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Table of Contents

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Exploring the Impact of Therapeutic Horticulture in Gynecologic Oncology Patients: A Pilot Study

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Abstract

Women who are diagnosed with gynecologic cancer experience a significant level of distress and symptoms that impact their quality of life. Non-pharmacological interventions such as therapeutic horticulture (TH) have been linked with enriching individual lives. The purpose of this study is two-fold: 1) to determine the impact of TH on the quality of life and anxiety for gynecologic oncology patients and 2) to test the feasibility and acceptability of implementing a pilot TH program for this specific patient population at an academic institution. The intervention included attending eight 1-hour group-based TH sessions that were led by a professionally registered horticultural therapist at Wilmot Botanical Gardens. Over one month, there were a total of 42 patients who were given our initial recruitment questionnaire at the gynecologic oncology clinic. In summary, 7 patients were able to participate in the study. 3 participants were able to complete the study in its entirety by attending 8 out of the 12 sessions. 4 participants were unable to complete at least 8 sessions due to scheduling conflicts: 1 participant completed 7 sessions and 3 participants completed less than 5 sessions. Given the small number of participants, quantitative, statistical analysis of questionnaire results was not undertaken. However, the STAI and FACT-G results qualitatively reflected a decrease in both current and general anxiety and an increase in health-related quality of life from pre- to post-TH. While our participant accrual was limited, there were lessons learned about implementing a TH study in a gynecologic oncology patient population.

Introduction

Gynecologic cancers are any type of cancer that arise from a woman's reproductive tract. The five main types of gynecologic cancer are cervical, ovarian, uterine, vaginal, and vulvar. Women with a gynecologic cancer diagnosis can experience a vast array of symptoms that can significantly impact their quality of life (Agarwal & Bodurka, 2010; Carter et al., 2012). These symptoms include anxiety associated with a new cancer diagnosis, pain, and fatigue. Multiple factors can increase distress in patients diagnosed with cancer, including disease and treatment symptoms, awareness of high mortality rates, side effects of cancer treatments, and implementation of lifestyle changes that are made to accommodate the cancer treatment (Brown et al., 2017; Sarfati et al., 2016; Wu & Harden, 2015)

Over the past few decades, clinicians have placed a greater emphasis on the role of the patient's mental health after receiving a cancer diagnosis (Holland, 2002). A holistic approach to mental wellness often incorporates lifestyle changes, including practicing mindfulness, nurturing interpersonal relationships, and finding support via group settings.

Therapeutic horticulture (TH) is a process that uses horticulture activities and nature interaction to improve well-being through active and passive participation. By providing opportunities to explore wellness strategies through the engagement of horticulture activities, we hope that participants will be able to increase their recognition of the connection between nature and well-being and learn about the intentional use of plants and nature for personal well-being. This would in turn increase their confidence in caring for plants and also create an environment of support through meaningful interactions with plants and other participants.

Multiple studies have shown the therapeutic effects of TH in different patient populations. At the University of Florida (UF), there was a significant decrease in stress and anxiety and an increase in resilience in college students participating in a TH program (Diehl et al., 2019). An earlier study at UF for healthy women aged 26-49 found that participating in TH led to a 23% decrease in anxiety, an 89% decrease in depression, a 49% decrease in perceived stress, and an overall improvement in total mood disturbance (Odeh et al., 2022). In a separate study, the effects of TH were studied in patients who were diagnosed with end-stage kidney

disease. The study found a decrease in patient frustration caused by the interference of kidney disease in daily life (Diehl et al., 2019). Patients receiving inpatient electroconvulsive therapy for major depressive disorders reported significant improvement on seven of eight subscales of the SF-36 Quality of Life Scale (Korah et al., 2021).

TH interventions for other participant groups have led to significant decreases in stress (Chalmin-Pui et al., 2021; Detweiler et al., 2015; Shao et al., 2020), depression (Gonzalez et al., 2010), and anxiety (Chan et al., 2017; Gonzalez et al., 2010; Kim & Park, 2018; Son et al., 2004), as well as significant increases in life satisfaction (Waliczek et al., 2005; Wood et al., 2016). Increasing evidence demonstrates the physiological benefits of TH such as lowering cortisol levels (Detweiler et al., 2015; Han et al., 2018), improving mood states (Shao et al., 2020; Wichrowski et al., 2005), boosting self-esteem (Sonti & Svendsen, 2018; Wood et al., 2016), enhancing interpersonal relationships(Waliczek et al., 2005), increasing life satisfaction (Son et al., 2004), and improving body image (Swami, 2020).

To date, no studies have explored the impacts of TH on patients diagnosed with gynecologic cancers. In palliative care settings, however, TH promoted an overall positive experience for participating patients as well as for the palliative care team (Lai et al., 2017; Masel et al., 2018).

The purpose of this study was twofold: 1) to determine the impact of TH on the quality of life and anxiety for gynecologic oncology patients using validated health-related quality-of-life and anxiety surveys and a focus-group and 2) to test the feasibility and acceptability of implementing a pilot TH program for this specific patient population.

Materials and Methods

This is an IRB-approved study that took place at one academic medical center. Women were recruited via an initial questionnaire (Figure 1) from the gynecologic oncology clinic at UF Health. Women who did not have a cancer diagnosis or had a pending pathology report were not given the initial questionnaire. Participants included women aged 18 or older who were diagnosed with vulvar, vaginal, cervical, uterine, or ovarian cancer. Once the questionnaire was completed, the interested individuals were contacted by phone to confirm study interest and invited to enroll in a TH program once the study date was established. The program took place at the UF's Wilmot Botanical Gardens greenhouse and was led by a professionally registered horticultural therapist.

Individuals who expressed interest in the study were invited to an initial visit that included an orientation to the study and informed consent. At this visit, participants then completed two self-reported, validated quality of life questionnaires. This was considered the pre-HT intervention assessment. Health-related quality of life (HRQOL) was assessed through Functional Assessment of Cancer Therapy -General (FACT-G), a core questionnaire of the Functional Assessment of Chronic Illness Therapy (FACIT) measurement system, which is aimed at patients with a cancer diagnosis (Cella et al., 1993; Overcash et al., 2001; Webster,Cella & Yost, 2003). The FACT-G aims to determine HRQOL via 27 items across four domains, including physical well-being (PWB), emotional well-being (EWB), social/family well-being (SWB), and functional well-being (FWB). Items are rated on a 5-point Likert-type scale, with responses ranging from 0 ("not at all") to 4 ("very much") for a recall period of the past seven days. The four mentioned subscales and total scores were then calculated.

Anxiety was assessed through the State-Trait Anxiety Inventory (STAI). Both situational and trait anxiety are gauged with 20 items on a 4-point Likert-type scale, ranging from 1 ("not at all" for state and "almost never" for the trait) to 4 ("very much so" for situational and "almost always" for the trait). The total score for the STAI was then calculated.

The authors could identify only limited prior data

regarding minimal clinically important differences (MCID) for the STAI, and that data suggests a difference of 10 points to mark a MCID. Using that metric, two participants displayed a MCID in anxiety as measured by the STAI. Using published data on MCID for the FACT-G, the mean change in the FACT-G indicates a small change; one participant's scores reflect a small change, one reflects a medium change, and two reflect trivial changes (Corsaletti et al., 2014; King et al., 2010).

After providing consent and completing the questionnaires, participants were oriented to the Wilmot Botanical greenhouse and then began the first TH session. Sessions were held for one hour, once per week, for ten weeks. During each of the ten TH sessions, participants engaged in a horticulture activity paired with a wellness strategy. Sessions were led by a professionally registered horticultural therapist who was supported by specially trained staff and interns. The horticulture activities included hands-on basic plant care such as plant propagation techniques and methods, proper planting and maintenance, and general plant identification and knowledge, as well as plant art activities. Paired wellness strategies included discussion and practice of mindfulness techniques, distress tolerance skills, beginner's mind, and opposite action, among others. Participants took plants home throughout the program to extend the program's benefits beyond the scheduled sessions.

After completing their eighth TH session, study participants filled out the same set of two health outcome questionnaires from their first visit. This was considered the post-HT intervention assessment. Although no further survey data was collected after the eighth session, participants were invited to continue until the end of the ten weeks. At the last session in the tenth week, a focus group with three participants was facilitated, and notes were written down by one of the study team members. Answers to the focus group questionnaire were written down by an IRB-approved study member.

Results

Over one month, a total of 42 women were given the initial recruitment questionnaire at the gynecologic oncology clinic. Of these 42 women, 9.5% (n=4) had heard about TH and 90% (n-38) had not previously heard about TH. Of the 42 women, 59.5% (n=25) were interested in the study, and 40.5% (n=17) were not interested. When each of the 25 potentially interested respondents was called at the time of enrollment (three months after the recruitment questionnaire), 18 respondents (72%) were unable to participate due to time constraints, travel distance, and changes in personal health. Seven women attended the initial study visit and provided informed consent to participate.

Of the 7 study participants, 6 women (85.7%) completed the study by returning to complete the post-intervention assessment. However, only 3 of the 7 participants completed the study in its entirety by attending at least 8 out of the 12 scheduled sessions. One participant completed seven sessions, and three participants completed less than five sessions. The reasons the study participants were unable to complete all eight of the sessions included transportation issues, schedule changes, changes in personal health, and loss of interest. The one woman who did not complete the study dropped out due to transportation difficulties.

Table 1 reports the demographics of the 7 participants. The ages of the 7 participants ranged from 40-77. There were 4 patients with uterine cancer, 1 with vulvar cancer, and 2 with ovarian cancer. All 7 patients were in surveillance as part of their treatment.

Given the limited number of participants, the study team decided to use survey results from all participants whose information was available from both pre-and post-TH regardless of how many sessions were completed. Of the seven participants, five completed questionnaires at both pre-TH and post-TH. One participant completed only pre-TH questionnaires, and one participant completed

Table 1

Demographics of participants with age, type of cancer, year of diagnosis, and stage of treatment

Particpant	Age	Type of Cancer	Year of Diagnosis	Active Treatment or Surveillance
1	65	Uterine	2022	Surveillance
2	77	Uterine	2021	Surveillance
3	69	Uterine	2021	Surveillance
4	46	Vulvar	2022	Surveillance
5	40	Ovarian	2017	Surveillance
6	50	Uterine	2021	Surveillance
7	63	Ovarian	2018	Surveillance

only post-TH questionnaires. In addition, one participant completed only half of the FACT-G at post-TH (items for two subscales were complete and items for two subscales were missing). Across all the completed scales and subscales, three individual FACT-G items were missing. In each of these cases, the score for the missing item was replaced by the FACT-G subscale item mean, as recommended by the measure's developers.

