuropsychology: A Journal on Normal and Abnormal Development in Childhood and Adolescence, 1*–18. <https://doi.org/10.1080/09297049.2024.2414875>
- Rosa, C. D., Chaves, T. S., Collado, S., Larson, L. R., Lee, K. J., & Profice, C. C. (2023). Horticultural interventions may reduce adults' depressive symptoms: A systematic review of randomized controlled trials. *Journal of Environmental Psychology, 91*(102112), 102112. <https://doi.org/10.1016/j.jenvp.2023.102112>
- Sawyer, S. M., Azzopardi, P. S., Wickremarathne, D., & Patton, G. C. (2018). The age of adolescence. *The Lancet Child & Adolescent Health, 2*(3), 223–228. [https://doi.org/10.1016/S2352-4642\(18\)30022-1](https://doi.org/10.1016/S2352-4642(18)30022-1)

- Shen, J.-L., Hung, B.-L., & Fang, S.-H. (2022). Horticulture therapy affected the mental status, sleep quality, and salivary markers of mucosal immunity in an elderly population. *Scientific Reports*, *12*(1), 10246. <https://doi.org/10.1038/s41598-022-14534-x>
- Sia, A., Tan, P. Y., Wong, J. C. M., Araib, S., Ang, W. F., & Er, K. B. H. (2022). The impact of gardening on mental resilience in times of stress: A case study during the COVID-19 pandemic in Singapore. *Urban Forestry & Urban Greening*, *68*(127448), 127448. <https://doi.org/10.1016/j.ufug.2021.127448>
- Soga, M., Gaston, K. J., & Yamaura, Y. (2017). Gardening is beneficial for health: A meta-analysis. *Preventive Medicine Reports*, *5*, 92–99. <https://doi.org/10.1016/j.pmedr.2016.11.007>
- Soto, E. F., Black, K., & Kofler, M. J. (2024). Is hyperactivity in children with attention deficit/hyperactivity disorder (ADHD) a functional response to demands on specific executive functions or cognitive demands in general? *Neuropsychology*, *38*(8), 699–713. <https://doi.org/10.1037/neu0000975>
- Spano, G., D'Este, M., Giannico, V., Elia, M., Cassibba, R., Laforteza, R., & Sanesi, G. (2021). Association between indoor-outdoor green features and psychological health during the COVID-19 lockdown in Italy: A cross-sectional nationwide study. *Urban Forestry & Urban Greening*, *62*(127156), 127156. <https://doi.org/10.1016/j.ufug.2021.127156>
- Suyin Chalmin-Pui, L., Roe, J., Griffiths, A., Smyth, N., Heaton, T., Clayden, A., & Cameron, R. (2021). “It made me feel brighter in myself” —The health and well-being impacts of a residential front garden horticultural intervention. *Landscape and Urban Planning*, *205*(103958), 103958. <https://doi.org/10.1016/j.landurbplan.2020.103958>
- Taylor, A. F., Kuo, F. E., & Sullivan, W. C. (2001). Coping with add: The surprising connection to green play settings. *Environment and Behavior*, *33*(1), 54–77. <https://doi.org/10.1177/00139160121972864>

The benefits of therapeutic horticulture for people with autism. (2023, June 2). *Melbourne Disability Institute*. <https://disability.unimelb.edu.au/home/projects/community-based-research-program/the-benefits-of-therapeutic-horticulture-for-people-with-autism>

Theodorou, A., Panno, A., Carrus, G., Carbone, G. A., Massullo, C., & Imperatori, C. (2021). Stay home, stay safe, stay green: The role of gardening activities on mental health during the Covid-19 home confinement. *Urban Forestry & Urban Greening*, *61*(127091), 127091. <https://doi.org/10.1016/j.ufug.2021.127091>

Ugolini, F., Massetti, L., Pearlmutter, D., & Sanesi, G. (2021). Usage of urban green space and related feelings of deprivation during the COVID-19 lockdown: Lessons learned from an Italian case study. *Land Use Policy*, *105*(105437), 105437. <https://doi.org/10.1016/j.landusepol.2021.105437>

Verra, M. L., Angst, F., Beck, T., Lehmann, S., Brioschi, R., Schneiter, R., & Aeschlimann, A. (2012). Horticultural therapy for patients with chronic musculoskeletal pain: results of a pilot study. *Alternative Therapies in Health and Medicine*, *18*(2), 44–50. <https://pubmed.ncbi.nlm.nih.gov/22516884/>

Wagenfeld, A. (2019, July 23). The remarkable ways sensory gardens can help people with autism. *Autism Parenting Magazine*. <https://www.autismparentingmagazine.com/sensory-gardens-can-help-autism/>

World Health Organization. (2022, September 13). *Depression*. <https://www.who.int/news-room/fact-sheets/detail/depression>

World Health Organization. (2022, September 27). *Anxiety disorders*. <https://www.who.int/news-room/fact-sheets/detail/anxiety-disorders>