Table 2 summarizes descriptive data for the STAI-State, STAI-Trait, and FACT-G measures as well as the FACT-G subscales: Physical Well-Being (PWB), Social/Family Well-Being (SWB), Emotional Well-Being (EWB), and Functional Well-Being (FWB). Given the small size of the data set, statistical comparison of pre-HT and post-HT data was not appropriate. The measures of central tendency for each of the scales moved in the expected direction: toward decreased anxiety and increased QOL. The mean scores for both State and Trait anxiety on the STAI decreased over time (i.e., $M = 38.33$ vs $M = 29.83$ for State anxiety; $M = 39.50$ vs $M = 34.50$ for Trait anxiety), reflecting a decrease in anxiety both at the time of measure and in general. The mean scores for the FACT-G and each of the FACT-G subscales increased over time (i.e., M=77.83 vs M-81.83 for the overall FACT-G scores), reflecting improvement in HRQOL from pre-HT to post-HT.

Figures 1 through 3 provide patterns of individual changes over time. As seen in Figure 1, four of the five participants displayed decreases in both state and trait anxiety over time. As displayed in Figure 2, three of four participants displayed slightly increased QOL over time. One participant displayed a slightly decreased QOL over time, but both the pre-HT and post-HT scores were near the top of the possible range for the FACT-G. Figure 3 displays change over time on the FACT-G subscales. Each of the respondents with a relatively low subscale score (i.e., under 15) at pre-HT demonstrated some improvement at post-HT. At the same time, each participant showed a decrease in one domain (three participants) or two domains (one participant).

In the focus group at the end of the study, the salient themes that emerged were camaraderie and overall mental and physical well-being. These themes were determined through thematic analysis methods gathered from focus group discussions. Participant testimonials included: "The sessions made us feel like we were not alone and that we had friends who understood our story. The TH sessions allowed us to build a long-lasting friendship with each other. Even though I missed a few sessions,

Table 2

Questionnaire Results

	pre-HT				pre-HT			
	n	Mean (SD)	Median	Range	n	Mean (SD)	Median	Range
STAI-State[a]	6	38.33 (10.35)	38.50	27-53	6	29.83 (12.48)	22.50	21-50
STAI-Trait[a]	6	39.50 (7.50)	38.50	29-52	6	34.50 (7.74)	33.50	27-47
FACT-G[b]	6	77.83 (22.85)	82.83	51-100	5	81.83 (20.76)	93.00	55-99
PWB[c]	6	21.33 (6.38)	23.00	9-26	6	22.17 (6.11)	25.00	13-27
SWB[c]	6	18.61 (9.71)	18.83	7-28	6	22.17 (6.74)	25.00	11-28
EWB[d]	6	19.00 (3.35)	18.50	16-23	5	19.40 (3.78)	21.00	14-23
FWB[c]	6	18.89 (6.75)	21.50	7-25	5	20.23 (6.81)	22.17	10-26

[a] possible range: 20-80; [b] possible range: 0-108; [c] possible range: 0-28; [d] possible range: 0-24

I always looked forward to bonding with the rest of the group in the next session. The sessions were engaging and I felt more physically active and mentally at peace at the end." Despite the positive feedback, there was not a large enough number of responses to draw any statistical conclusions regarding the results outcomes.

Discussion

A holistic approach is increasingly being used in the care of cancer patients. There has been a focus on complementary alternative medicine for cancer patients (Judson et al., 2017) and it has been used as therapy for managing the cancer and treatment-related symptoms. Although there are no specific guidelines for the implementation of alternative medicine, it is well established that it enhances comprehensive cancer care.

In our pilot TH study for women with gynecological cancer diagnoses, quantitative analyses were limited due to the number of participants. Changes in scores on the anxiety and health-related quality of life questionnaires are consistent with improvement although the small number of participants limits the ability to draw conclusions.

Focus group responses also indicated that participants experienced positive effects of HT, including a sense of camaraderie with other participants and an improved sense of physical and emotional well-being. Participants described their experiences of attending sessions, experiences with diagnosis, community unity, and current health journeys. These themes were uncovered through coding of focus group discussions, for recurring topics discussed. These topics were determined as the content of the discussions reached saturation. The focus groups allowed us to identify patterns in discussion and to define the meaning of the experiences held by participants of the effects of HT. The understanding of these experiences and assessment of prevalent elements is essential to understanding the impact that HT has on the quality of life of participants and potentially similar demographics.

Even though previous literature suggests both the feasibility and benefits of TH for cancer patients, we found that there were numerous limitations in this study. Firstly, the number of participants in the study was small. This was due to several factors, one being that the percentage of women in the clinic who had gynecologic cancer and therefore eligible for the study was small. Secondly, recruitment was limited due to inconsistent staffing of a study member. Although clinic physicians attempted to inform patients about the study and a medical student provided information in the clinic waiting room on some days, a more coordinated and consistent recruitment pipeline did not exist.

Thirdly, despite an initial pre-recruitment of 42 interested patients, the large majority who initially expressed interest decided not to participate at the time the program commenced. A variety of reasons were given with the most prevalent being

Figure 1

STAI scores at pre- and post-HT

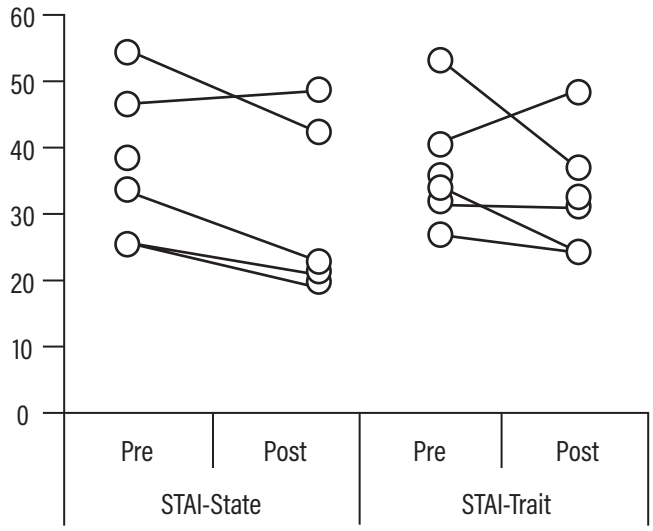


Figure 2

FACT-G scores at pre- and post-HT

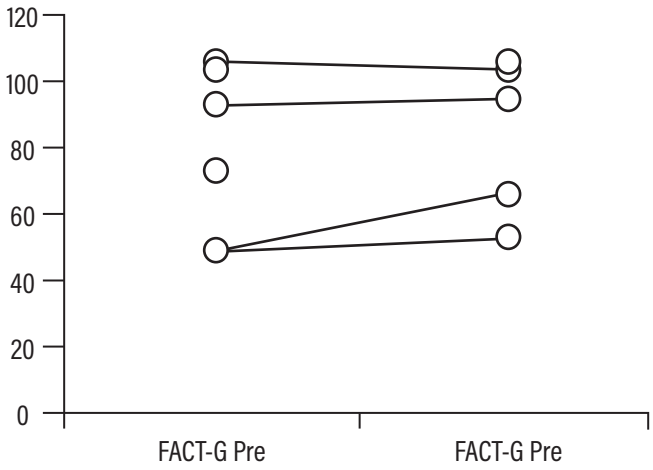
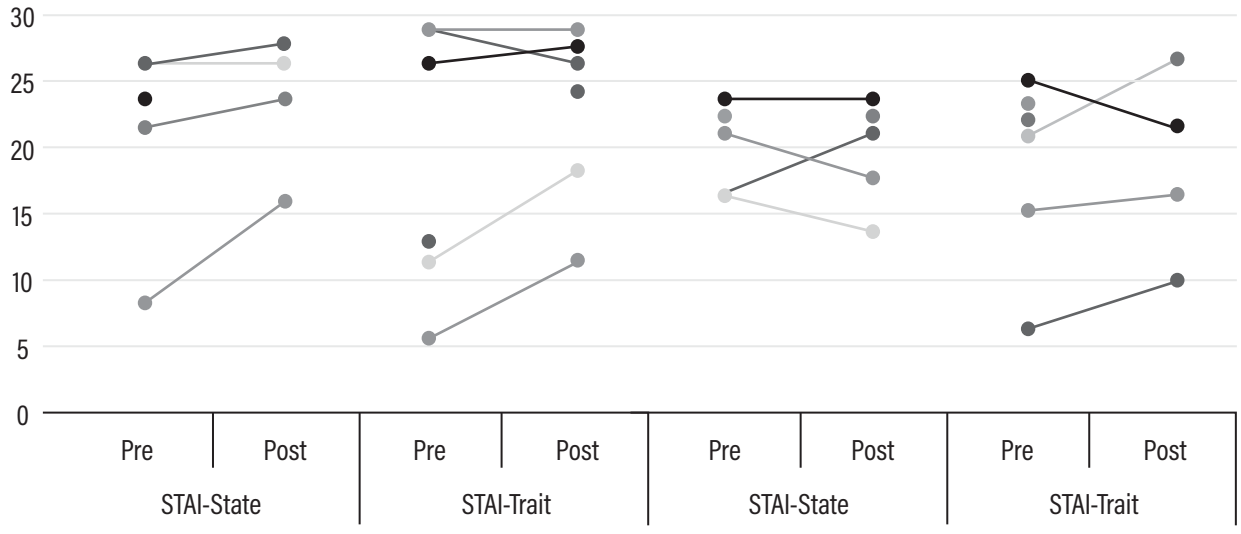


Figure 3

FACT-G subscale scores at pre- and post-HT



an inability to regularly attend the weekly program. Given that initial recruitment was done 3 months before the start of the program and the two most

common issues reported were a lack of reliable transportation and changes in personal health, perhaps too much time elapsed between recruitment and program implementation. Additionally, patients were asked to commit to regular attendance if joining the study and that may have dissuaded some mildly interested patients. A stronger recruitment plan may have helped in increasing patient interest in the program.

Transportation and poor health were also issues among those who participated in the sessions. Among the seven patients enrolled in the study, only three were able to complete the study by attending eight of 12 scheduled visits. The barriers identified included participants' lack of consistent transportation due to no access to a vehicle, reliance on a family member to transport them, or lack of financial resources to pay for transport. Additionally, some study participants reported poor health as a reason for missing sessions.

As a pilot study, one of the goals was to determine the benefits and barriers of participating in a TH program for women with gynecologic cancer. In future studies with this population, it would be essential to 1) determine the best recruitment method that leads to a higher rate of participation; 2) mitigate transportation obstacles; and 3) plan for absences due to health issues. A financial incentive such as a gift card could help to address the transportation restraints and a substantial buffer of additional sessions could mitigate the impact on the study of missing weeks due to illness.

Conclusion

To our knowledge, this is the first therapeutic horticulture study implemented in a patient population with gynecologic cancer. This study allowed us to explore some of the feasibility issues in performing a pilot study in this specific cohort of patients at an academic health institution. As addressed in the limitations, this study allowed us to identify many barriers patients experienced, even when highly interested in participating in the study.

Attending HT sessions consistently can be difficult among cancer patients due to age, difficulties with transportation, and financial constraints especially in the light of ongoing cancer-related treatment demands. Non-pharmacological interventions, such as TH, can motivate patients to connect with others who have shared experiences through meaningful activity, and this can lead to enriched individual lives. Previous studies have shown that TH may help improve the quality of life, which may reduce stress and improve healing and recovery from cancer.

While our participant accrual was limited and cannot be generalized to a larger population of women with gynecologic cancer, there were general lessons that were learned about implementing a TH program with this population. These lessons included identification of the benefits of the program as well as the barriers to participation. Additionally, the collaboration between the TH program and the gynecologic oncology clinic highlighted the potential value of TH in patient care. Patients and healthcare staff experienced the benefits of nearby gardens and horticulture-based programming and the proximity of the clinic to the TH program site was advantageous.

We hope that this pilot study can bring light to the benefits of TH programming for women with this diagnosis as well as help identify some of the challenges that might be faced. Therapeutic horticulture programs like this can motivate women with gynecologic cancer to connect with others and to the community, providing opportunities for holistic well-being that persist well beyond participation in the program. This study confirms that such a program is feasible in this population with a well-developed TH program near a National Cancer Institute (NCI) – designated cancer program and can be strengthened by a structured recruitment plan that acknowledges the challenges faced by this patient group.

References

Agarwal, S., & Bodurka, D. C. (2010). Symptom research in gynecologic oncology: a review of available measurement tools. *Gynecolological Oncology, 119*(2), 384-389. https://doi.org/10.1016/j.ygyno.2010.07.009

Brown, A. J., Thaker, P. H., Sun, C. C., Urbauer, D. L., Bruera, E., Bodurka, D. C., & Ramondetta, L. M. (2017). Nothing left to chance? The impact of locus of control on the physical and mental quality of life in terminal cancer patients. *Support Care Cancer, 25*(6), 1985-1991. https://doi.org/10.1007/s00520-017-3605-z

Carter, J., Penson, R., Barakat, R., & Wenzel, L. (2012). Contemporary quality of life issues affecting gynecologic cancer survivors. *Hematolological Oncoligal Clinics of North America, 26*(1), 169-194. https://doi.org/10.1016/j.hoc.2011.11.001

Chalmin-Pui, L. S., Griffiths, A., Roe, J., Heaton, T., & Cameron, R. (2021). Attitudes and the perceived health benefits of home gardening. In. Cities. Elsevier.

Chan, H. Y., Ho, R. C., Mahendran, R., Ng, K. S., Tam, W. W., Rawtaer, I., . . . Kua, E. H. (2017). Effects of horticultural therapy on elderly' health: protocol of a randomized controlled trial. *BMC Geriatrics, 17*(1), 192. https://doi.org/10.1186/s12877-017-0588-z

Detweiler, M. B., Self, J. A., Lane, S., Spencer, L., Lutgens, B., Kim, D. Y., . . . Lehmann, L. P. (2015). Horticultural therapy: a pilot study on modulating cortisol levels and indices of substance craving, posttraumatic stress disorder, depression, and quality of life in veterans. *Alternative Therapies In Health and Medicine, 21*(4), 36-41.

Diehl, E., Morrison, D., & Tisher, C. (2019). Therapeutic horticulture as a quality-of-life intervention in chronic hemodialysis patients. In (Vol. 29). *Journal of Therapeutic Horticulture*.

Gonzalez, M. T., Hartig, T., Patil, G. G., Martinsen, E. W., & Kirkevold, M. (2010). Therapeutic horticulture in clinical depression: a prospective study of active components. *Journal of Advanced Nursing, 66*(9), 2002-2013. https://doi.org/10.1111/j.1365-2648.2010.05383.x

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

Holland, J. C. (2002). History of psycho-oncology: overcoming attitudinal and conceptual barriers. *Psychosomatic Medicine, 64*(2), 206-221. https://doi.org/10.1097/00006842-200203000-00004

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

Korah, T., Morrison, D., Mason, D., Diehl, E. R., & Bussing, R. (2021). Therapeutic horticulture as a therapeutic intervention in patients receiving electroconvulsive therapy (ECT) treatment for major depressive disorder. In (Vol. 13, pp. e17363). Cureus.

Lai, C. K., Lau, C. K., Kan, W. Y., Lam, W. M. M. M. F. F., & Fung, C. Y. Y. R. H. (2017). The effect of horticultural therapy on the quality of life of palliative care patients. *Journal of Psychosocial Oncolology, 35*(3), 278-291. https://doi.org/10.1080/07347332.2017.1286699

Masel, E. K., Trinczek, H., Adamidis, F., Schur, S., Unseld, M., Kitta, A., . . . Watzke, H. H. (2018). Vitamin "G"arden: a qualitative study exploring perception/s of horticultural therapy on a palliative care ward. *Supportive Care Cancer, 26*(6), 1799-1805. https://doi.org/10.1007/s00520-017-3978-z

Odeh, R., Diehl, E., & Nixon, S. (2022). A pilot randomized controlled trial of group-based indoor gardening and art activities demonstrates therapeutic benefits to healthy women. In. *PLoS One 17*.

Sarfati, D., Koczwara, B., & Jackson, C. (2016). The impact of comorbidity on cancer and its treatment. *CA Cancer Journal for Clinicians, 66*(4), 337-350. https://doi.org/10.3322/caac.21342

Shao, Y., Elsadek, M., & Liu, B. (2020). Horticultural Activity: Its Contribution to Stress Recovery and Wellbeing for Children. *International Journal of Environmental Research and Public Health, 17*(4). https://doi.org/10.3390/ijerph17041229

Son, K. C., Um, S. J., Kim, S. Y., Song, J. E., & Kwack, H. R. (2004). Effect of horticultural therapy on the changes of self-esteem and sociality of individuals with chronic schizophrenia. In (pp. 185-191). *Acta Horticuralae*.

Sonti, N. F., & Svendsen, E. S. (2018). Why garden? Personal and abiding motivations for community gardening in New York City. In Society and Natural Resources, (pp. 1189-1205).

Swami, V. (2020). Body image benefits of allotment gardening. In (pp. 19-23). *Ecopsychology*.

Waliczek, T. M., Zajicek, J. M., & Lineberger, R. D. (2005). The influence of gardening activities on consumer perceptions of life satisfaction. In (pp. 1360-1365). *HortScience*.

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

Wood, C. J., Pretty, J., & Griffin, M. (2016). A case-control study of the health and well-being benefits of allotment gardening. *Journal of Public Health (Oxf), 38*(3), e336-e344. https://doi.org/10.1093/pubmed/fdv146

Wu, H. S., & Harden, J. K. (2015). Symptom burden and quality of life in survivorship: a review of the literature. *Cancer Nursing, 38*(1), E29-54. https://doi.org/10.1097/ncc.0000000000000135

Why People Love Trees: A Hermeneutic Analysis of Themes Found on Social Media

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Abstract

Humans are inherently draw to trees. Biophilia theory (Wilson, 1984) asserts that we are drawn towards Nature as a whole, but does not specify about our attraction towards trees. Interaction with trees has been proven to reduce general anxiety and lower blood pressure (Ideno, 2017). Despite this history, contemporary research has not yet asserted a reason for why we are attracted to trees specifically. Using a combined process of thematic analysis and hermeneutic investigation, I analyzed posts from social media Nature groups to find the trends in numinous experiences people have with trees. These are experiences Facebook authors describe with trees that changed them spiritually or psychologically. Through the Hermeneutic Circle, I discerned the most commonly occurring meanings that people ascribed to these experiences with trees. This two-stage analysis resulted in a hermeneutic "true meaning" that people are attracted to trees because the tree's beauty is synonymous with the tree's old age. Instead of youth, trees are considered beautiful and praised because they have lived long and endured many experiences. This analysis holds clinical implications for mental health practitioners who use trees in horticultural therapy, forest therapy, shinrin-yoku, ecotherapy, transpersonal psychologists, ecopsychologists, therapeutic horticulture, wilderness therapy, adventure therapy, garden design, and civics.

Introduction

The purpose of this qualitative study is to present a hermeneutic analysis for subjects' attraction to trees. I was inspired to explore this area from Nuckols' (2010) work on numinous experiences. Numinous experiences are spiritually or psychologically meaningful interactions that people have with Nature (Nuckols, 2010; Harrild & Luke, 2020). In numinous experiences, the onlooker is filled with a mixture of three emotions: awe, mystery, and dread (Nuckols, 2010; Harrild & Luke, 2020). A Midwestern lighting storm, for example, could fill an observer with awe at the impressive display of light across the sky, mystery at the science of how lighting is formed, and dread that they might be struck dead by the same bolts. Numinous experiences make us feel small in a positive way. They remind us of our place in the ecosystem and can be used to scale emotional responses to trauma (Harild & Luke, 2020). If a person has experienced hardship in their life, by observing the wonders of the natural world they are able to integrate and contextualize their experience into a larger understanding of the life cycle within an ecosystem.

Numinous experiences could be to key to understanding why people are drawn to trees. Interactions with trees easily meet the criterion of awe, mystery, and dread. Humans across the globe have engaged in tree worship for just this very reason: encountering a stoic, woody giant in the forest fills us with a transcendent kind of experience (Tully, 2023; McDonald, 2018; Haberman, 2017). What has differentiated trees from other forms of numinous experiences? Trees are frequently anthropomorphized (Haberman, 2017). As an observable, whole organism, trees hold the ability to carry a personality, even a projected one (Robinson et al, 2024). Our relationship to these organisms is both personal and active. We can touch trees, hug them, and shelter beneath them from the elements. Researchers have found interaction with trees increases self-compassion and connection among participants in *shinrin-yoku* (forest bathing), both protective factors for mental health that are derived through relationships (Kotera & Fido, 2022; Mackali, Çetinkaya, & Ay, 2023). Interactions with trees provide a host of health benefits, including feelings of safety and security (Poulsen, 2016). Current research even suggests that forests and wooded areas are ideal spaces for healing family systems (Harper, Rose & Segal, 2019).

However, to answer the question of *why are we attracted to trees*, we must expand from correlated factors into larger constructs of meaning. By conducting a thematic analysis (Braun & Clarke, 2006) of a large data set of social media posts from people on their interactions with trees,

we can identify trends in experience (Guest, MacQueen, & Namey, 2012). From these trends, we can find a larger, functional description of the human experience of relating to trees. Beyond finding correlation between health outcomes for individuals, an in-depth, qualitative analysis using hermeneutics gives a reason for the true meaning we assign trees (Wernet, 2014).

In our current day and age, authorship about numinous experiences are published directly to social media. Social media, arguably the greatest integration of pop culture with the everyday person, provides a unique platform for us to see the meaning large groups of people make from their interaction with Nature. Importantly, social media is largely unfiltered by editorial review. Whereas writing historically was limited by the capacity of the Press, researchers now can study a more "raw" data set published by thousands of individuals simultaneously in Facebook groups. These groups provide a welcoming space for people to share their experiences around a unifying topic. Many groups focus on numinous experiences in nature, such as "Amazing Wildlife And Nature," a public forum of more than 600,000 people who share incredible moments. Additionally, the flexibility of social media means that participants can share numinous experiences via memes, pictures, essays, *and* short-form posts. By studying the meaning that individuals describe in their posts about numinous experiences, therapists can develop insight into how people make meaning of their shared relationship to Nature.