Wu, C.-F., Chou, L.-W., Huang, H.-C., & Tu, H.-M. (2022). Perceived COVID-19-related stress drives home gardening intentions and improves human health in Taiwan. *Urban Forestry & Urban Greening*, *78*(127770), 127770. <https://doi.org/10.1016/j.ufug.2022.127770>

- Yang, J., Deng, Z., Pei, S., & Zhang, N. (2024). A feasibility study on indoor therapeutic horticulture to alleviate sleep and anxiety problems: The impact of plants and activity choice on its therapeutic effect. *Complementary Therapies in Medicine, 81*(103032), 103032. <https://doi.org/10.1016/j.ctim.2024.103032>
- Young, C., Hofmann, M., Frey, D., Moretti, M., & Bauer, N. (2020). Psychological restoration in urban gardens related to garden type, biodiversity and garden-related stress. *Landscape and Urban Planning, 198*(103777), 103777. <https://doi.org/10.1016/j.landurbplan.2020.103777>
- Zhang, Y. W., Wang, J., & Fang, T. H. (2022). The effect of horticultural therapy on depressive symptoms among the elderly: A systematic review and meta-analysis. *Frontiers in Public Health, 10*, 953363. <https://doi.org/10.3389/fpubh.2022.953363>

Appendix

Horticultural Therapy: ACT-Integrated Workshop Curriculum for Neurodivergent Participants

Session 1: Planting Seeds of Safety (60-75 mins)

Facilitation Notes:

Keep activities predictable and low-pressure. Encourage autonomy—participants can watch or touch soil at their own pace. Gently link to ACT concepts: values of growth and patience. “Like your plant, you’re choosing what matters to you in this space.”

Normalize different levels of participation. Emphasize choice as a values-based act of autonomy.

Goals:

- Build group trust
- Establish safety
- Introduce plant care
- Connect to values of growth and care

Activities:

- Welcome and group agreements (focus on values, e.g. kindness, respect).
- Sensory friendly grounding (deep breaths with herbs like lavender, mint).
- Individual activity: potting a small starter plant (succulent, aroid, or an herb of choice)
- Reflection: “What does this plant represent for me right now?”
- Closing circle.

Materials:

- Soil
- Pots
- Starter plants
- Gloves, aprons
- Tools: misting bottles, pruning tools, spade, watering can
- Journaling and art supplies
- Headphones

Session 2: Growing Together (60-75 mins)

Facilitation Notes:

Offer clear steps and visual aids to scaffold executive tasks. Normalize different roles (watering, arranging, observing).

Reinforce social learning without forcing interaction. Link cooperation to ACT’s “committed action.” Encourage noticing feelings of frustration, pride, or joy, and relating them back to chosen values. Reinforce that being part of a group does not mean losing autonomy.

Goals:

- Practice executive functioning (planning, sequencing) and cooperative work

Activities:

- Brief check-in.
- “What value do you want to bring to today’s group?”
- Group activity: design and plant a shared garden (e.g. succulent garden, or herb garden, or a mix and match).
- Reflection journaling or drawing.
 - “What role do I want to play in my garden and in my group?”
- Closing circle.

Materials:

- Group planter
- Soil
- Plants
- Journaling and art supplies
- Markers
- Tools: spade, watering cans
- Headphones

Session 3: Engaging the Senses (60-75 mins)

Facilitation Notes:

Allow participants to skip scents or textures that feel overwhelming. Encourage choice to promote autonomy. Relate to sensory integration theory (Mostafa, 2008).

Emphasize ACT’s “being present” process. Frame mindfulness in simple, sensory-based terms: “Notice the feel of the soil without judging it.” Validate differences in sensory responses (seekers vs. avoiders).

Goals:

- Explore sensory processing and regulation through plant-based activities

Activities:

- Sensory warm-up: “garden touch-and-smell” with herbs, textured leaves, flowers
- Individual sensory planting: choose a plant based on personal preference
- Closing with mindful observation of plants and their own role in cultivating the plants.
 - “What did I notice when I slowed down?”

Materials:

- Variety of plants (e.g. nerve plant, mint, basil, succulents, aroids, stringing plants, flowers)
- Soil
- Pots
- Planting tools
- Headphones

Session 4: Reflection and Choice (60-90 mins)

Facilitation Notes:

Celebrate progress. Use PCT lens: offer empathy, unconditional positive regard, space for authentic sharing. Reinforce ACT's processes of values, growth, and committed action.

Encourage reflection on growth (even if small). Frame the plant as a metaphor for ongoing self-nurturing.

Goals:

- Consolidate learning
- Highlight coping strategies
- Celebrate and highlight growth and future values

Activities:

- Group check-in: "What value do I want to carry forward?"
- Choice-based planting project (mini planter, terrarium, or repotting earlier plant).
- Reflection activity: "Like my plant, what have I nurtured in myself these past weeks"?
- Closing celebration and take-home plants.

Materials:

- Pots
- Terrarium materials
- Soil
- Plants
- Art and journaling supplies
- Headphones.