To answer the question *why are we attracted to trees?*, this study will pass themes derived from a large data set of online subjects through the Hermeneutic Circle in order to find the underlying, generalizable reason for our collective attraction to trees. As we face climate change together, redefining our relationship with Nature can begin with simple questions such as this. Ecopsychology points to our symbiosis with the ecosystem as the core healing that humanity must undertake if we are going to continue to survive on our planet (Cianconi, Betrò, & Janiri, 2020).

Literature Review

Wilson's (1984) theory of Biophilia created a new concept of our relationship to the Earth. He proposed that human beings are inherently drawn to interspecies relationships as well as to nonhuman, nonconscious organisms such as plants or invertebrate (Wilson, 1984). Within the confines of an urbanized lifestyle, we are denied the chance to interact with the planet in the direct, symbiotic way that our bodies have adapted to. Wilson's original publication drew upon his boyhood experiences hunting snakes and frogs in Floridian swampland. He avoids interpretating Nature as a nurturing or loving entity like Native scholars (Conty, 2022; Kimmerer, 2015). Instead, Wilson highlights the duality of fear and attraction that each individual holds for their natural environment. He argues that by reentering our ecosystem means reentering the food chain from which we have artificially removed ourselves (Wilson, 1984). In this way he paved the way for ecopsychologists who argue that our reconnection with survival is the gateway for psychological integration of our *humanitas* and *animalitas* parts, the separation of which now creates existential anxiety (DeRobertis, 2015).

Recent scholarship in ecopsychology has pushed for the re-attunement of humans to the natural environment. Human beings have currently shaped more than half of the planet's surface (Hooke & Martin-Duque, 2012). Since Industrialization, our planet has been warmed at an alarming rate. Carbon dioxide released from the burning of fossil fuels has steadily increased the temperature on land and in the sea (Arrhenius, 1895; Ricket, 2021). Our nonstop pollution has created an existential crisis in younger generations, raising widespread anxiety over our future as a species (Ricket, 2021; Plesa, 2019; Hickman et al, 2021). Ecopsychology proposes that we must realign our mental and behavioral patterns with our planetary ecosystem (Harrild & Luke, 2020). Capitalism, in the short span of its existence, has created widespread harm to our natural resources (Ricket, 2021; Simard, 2021). Ecofeminists have framed this harm as an

epistemological shift from the premodern era in which humanity viewed the Earth as a Mother/Goddess figure, to one of Industrial obsession with Mastery over Nature for the production of Capital (Plesa, 2019). An anecdote to this vainglorious relationship with Nature are "mystical experiences" that blur the line between our experience as human beings and our experience as animals, also known as the numinous experiences discussed previously (DeRobertis, 2015; Harrild & Luke, 2020; Nuckols, 2010).

What clinical implications do Numinous experiences hold? Numinous experiences help us feel "small." They decentralize our concept Self beyond individualism, reminding us that we are a part of an ecosystem much larger than ourselves (Harrild & Luke, 2020; Nuckols, 2010). This decentralization of the Self into Nature has philosophical roots in Shingon Buddhism (Terakawa, 1960; Levine, 2022). In Juju-Shin, or, the Ten Stages of the Mind, the eighth stage towards enlightenment is for "the mind to be aware of Oneness of all existence" (Terakawa, 1960). This feeling of "no-self" is fertile ground for therapists helping clients make meaning of their lived experiences. In fact, numinous experiences often lead individuals to find meaningful connections and resolve internal conflict (Harrild & Luke, 2020; Nuckols, 2010). Family therapy already requires both therapist and clients to "zoom out" from their individual psychologies to think of the larger system at work (Kerr & Bowen, 1988; Harper, Rose & Segal, 2019). As ecopsychologists have argued, engaging clients in contemplating their relationship with the ecosystem broadens their view of the metanarrative of human life (Buzzell & Chalquist, 2009; Herrild & Luke, 2020).

Numinous experiences hold deep spiritual significance. Authors such as Isak Dinesen and Basho are famous for their narratives of the spiritual meaning they have formed from numinous experiences in Nature (Dinesen, 1952; Basho, 1966). These experiences fall under the purview of transpersonal ecopsychology, as it examines the potential numinous experiences have to unlock the highest human potential (Herrild & Luke, 2020). Transpersonal psychology studies altered states of consciousness to find human betterment, usually through transcendence or unity (Herrild & Luke, 2020; Lajoie & Shapiro, 1992). Numinous experiences push us into the "no-Self" (Terakawa, 1960), an altered state of consciousness that allows us the freedom to belong to our ecosystem like any other animal (DeRobertis, 2015). This state of consciousness exists outside of our Industrialized view of time, where incremental progress is eroded in favor of felt understandings of time (Sherman, 2019; Ricket, 2021). It is in this transcendent state of consciousness that we can truly appreciate the age and wisdom of trees.

Trees, particularly large trees, can facilitate these numinous experiences. Encountering an ancient tree in the forest inspires a sense of awe that can be amplified through meditation (Ricket, 2021; Simard, 2021). When we enter a forest, we breathe in a mixture of beneficial microorganisms that propagate in healthy woodland soil (Simard, 2021; Wohlleben, 2018). Forest bathing, or Shinron-yoku, has been proved to decrease blood pressure and general anxiety (Ideno et al, 2017). Wohlleben (2021) discusses how for centuries, pagan traditions centered trees in their rituals. Most Americans are familiar with tree-centered ritual, such as Christmas Trees during December that remain up from around the Winter Solstice, through Christmas (December 25), and then finally come down in the Gregorian New Year. Kimmerer (2015) and other native scholars promote trees as teachers, re-introducing Western biologists to the concept of learning from plants instead of seeing them as passive resources (Plesa, 2019). Wilson (1984) cites trees in his original theory of Biophilia, but our exact motivation for interaction with trees remains on ongoing field of study (Simard, 2021; Wohlleben, 2018; Wohlleben, 2021).

Ecopsychology has been introduced to the field of Family Therapy via nature-based therapy (Harper, Rose & Segal, 2019). Horticultural therapists

have become the torchbearers for introducing family systems to Nature (Harper, Rose & Segal, 2019; Marcus & Sacks, 2014). Healing gardens are invaluable spaces for therapists to work in (Harper, Rose & Segal; Marcus & Sacks, 2014; Wise, 2015). For many vulnerable populations, a contained, safe garden is optimal for reconnecting with Self and Others (Poulsen et al, 2018; Poulsen et al, 2016; Sidenius et al, 2017). However, they lack wildness. In order to transcend the human experience, we must reconnect with the essence of wilderness (DeRobertis, 2015; Herrild & Luke, 2020; Wilson, 1984). Fortunately, we now have data provided spontaneously by millions of people worldwide who experience healing outside of curated green spaces. Most people nowadays who find themselves at the foot of an ancient tree deep in the woods have a way of documenting and sharing their numinous experience with the world: mobile connection to the Internet.

Methodology

Participants

First, I began by emerging myself in the data. These were comments, posts, and captioned pictures in Nature-based groups on Facebook. Special considerations for textual analysis have to be made given the new-fangled nature of social media text versus text written from the era of printing-press publication. Alleyne (2015) discusses how mini-narratives are made through Facebook stories and comments. Each comment lists a person and time stamp, meaning that a "scene" is implied through character and setting as the time combined with a computer. For example, a comment posted by Brendan Yukins at 3:55pm sets up a vignette where the character of "Brendan," who we can describe by his profile picture, was sitting at his computer in late afternoon. Mini-narratives utilize the basic Three Act model of "The Heroes Journey": Act 1, the hero starts in the ordinary world, Act 2, they undergo some sort of challenge or quest, then Act 3, returns changed and triumphant to the same world (Alleyne, 2015; Campell, 2012). I utilized this framework to screen for numinous experiences described in Nature groups on Facebook. Posts that I retained in the data set had to meet the Hero's Journey criteria: a reportedly ordinary person who had a numinous experience with a tree, then returned to their computer changed to write about it on Facebook. This way, I focused solely on those describing Numinous experiences, which by their definition have a significant psychological impact on the author. "Look how pretty this tree is!" would be a comment I would remove because, although charming, it does not demonstrate a psychologically transformative experience on behalf of the author.

Data Collection

To reach a sample size of saturation, we would have to access a large number of personal accounts that people have voluntarily transcribed about their experiences with trees. Thankfully, Social Media provides us with such a library. When reviewing social media posts on Facebook, I started by using inductive coding to find multiple trends in descriptions of nature overall. By starting with natural experiences generally, I could determine if trees held a more specific significance in the popular psyche, or if such interactions followed general trends of interactions with nature. Reoccurring codes for natural encounters included 1) with large or rare animals, 2) high-definition images of moss or fungi 3) pastoral farming motifs, and 4) birds in flight. The descriptions of such a variety of images was too random to reach saturation. When I focused on trees, however, language trends become more specific. I examined the trend of people posting pictures of themselves hugging or standing next to large trees.

Using data from Facebook brings with it questions of intellectual property. If someone posts about their experience on Facebook, is it ethical to source that data as public domain? Facebook's policy on intellectual property centralizes the company: all content posted onto the social media platform is licensed to Meta, Facebook's new company, "when you share, post, or upload content that is covered

by intellectual property rights on or in connection with our Products, you grant us a non-exclusive, transferable, sub-licensable, royalty-free, and worldwide license to host, use, distribute, modify, run, copy, publicly perform or display, translate, and create derivative works of your content" (Meta, 2022). This raises the question of research conducted using the social media's content. Under Facebook's copyright policy, "copyright protects original expression such as words or images. It does not protect facts and ideas, although it may protect the original words or images used to describe an idea" (Meta, 2022). Using compliance with Facebook copywrite policy as my guide, I will be citing ideas posted by user, but not using images or original words. All identifying information was removed from data collected, such as names of OPs (Original Posters) and the originating Facebook group. Quotes do appear in this study, but only for the process of the Hermetic Circle. There is no direct analysis or interpretation of a specific author's meaning or motivation without hermeneutic investigation. In this way, I can protect both the confidentiality of the subjects as well as avoid plagiarizing ideas directly taken from a post. For example, if a Facebook author posted a direct answer to the question *why are we attracted to trees*, I would not lift it for this study, as the analysis would be plagiarized.

Thematic analysis using inductive coding is a research method that involves assembling qualitative features, such as words, to find common essential points among the data (Braun & Clark, 2006). I began by compiling Facebook posts that express numinous experiences in Nature. This was to try and capture thematic similarities among all numinous experiences overall, not just with trees. If there was an obvious trend in numinous experiences overall, I did not want to over-specify a larger psychological phenomenon to a narrower relationship between human begins and Nature. Once I complied and saved at least 35 of these posts in a Word Document, I process coded for reoccurring words, phrases, and ideas that OPs use to describe their experience in Nature. This phase is called "disassembling" the data (Strauss & Corbin, 1990). These codes proved to vary greatly depending on the subject matter. For example, codes based on pictures of encounters with wild animals tended to discuss the ethics of hunting. These codes were strikingly different than the codes used to discuss posts about trees, which focused on the size and magnificence of the organism. The first round of process codes resulted in the following thematic trends:

Beautiful/Beauty
God's Creation
No Hunting
Grace
Mother
Gorgeous
Fungi
Mushrooms
Thank you
Men
Amazing
Love
Giant
Breathtaking
Tree
Heaven
Age
Wisdom
Magnificent
Wall-of-Wood
Big
Hug
Touching
Wonderful
Crossed paths
Elder
Big Tree
Daughters
Health care
Eye
Stunning
Tears
Peace
Forest
Stream
Language
Universal
Horse
Fowl

At this juncture, I noted that the codes were too varied to reach conclusive saturation. I focused my second round of coding firmly on Trees (Strauss & Corbin, 1990; Saldaña, 2016). In memes, pictures, and other forms, trees occurred as the second-most frequent subject matter after animals. However, trees had the largest number of posts involving numinous experiences, which follow the criteria for the Hero's Journey. After determining that indeed most posts about numinous experiences in the Facebook groups were about trees, I re-emersed myself in the data with the narrowed scope of tree-related posts, maintaining a sample size of 35 posts about numinous experiences (Castelberry & Nolan,

2018). The following short list are thematic codes, derived from the social media posts focused on numinous experiences with trees:

Beautiful/Beauty	Age
Amazing	Big
Love	Elder
Breathtaking	Magnificent
Tree	Wisdom
Heaven	Big Tree

Data Analysis

This stage of analysis was documented via analytic memos (Saldaña, 2016). Memos were documented with dates in the same Word Document as my collected data (screenshots of Facebook posts and comments sections). Graduating beyond thematic analysis, I then used hermeneutic investigation to explore the underlying messages Facebook authors were conveying (Palmer, 1969; Dibley et al, 2020). Hermeneutics is the process of interpreting experience into language (Nuckols, 2010; Patton, 2002). Meaning making of interactions with Nature requires an openness by the researcher towards spiritual exploration. Numinous experiences are a transpersonal psychological state similar to prayer or meditation (Nuckols, 2010). Hermeneutics is a tool, originally from theology, that deconstructs holistic meaning down into parts, reinterprets or finds nuanced meaning within those parts, then strings those parts back together to make a newly nuanced whole. This cycle is called the "Hermeneutic Circle" (George, 2021). Friederich Schleiermacher, the grandfather of hermeneutic thought, emphasized the use of intuition in interpretation (Prakoso & Khasanah, 2018). He encourages the interpreter of the textual data to allow times of non-work to allow ideas to arise from the depths of their soul (Palmer, 1969). Later on, Wilhelm Dilthey would add to the field the use of historical context to interpret words and phrases (Palmer, 1969; Prakoso & Khasanah, 2018). This begat the common Hermeneutic tradition of finding root words to nuance meaning. For example, the English word, "happiness" is based on an old Norse word, hap, meaning, "luck/chance/good fortune" (de Vaan, 2008). Therefore, "you make me happy," through the Hermeneutic Circle is reinterpreted to mean "you make me lucky." The Hermeneutic Circle provides researchers with a methodology to detect meanings that have deep, cultural roots even below the speaker's awareness. In this example, "happy" and "lucky" become synonymized, revealing a "true meaning" of the word as it is used and understood by the subject (Wernet, 2014). The therapist can use this process to deepen understanding with clients of their deepest beliefs, desires, and unarticulated passions.

For this study, I utilized Schleiermacher's model of Whole and Parts to explore the most frequent process codes that occurred in the comment section, my own analytic memos, and OP's description under posts about numinous experiences with trees (Palmer, 1969). In abbreviated form, this is my rendition of the Hermaneutic Circle (Prakoso & Khasanah, 2018). First, I examined the symbolic meaning of the whole original phrase. For example, one commenter described a Giant Sequoia: "As if the spirit of a man lives in that tree." As a Whole, I interpret this phrase to mean they feel like the tree has an anthropomorphized soul. My second step is to break the phrase into parts. Key words from this post are "spirit," "man," and "lives." "Spirit" comes from the Latin word spirare, meaning "breathe" (Simpson, Weiner, & Oxford University Press., 1989). "Man" is a Greek word man/manu meaning "hand" (Simpson, Weiner, & Oxford University Press., 1989). "Lives" is from the Old English word lifian, meaning "to experience" (Simpson, Weiner, & Oxford University Press., 1989). Now, to complete the Hermaneutic Circle, I string these parts back into the Whole. Instead of "As if the spirit of a man lives in that tree," the original sentence now reads "As if the [breathe] of a [hand] [is experienced] in that tree." From this new Whole, a second interpretation arises: the image of a person laying their hand on the tree's trunk and taking a breath. In Schleiermacher's model, the two interpretations are then combined and reflected upon (Tomkins

& Eatough, 2018; Palmer, 1969). The interpreted result: I experienced a tree's anthropomorphized soul by laying my hand on a Giant Sequoia's trunk for one breath. Cross-referencing the original social media post, the subject is indeed placing their hands on the tree's trunk. Through this Circle, instructions on how to experience this same feelings the subject had are revealed.

Findings & Discussion

No words can accurately express the feelings I had when next to a sequoia

-Anonymous Poster, Facebook Group, 2022

Using hermeneutics in the final stage of interpretation of the data is to find the meaning in the lived experiences hidden behind commentors' language. Transpersonal ecopsychology is fundamentally experiential. People do not write a numinous experience, they feel it. As in this example, the final hermeneutic interpretation of these Facebook posts can hold instructions for how to experience the same feeling that the author had at the time, even if the author intended only to describe their experience. Following this logic, the reason for why people are attracted to trees may be instructions for embodied experience as much as theoretical insight. In interpreting the data, I found quite literal instructions on how to feel the "love" of trees for myself, as love was the common experience reported by posters to social media.

Hermeneutic exploration of the most common analytic codes for trees reveals the following root themes in Fig. 1 (Hindley, Langley & Levy, 2000; Watkins, 2000).

When incorporated into users' Facebook comments, these words enrich our interpretation of commenter's numinous experiences with trees. Take this comment underneath a picture of Sequoia National Park, California, "Looks like a very tall

Figure 1
Root Themes

Beautiful/Beauty	Physical attractiveness, goodness/courtesy (Anglo-French, 14th ce), bealte
Amazing	stunned, dazed, bewildered (Old English), amasod
Love	feeling of love; romantic sexual attraction; affection; friendliness; the love of God; Love as an abstraction or personification, (Old English), lufu
Tree	Be firm, solid, steadfast (Proto-Indo-European), *deru-
Breathtaking	Act of taking breaths or a breath (Middle English)
Heaven	The visible sky, firmament, Home of God (Old English), heofon
Age	Grow old, make old (Old English)
Big	Old, power, strength, greatness, large amount (Latin), magn
Elder	Older person, parent, ancestor, chief, prince (Old English), eldra
Magnificent	To make great (Latin), magn
Wisdom	Knowledge, learning, experience (Old English), wis

person wearing a cloak of green and a long brown robe. Awesome." The word "awesome" is derived from Old English, meaning "inspiring awe or dread" (Hindley, Frederick & Levy, 2000). Unconsciously, the commenter is reporting a numinous experience of the picture (Nuckols, 2010). It is unclear whether the commenter themselves has visited the Sequoia in-person. Many commenters mention they have visited a particular tree, but many seem to have a numinous experience simply from viewing a picture. Ecopsychology focuses on real-life interaction with Nature (Buzzell & Chalquist, 2009; Ricket, 2021). Most ecopsychologists would argue that simply viewing pictures online is not enough. However, online pictures may be serving the same purpose as pictures of forests or landscapes in therapy offices, which are proven to lower blood pressure and decrease anxiety (DeAngelis, 2017). Indeed, comments about trees such as the one above may indicate that people can use images of nature to access the altered consciousness necessary to have numinous experiences (Nuckols, 2010; Harrild & Luke, 2020). If true, this means that we already have access to numinous experiences in the palm of our hand; an exciting prospect given that dense urbanization may render wilderness inaccessible to many (Hooke & Martin-Duque, 2012; Ricket, 2021). However, without direct interaction with the Natural World, the effect may be diluted (DeRobertis, 2015; Wislon, 1984).

Anthropomorphizing trees as "giants" occurred frequently in the data collected from Nature-based Facebook groups. "Tall" has its roots in Middle English, where the word signifies someone who is "handsome, good-looking, large, big, humble, meek" (de Vaan, 2008). The root for "big" is the Latin *magn*, which carries the simultaneous meanings of old, large, and great (de Vaan, 2008). In this ancient conceptualization of "growth," to become older is both to become physically *bigger* as well as qualitatively *better*. Therefore, many kings used the superlative "the Great" after their name: it denoted how their power correlated with the *longevity* of their reign (de Vaan, 2008). Trees, it seems, get better as they get bigger and older. Facebook authors frequently used "giant" to describe the trees they interacted with. Trees live hundreds of years longer than humans (Wohlleben, 2018). When we touch or hug a tree, we are interacting with a species whose "greatness" surpasses all humanity by the fact of its lifespan. In a person's whole life, they will never interact with another human as old as an ancient tree. A 69-year-old Facebook poster illustrated this point by posting a picture of himself hugging a tree, juxtaposing an elder human with an elder tree to illustrate short our lifespans are. In this way, trees serve as our models for how to grow old (Kimmerer, 2015). Relationships to trees can serve as proxy to relationships with humans who came long before ourselves (Simard, 2021). This message came up again and again in the Facebook posts describing a feeling a solace in the "wisdom of trees." Passing their words through the Hermenautic Circle, I found that "wisdom" means *experience in steadfastness* in Old English (Hindley, Langley & Levy, 2000; Watkins, 2000). Relationally speaking, authors were reporting that trees offered them lessons in steadfastness the way that an older relative would offer wisdom to a younger family member.

Of the most frequently occurring codes for trees, "Elder," "Age," and "Big" all include root word references to *time* (Hindley, Langley & Levy, 2000). Particularly, Facebook authors described "keeping up on over time" with their favorite trees. In our post-Industrial era, our concept of time has become precise and incremental (Sherman, 2019; Ricket, 2021). Prior to Industrialization, measurements of time were approximate (Sherman, 2019). Instead of rushing to a meeting or other obligation, workers were able to complete their tasks at a pace appropriate to the amount of time it took to complete them. How we measure time is part of our *humanitas* identity (DeRobertis, 2015). It is separate from our natural, *animalitas* experience of time based on the sun and seasons. One Facebook poster said, "A combination of ancient soils, time, and the elements have carved out every line, lovingly sculpted and imbued this tree with life!"

Time, in our post-Industrial understanding, is a flattened, standardized measurement of change (Sherman, 2019). The number of years a person has been living is a hyper-standardized conceptualization of a person's developmental stages. For example, at one year of age, a person is "supposed" to walk. However, that timeline varies based on each person. Trees help to complicate that narrative. Trees grow at different speeds year-to-year, impacted by weather conditions and natural disasters. The effects of these variations lead to twists and bends in each tree that resist standardization. Interacting with this "tree" concept of time, we are able to perceive ourselves outside of the post-Industrial concept of Time and rejoin a metanarrative of the planet in which time is measured in change sculpted by the seasons (Buzzell & Chalquist, 2009).

Conclusion & Clinical Implications

We are attracted to trees because they reconnect us to the natural flow of time, fluctuating with each season and change in environment. Trees serve as guides in aging, reminding us that to grow old is synonymous with growing more beautiful. Numinous experiences with trees allow us to be filled with awe at the passage of time, not remorseful that we have "wasted" it. Trees do not work on an exact schedule. Even though trees generally grow and hibernate in rotation, the pace and degree to which they do these activities vary widely based on a wide variety of factors. For therapists, trees can serve as ways for clients to accept the passage of time. If we instruct a client to examine a trees trunk, describe its features, or touch its surface, we can facilitate numinous experiences that help clients reconceptualize their aging process. Clients who suffer anxiety may benefit from interaction with trees, as well as clients undergoing major losses with time-themed negative core concepts. For example, a client who fears they "have wasted time" could benefit from meditation with a tree. The attending therapist could prompt them to meditate on the tree's life experiences, or guide the client to touch areas where the tree has regrown. Therapists can use trees to contextualize time, which helps clients emotionally "scale" their anxiety.

Numinous experiences have to be felt in order to have psychological impact, so the therapist should be cautious about over-facilitating the interaction between the person and the tree. After all, most of the posts about numinous experiences with trees described scenarios in which the author was alone. However, open dialogue with the client following their individual experience with a tree could expand reflection and meaning-making. Clinicians should find their own creative application of the knowledge presented in this study. Their access to trees may also be influenced by office location, legal concerns regarding liability, or seasonal allergies. Nevertheless, interaction with trees improves mental health (Ideno et al, 2017). I conclude by offering this invitation: hundreds of people on social media report falling in love with trees through somatic interaction. To discover why, I invite the reader to venture outside, and lay their hand on the bark of a tree.

References

Alleyne, B. (2015). Narrative at work in the world. *Narrative a: Storied approaches in a digital ge* (pp. 99-130). SAGE Publications, Inc. https://doi.org/10.4135/9781473910782

Altheide, D. L. (1996). Ethnographic content analysis. *Qualitative analysis*. 14-23. SAGE Publications, Inc., https://doi.org/10.4135/9781412985536

Arrhenius, S. (1896) XXXI. On the influence of carbonic acid in the air upon the temperature of the ground, *The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science*, 41:251, 237-276, DOI: 10.1080/14786449608620846

Bash, M. 1644-1694. (1966). *The narrow road to the Deep North, and other travel sketches*. Harmondsworth: Penguin.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*, 77-101.

Campbell, J. (2012). *The hero with a thousand faces* (3rd ed.). Novato: New World Library.

Castleberry, A., & Nolen, A. (2018). Thematic analysis of qualitative research data: Is it as easy as it sounds? *Currents in Pharmacy Teaching and Learning*, *10*, 807-815. https://doi.org/10.1016/j.cptl.2018.03.019

Chapman, A., Hadfield, M., Chapman, C. (2015). Qualitative research in healthcare: An introduction to grounded theory using thematic analysis. *Journal of the Royal College of Physicians of Edinburgh. 2015; 45*(3):201-205. doi:10.4997/jrcpe.2015.305

Cianconi, P., Betrò, S., Janiri, L. (2020). The Impact of Climate Change on Mental Health: A Systematic Descriptive Review. *Front Psychiatry*; *11*(74). doi: 10.3389/fpsyt.2020.00074. PMID: 32210846; PMCID: PMC7068211.

Conty, A. (2022). Animism in the Anthropocene. *Theory, Culture & Society*, *39*(5), 127–153. https://doi.org/10.1177/02632764211039283

DeAngelis, T. (2017). Healing by design. *Monitor on Psychology*, *48*(3). https://www.apa.org/monitor/2017/03/healing-design

DeRobertis, E. M. (2015). Philosophical-anthropological Considerations for an Existential-Humanistic Ecopsychology. *The Humanistic Psychologist*, *43* (4), 323-337. doi: 10.1080/08873267.2014.961637.

de Vaan, M. (2008). *Etymological Dictionary of Latin and the other Italic Languages*, vol. 7. Leiden: Brill.

Dibley, L., Dickerson, S., Duffy, M., & Vandermause, R. (2020). *Doing hermeneutic phenomenological research: a practical guide*. SAGE Publications Ltd, https://doi.org/10.4135/9781529799583

Dinesen, I. (1952). *Out of Africa*. New York: Modern Library

Foley G., Timonen V. (2015). Using grounded theory method to capture and analyze health care experiences. *Health Services Research*, *50*, 1195–1210. doi:10.1111/1475-6773.12275

Ideno, Y., Hayashi, K., Abe, Y., Ueda, K., Iso, H., Noda, M., . . . Suzuki, S. (2017). Blood pressure-lowering effect of Shinrin-yoku (Forest bathing): A systematic review and meta-analysis. *BMC Complementary and Alternative Medicine*, 17(1), 1-12.

George, T. (2021). *"Hermeneutics", The Stanford Encyclopedia of Philosophy*, Edward N. Zalta (ed.). https://plato.stanford.edu/archives/win2021/entries/hermeneutics/

Guest, G., MacQueen, K. M., & Namey, E. E. (2012). Planning and preparing the analysis. *In Applied Thematic Analysis* (pp. 21-48). SAGE Publications, Inc., https://doi.org/10.4135/9781483384436

Haberman, D. L. (2017). Drawing out the iconic in the aniconic: worship of neem trees and Govardhan stones in Northern India. *Religion*, *47*(3), 483–502. https://doi.org/10.1080/0048721X.2017.1290663

Harrild, F., & Luke, D. (2020). An evaluation of the role of mystical experiences in transpersonal ecopsychology. *Transpersonal Psychology Review*, *22*(1), 45–52.

Harper, N. Rose, K., & Segal, D. (2019). *Nature-based therapy: A practitioner's guide to working outdoors with children, youth, and families*. Gabriola Island: New Society Publishers.

Hickman, C., Marks, E., Pihkala, P., Clayton, S., Lewandowski, R. E., Mayall, E. E., Wray, B., Mellor, C., & van Susteren, L. (2021). Climate anxiety in children and young people and their beliefs about government responses to climate change: a global survey. *The Lancet Planetary Health*, 5(12), 863–873. https://doi.org/10.1016/S2542-5196(21)00278-3

Hindley, A., Frederick, W.L., Levy, B.J. (2000). *Old French-English Dictionary*. Cambridge: University Press.

Hooke RLeB, Martin-Duque, JF. 2012. Land transformation by humans: A review. *GSA Today* 22: 4–10. https://doi.org/10.1130/GSAT151A.1

Kerr, M.E., & Bowen, M. (1988). *Family evaluation*. New York: W.W. Norton.

Kimmerer, R. W. (2015). *Braiding sweetgrass*. Minneapolis: Milkweed Editions.

Kotera, Y., & Fido, D. (2022). Effects of Shinrin-Yoku Retreat on Mental Health: a Pilot Study in Fukushima, Japan. *International Journal of Mental Health & Addiction*, *20*(5), 2652–2664. https://doi.org/10.1007/s11469-021-00538-7

Lajoie, D.H. & Shapiro, S. (1992). Definitions of transpersonal psychology: The first twenty-three years. *The Journal of Transpersonal Psychology*, *24*(1), 79–98. https://www.atpweb.org/jtparchive/trps-24-92-01-079.pdf

Levine, G. (2022). Disappearing acts: What Buddhist tree-icons might tell us. *Postmedieval*, *13*, 259–272. https://doi.org/10.1057/s41280-022-00234-2

Marcus, C., & Sachs, N. (2014). *Therapeutic landscapes : An evidence-based approach to designing healing gardens and restorative outdoor spaces*. Hoboken: John Wiley & Sons.

Mackali, Z., Çetinkaya, S., & Ay, N. (2023). The mediating role of self-compassion in the relationship between internalized stigma and psychological resilience in bipolar disorder. *Psychology & Psychotherapy: Theory, Research & Practice*, *96*(4), 952–966. https://doi.org/10.1111/papt.12488

McDonald, J. A. (2018). Influences of Egyptian Lotus Symbolism and Ritualistic Practices on Sacral Tree Worship in the Fertile Crescent from 1500 BCE to 200 CE. *Religions*, *9*(9), 256. https://doi.org/10.3390/rel9090256

Nuckols, G. T. (2010). On nature and the psyche: The psychological and spiritual significance of nature-based numinous experiences. *ProQuest Dissertations & Theses Global: The Sciences and Engineering Collection*, 746479579. https://www.proquest.com/dissertations-theses/on-nature-psyche-psychological-spiritual/docview/746479579/se-2?accountid=26166

Plesa, P. (2019). *A theoretical foundation for ecopsychology: Looking at ecofeminist epistemology, New Ideas in Psychology*, 52, 18-25, https://doi.org/10.1016/j.newideapsych.2018.10.002.

Palmer, R.E. (1969). *Hermeneutics: Interpretation Theory in Schleiermacher, Dilthey, Heidegger and Gadamer*. Evanston: Northwestern University Press.

Patton, M (2002). *Qualitative research and evaluation methods*. Thousand Oaks: Sage Publications.

Poulsen, D.V., Stigsdotter, U.K. & Davidsen, A.S. (2018). "That Guy, Is He Really Sick at All?" An Analysis of How Veterans with PTSD Experience Nature-Based Therapy. *Healthcare*, 6(2), 64. doi: 10.3390/healthcare6020064

Poulsen, D. V., Stigsdotter, U. K., Djernis, D., & Sidenius, U. (2016). 'Everything just seems much more right in nature': How veterans with post-traumatic stress disorder experience nature-based activities in a forest therapy garden. *Health psychology open*, *3*(1), 2055102916637090. doi:10.1177/2055102916637090

Prakoso, T., & Khasanah, V. (2018). Understanding the Core Ideas of Hermeneutics Figures. *KnE Social Sciences*, *3*(9), 702–711. https://doi.org/10.18502/kss.v3i9.2733

Ricket, A. L. (2021). Teaching Land as an Extension of Self: The Role of Ecopsychology in Disrupting Capitalist Narratives of Land and Resource Exploitation. *Radical Teacher, 119*, 14–20. https://doi.org/10.5195/rt.2021.706

Robinson, D. G., Ammer, C., Polle, A., Bauhus, J., Aloni, R., Annighöfer, P., Baskin, T. I., Blatt, M. R., Bolte, A., Bugmann, H., Cohen, J. D., Davies, P. J., Draguhn, A., Hartmann, H., Hasenauer, H., Hepler, P. K., Kohnle, U., Lang, F., Löf, M., & Messier, C. (2024). Mother trees, altruistic fungi, and the perils of plant personification. *Trends in Plant Science, 29*(1), 20–31. https://doi.org/10.1016/j.tplants.2023.08.010

Saldaña, J. (2016). *The coding manual for qualitative researchers (3rd ed.)*. Los Angeles: SAGE.

Sherman, A. (2019). *The Bells of Old Tokyo: Meditations on Time and a City*. New York: Picador.

Sidenius, U., Karlsson Nyed, P., Linn Lygum, V., & K Stigsdotter, U. (2017). A Diagnostic Post-Occupancy Evaluation of the Nacadia® Therapy Garden. *International journal of environmental research and public health, 14*(8), 882. doi:10.3390/ijerph14080882

Simard, S. (2021). *Finding the mother tree: Discovering the wisdom of the forest*. New York: Alfred A. Knopf.

Simpson, J.A., Weiner, E.S.C., & Oxford University Press. (1989). *The Oxford English Dictionary*. Oxford: Clarendon Press.

Strauss, A. L. & Corbin, J. (1990). *Basics of Qualitative Research: Grounded Theory Procedures and Techniques*. London: SAGE.

Terakawa, S. (1960). A Jungian interpretation of Juju-Shin, or, The ten stages of mind in Shingon Buddhism. *ProQuest Dissertations & Theses Global: The Sciences and Engineering Collection*. (1654456513). https://www.proquest.com/dissertations-theses/jungian-interpretation-juju-shin-ten-stages-mind/docview/1654456513/se-2?accountid=26166

Thoreau, H. D. (2016). *Walden*. Macmillan Collector's Library.

Thoreau, H.D. (2006). *Thoreau and the Art of Life: Precepts and Principles*. North Ferrisburg: Heron Dance Press.

Tomkins, L. & Eatough, V. (2018). *Hermeneutics: interpretation, understanding and sense-making. The sage handbook of qualitative business and management research methods*. 185-200. https://dx.doi.org/10.4135/9781526430212

Tully, C. (2023). Paradise on Earth: Feraferia and the Landscapes of the Mind. *Journal for the Study of Religion, Nature & Culture, 17*(4), 439–457. https://doi.org/10.1558/jsrnc.24207

Vaismoradi, M., Turunen, H., & Bondas, T. (2013). Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. *Nursing and Health Sciences, 15*, 398-405. doi: 10.1111/nhs.12048

Vujcic Trkulja, M., Tomicevic-Dubljevic, J., Tosevski, D. L., Vukovic, O., & Toskovic, O. (2021). Development of Evidence-Based Rehabilitation Practice in Botanical Garden for People With Mental Health Disorders. *HERD: Health Environments Research & Design Journal, 14(*4), 242–257. https://doi.org/10.1177/19375867211007941

Watkins, C. (2000). *The American Heritage Dictionary of Indo-European Roots, 2nd ed.*, Boston: Houghton Mifflin Co.

Wernet, A. (2014). Hermeneutics and objective hermeneutics. *The SAGE Handbook of Qualitative Data Analysis*. 234-246. https://doi.org/10.4135/9781446282243

Wilson, E. O. (1984). *Biophilia*. Cambridge: Harvard University Press.

Wohlleben, P., Billinghurst, J., & David Suzuki Institute. (2018). *The Hidden Life of Trees*. Vancouver: Greystone Books.

Wohlleben, P. (2021). *The Heartbeat of Trees*. Vancouver: Greystone Books.

Biography

Brendan Yukins, LSW is a social worker and community gardener in Chicago, IL. He works as a staff therapist with the Expansive Group, specializing in Queer sex therapy for survivors of intimate partner and sexual violence. Brendan is a board member for the American Horticultural Therapy Association, a PhD student in the Couple and Family Therapy Department at Adler University, and a published poet. He has presented domestically and internationally on Climate Change Anxiety, Nature-based therapy with family systems, and working with LGBTQIA+ populations.

Evaluation of a Horticultural Therapy Program for Care Home Residents with Mental Illness

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Abstract

Horticulture has long been used as a leisure or social activity in care homes, but there were few evaluation studies of Horticultural Therapy (HT) for care homes residents with mental illness. This study examined the process and outcomes of a standardized horticultural therapy program for care home residents with severe mental illness. Fifty participants were randomly assigned to an 8-session HT group and a comparison group (n = 25 for each group). The process and outcomes of the program, including stress and anxiety, mental well-being, and degree of engagement in meaningful activities were obtained through self-completed questionnaires and observational ratings of participants during the group sessions. The results supported that HT significantly promoted participants' mental well-being, engagement, and sense of meaningfulness and achievement. The evidence provides support on the effectiveness of HT for care home residents with long-term mental illnesses.

Introduction

Horticultural therapy is the design and use of plants and plant-based activities to achieve specific treatment and rehabilitation goals in the emotional, social, physical or intellectual domains (Capra et al., 2019). Horticultural therapy is a process of guiding participants to appreciate nature, develop interest in horticultural activities like gardening or farming, learn skills in taking care of plants, and develop self-efficacy and sense of achievement (Oh et al., 2018; Parkinson et al., 2011). Many studies showed that horticultural therapy could reduce stress and anxiety (Detweiler et al., 2015; Kam & Siu, 2010; Siu et al., 2020),increase attention and cognitive ability (Berman et al., 2008; Perrins-Margalis et al., 2000), improve engagement in meaningful activities and interests (Siu et al., 2020), increase quality of life (Tu 2022), and improving social interaction and sense of belonging (Diamant & Waterhouse, 2010; Sempik et al., 2014) among people with schizophrenia and severe mental illness.

While horticulture was used as therapeutic activity for care home residents (Clatworthy et al., 2013), many studies were conducted on people with dementia (Lu et al., 2020; Uwajeh et al., 2019). Care home residents with mental illness often had long history of illness and residual symptoms which impact on their daily functioning, although many could be partially or completely independent in activities of daily activities (ADL). Due to volitional or habituation issues, it is also often challenging to engage clients with severe mental illness to participate in instrumental ADL, social, productive, and leisure activities. It is a common objective for care homes to try to engage clients with long-term mental illness in meaningful activities, which could stimulate interest and participation in daily activities, enable re-learning of daily living and self-management skills, and enhance mental well-being and quality of life (Goldberg et al., 2002; Wu & Ma, 2016). Horticultural activities could be designed and graded with appropriate challenges to their cognitive and social skills, so that clients could participate and improve functional abilities through the activities. Through building meaningful connections with plants and nature, horticultural activities could promote relaxation and mindfulness, learning and practice of functional skills, and stimulate interests in activity participation. This study aims to address the research gap of examining the effects of horticultural therapy for care home residents with long-term mental illness.

Method

The study used a quasi-experimental design to evaluate the outcomes of a horticultural therapy programs for people with mental illness who resided in a care home. The study compared process and outcome measures of horticultural therapy group with a comparison group. The

outcome data was collected using self-report questionnaires and behavioral observations.

Participant

The participants of this study are people with severe mental illness from a residential care home (known as long-stay care home in Hong Kong). Participants should be able to follow instructions of horticulture activities (see Table 2). The exclusion criteria include those with intellectual disabilities or who have participated in horticulture activities in the past 6 months. Participants with challenging behavior are allowed to join if their behavior could be managed by HT group leader. The horticultural therapy activity and research were advertised through notices, leaflets, as well as announcement during community meeting of the care home. A total of 80 potential participants in the care home agreed to join the study. They were screened using the selection and exclusion criteria, and 50 met the selection criteria for the study. We obtained informed consent of 50 participants, who volunteered to join the program and the study. No incentives were provided for participating in the study, and participants were not required to pay to join the horticultural activities.

Sample size

A recent meta-analysis suggested that the effect size of horticultural therapy on mental health outcomes were in the medium range (Soga et al., 2017; Tu, 2022). The repeated-measures design used in this study had two groups (an intervention group and a control group), and there were two repeated measures over time. Using the G*Power software in power analysis, a sample size of 18 per group would be adequate to achieve a power of 0.80 if we assume a medium effect size (d) of 0.4, and α is .05 (Faul et al., 2007). To account for a potential attrition rate of 10%, we planned to recruit at least 44 subjects for random assignment to the two groups.

Procedures

We briefed the potential participants on the purpose, risks and benefits, and procedures of study. Among 80 potential participants who verbally agreed to join, fifty were suitable for participation in the horticultural therapy program. Those who agreed to join were requested to sign a consent form. The participants' basic demographic information, including gender, age, diagnosis, years of onset, was obtained from their case records.

The participants were randomly assigned to the horticultural therapy group and the comparison group using a random number generator application. The experimental group received both the weekly horticultural therapy program, while the comparison group joined parallel group activities, such as coloring pictures, reading newspaper and magazines. The study is single-blind, with only the assessors blinded to the participants' group membership. The therapist who conducted the horticulture therapy group and the participants were both aware of whether they were assigned to the intervention group or the control group.

Intervention Program

The standardized horticultural therapy program has a total of eight sessions, conducted by a qualified horticultural therapist. Each session lasts for one hour, which include introduction and instruction, activity time, and reflection and feedback. The HT sessions cover knowledge and skills in planting, arrangement of plants and flowers, care of indoor and outdoor plants, the use of herbs and aroma (Table 1). The key objectives of the HT program were to increase participation in meaningful activities, improve mental well-being, and build interests and leisure pursuits, and experience achievement and satisfaction.

Outcome Measures

Mental Well-being. We used the 7-item Chinese Short Warwick-Edinburgh Mental Well-being Scale (C-SWEMWBS) to measure the mental well-being of the participants. A validation study of the Chinese version showed that the instrument had acceptable

test-retest reliability of .67 ('Ng et al, 2014) It has a unidimensional factor structure and its score correlated in expected direction and strength with concurrent measures of well-being and quality of life (Fung, 2019).

Engagement and Meaningfulness. We used the 12-item Engagement in Meaningful Activities Survey (EMAS) to assess how far participants experience meaning in daily life (Goldberg et al., 2002). A validation study of the EMAS showed that its scores correlated in expected directions with the concurrent measures of well-being and life satisfaction (Eakman, 2013). The Chinese version of instrument was translated and validated in a previous study of horticultural therapy (Kam & Siu, 2010). We hypothesized that the horticultural therapy group would help participants to increase engagement in activities and add meaning to daily life experience.

Engagement in activity during HT Sessions. We hypothesized that HT could promote participants' engagement in activities. Using the observation and recording method developed by Gigliotti & Jarrott (Gigliotti & Jarrott, 2005), trained assessors rated the engagement of each participant using a behavioral sampling schedule. With consent from participants, we used a 360o camera to record the group activity process for analysis of engagement. Trained assessors watched the 360o videos and rated the engagement of each group participant. Assessors assigned one of four behavior codes reflecting participants' engagement for a minute in every five-minute segment of the video: 1) horticultural therapy (H); 2) productive behavior (P), 3) social behavior (S); and 4) non-engaged (N), and 5) disruptive behavior (D).

Perceived Benefits of Activity. This is a 7-item rating scale designed by the researchers to collect the perceived benefits from participants of HT program. The perceived benefits cover physical demands, relaxation, promote and leisure interest, relaxation, satisfaction, making good decisions, increase social skills, increase in competence. A high score indicates the individual perceived the intervention or control condition that they experienced as beneficial to them.

Results

There were 25 participants each in the control group and the experimental group. The mean age of participants (N = 50) was 63.64 (SD = 11.36), with a range from 40 to 90 years old. The majority (n = 40, 80%) of participants had a diagnosis of schizophrenia, while the rest of participants had paranoid schizophrenia or schizoaffective disorders (n = 10, 20%). There were no significant differences in age, gender proportions, or years of onset between groups (Table 2).

Using Repeated Measures Analysis of Variance (ANOVA), we compared the changes in outcome measures between the HT group and the control group (Table 3). The HT group also reported significantly higher mental well-being than the comparison group ($F = 4.31$, $p < .05$, Figure 1). The HT group also had significantly higher EMAS scores, in both the personal-competence ($F = 10.54$, $p < .001$; Figure 2) and social-experiential components of engagement ($F = 4.95$, $p < .05$; Figure 1).

The HT group perceived that the HT is significantly more beneficial to them than comparison group ($F = 5.28$, $p < .05$). The HT group reported their group experience is beneficial in the areas of having autonomy and opportunities for making decisions ($t = 3.00$, $p = .004$), social skills ($t = 3.45$, $p = .001$), and in developing competence in horticulture ($t = 3.10$, $p = .003$).

We analyzed the behavioral observation ratings from the 360-degrees video recording of three HT sessions (Table 4). The engagement in the HT activities was very high among 1st (84.2%¬), 4th (72.3%) and 8th (86.6%) sessions, with an average of 81.0% (SD = 7.6). This is followed by non-engaged behavior (M = 13.2, SD = 5.6), productive behavior (M = 2.9, SD = 1.3), social behavior (M = 2.2, SD = 1.1), and disruptive behavior (M = .5, SD = .6).

Disengaged behavior is low at 1st and 8th session but is significantly higher in the 4th session. Social behavior remained at a low level over the three sessions.

Discussion

The results showed that the participants reported an increase in mental well-being with small effect size. There is a significant increase in engagement in meaningful activities with moderate effect sizes. This is consistent with the observation of the group process from the video recording, which shows a high engagement in horticultural activity (72 to 87% among three sessions). These results are consistent with evaluation studies conducted with people with severe mental illness in other settings, like community mental health services or vocational rehabilitation programs (Ascencio, 2019; Kam & Siu, 2010; Liu et al., 2014). A closer look at the results of EMAS showed that there is a greater effect size in scores of the personal-competence component than the social-experiential component. This may suggest that the participants' positive engagement experience in horticulture therapy is more linked to the sense of competence from horticultural tasks rather than from social interactions in the group.

The participants perceived three aspects of HT as most helpful, including opportunity to make decisions (autonomy), social skills, and competence. While the key objectives of this HT group encourage participants to build horticultural skills and gain of sense of mastery, it did not expect the group would promote social skills or competence. The perceived benefit of improving social skills is not consistent with our previous study of people with severe mental illness in a rehabilitation setting (Siu et al., 2020), which showed no changes in social interaction and competence among participants. From the 360o video recording, we also noticed that social interaction played a small part in the group. Participants are mostly working on HT projects in parallel mode, except when they are guided to share about their horticultural projects. Further qualitative study using interviews may be needed to further understand why the participants consider social interaction and skills as an important benefit of the HT group.

There are several limitations of this study. First, we found that many care home residents have participated in horticulture activities in the past six months, and it is the key reason that many did not meet the selection criteria. In future studies, it may be better to examine the effects of HT in a care home in which horticulture activities are not yet a common activity. Second, we could only implement a comparison group instead of a control group. The comparison group participated in parallel activities like newspaper reading or coloring activity. These activities could have some beneficial effects on the participants even though they are parallel activities, which may decrease the power of statistical comparison with the intervention group. Third, all the data was obtained through self-report questionnaires, except for the observation of participation. While standardized questionnaires were used in outcome measurement, self-report questionnaires are subject to biases like social desirability, recall, self-representation, or acquiescence. Last, the results are obtained from residents of only one care home for people with severe mental illness. The study needs to be further replicated in multiple settings.

Conclusion

This study showed that participation in a horticultural therapy group could significantly increase the mental-welling, engagement in meaningful activity, and satisfaction of care home residents with severe mental illness. The effect sizes for changes in mental well-being is small, while the change in engagement is moderate. The positive changes are linked to cultivation of task competence in horticultural tasks and projects. Participants perceived the horticultural activities as beneficial to their autonomy, competence, and social skills.

References

Ascencio, J. (2019). Horticultural Therapy as an Intervention for Schizophrenia: A Review. Alternative and Complementary Therapies, 25(4), 194–200. https://doi.org/10.1089/ACT.2019.29231. JAS/ASSET/IMAGES/LARGE/FIGURE1.JPEG

Berman, M. G., Jonides, J., & Kaplan, S. (2008). The cognitive benefits of interacting with nature. Psychological Science, 19(12), 1207–1212. https://doi.org/10.1111/j.1467-9280.2008.02225.x

Capra, C. L., Haller, R. L., & Kennedy, K. L. (2019). Introduction to the profession of horticultural therapy. *The Profession and Practice of Horticultural Therapy, 3–22*. https://doi.org/10.1201/9781315143101-2/INTRODUCTION - PROFESSION - HORTICULTURAL - THERAPY-CHRISTINE - CAPRA-REBECCA-HALLER-KAREN-KENNEDY

Clatworthy, J., Hinds, J., & Camic, P. M. (2013). Gardening as a mental health intervention: A review. *Mental Health Review Journal, 18*(4), 214–225. https://doi.org/10.1108/MHRJ-02-2013-0007

Detweiler, M. B., Self, J. A., Lane, S., Spencer, L., Lutgens, B., Kim, D. Y., Halling, M. H., Rudder, T. F., & Lehmann, L. (2015). Horticultural therapy: A pilot study on modulating cortisol levels and indices of substance craving, posttraumatic stress disorder, depression, and quality of life in veterans. *Alternative Therapies in Health and Medicine, 21*(4), 36–41.

Diamant, E., & Waterhouse, A. (2010). Gardening and belonging: Reflections on how social and therapeutic horticulture may facilitate health, wellbeing and inclusion. *British Journal of Occupational Therapy, 73*(2), 84–88. https://doi.org/10.4276/030802210X12658062793924

Eakman, A. M. (2013). Relationships between meaningful activity, basic psychological needs, and meaning in life: Test of the meaningful activity and life meaning model. *OTJR Occupation, Participation and Health, 33*(2), 100–109. https://doi.org/10.3928/15394492-20130222-02

Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*(2), 175–191. https://doi.org/10.3758/BF03193146

Fung, S. F. (2019). Psychometric evaluation of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS) with Chinese University Students. *Health and Quality of Life Outcomes, 17*(1). https://doi.org/10.1186/s12955-019-1113-1

Gigliotti, C. M., & Jarrott, S. E. (2005). Effects of Horticulture Therapy on Engagement and Affect. *Canadian Journal on Aging / La Revue Canadienne Du Vieillissement, 24*(4), 367–377. https://doi.org/10.1353/cja.2006.0008

Goldberg, B., Brintnell, E. S., & Goldberg, J. (2002). The relationship between engagement in meaningful activities and quality of life in persons disabled by mental illness. *Occupational Therapy in Mental Health, 18*(2), 17–44. https://doi.org/10.1300/J004v18n02_03

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

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

Lu, L.-C., Lan, S.-H., Hsieh, Y.-P., Yen, Y.-Y., Chen, J.-C., & Lan, S.-J. (2020). Horticultural therapy in patients With dementia: A systematic review and meta-analysis. *American Journal of Alzheimer's Disease & Other Dementias®, 35*, 153331751988349. https://doi.org/10.1177/1533317519883498

Ng, S. S. W., Lo, A. W. Y., Leung, T. K. S., Chan, F. S. M., Wong, A. T. Y., Lam, R. W. T., & Tsang, D. K. Y. (2014). Translation and validation of the Chinese version of the short Warwick-Edinburgh mental well-being scale for patients with mental illness in Hong Kong. *East Asian Archives of Psychiatry, 24*(1), 3–9. https://search.informit.com.au/

Oh, Y. A., Park, S. A., & Ahn, B. E. (2018). Assessment of the psychopathological effects of a horticultural therapy program in patients with schizophrenia. *Complementary Therapies in Medicine, 36*(October 2017), 54–58. https://doi.org/10.1016/j.ctim.2017.11.019

Parkinson, S., Lowe, C., & Vecsey, T. (2011). The therapeutic benefits of horticulture in a mental health service. *British Journal of Occupational Therapy, 74*(11), 525–534. https://doi.org/10.4276/030802211X13204135680901

Perrins-Margalis, N. M., Rugletic, J., Schepis, N. M., Stepanski, H. R., & Walsh, M. A. (2000). The immediate effects of a group-based horticulture experience on the quality of life of persons with chronic mental illness. *Occupational Therapy in Mental Health, 16*(1), 15–32. https://doi.org/10.1300/J004v16n01_02

Sempik, J., Rickhuss, C., & Beeston, A. (2014). The effects of social and therapeutic horticulture on aspects of social behaviour. *British Journal of Occupational Therapy, 77*(6), 313–319. https://doi.org/10.4276/030802214X14018723138110

Siu, A. M. H. H., Kam, M., & Mok, I. (2020). Horticultural therapy program for people with mental illness: A mixed-method evaluation. *International Journal of Environmental Research and Public Health, 17*(3), 711. https://doi.org/10.3390/ijerph17030711

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

Tu, H. (2022). Effect of horticultural therapy on mental health: A meta-analysis of randomized controlled trials. *Journal of Psychiatric and Mental Health Nursing, 29*(4), 603–615. https://doi.org/10.1111/jpm.12818

Uwajeh, P. C., Iyendo, T. O., & Polay, M. (2019). Therapeutic gardens as a design approach for optimising the healing environment of patients with Alzheimer's disease and other dementias: A narrative review. *EXPLORE, 15*(5), 352–362. https://doi.org/10.1016/j.explore.2019.05.002

Wu, C., & Ma, S. C. (2016). *Occupational Therapy in Mental Health Facilitating Intrinsic Motivation in Clients with Mental Illness*. 3101(April 2014), 37–41. https://doi.org/10.1300/J004v16n01

Table 1

Objectives, and Activities of the Horticulture Therapy (HT) Sessions

Session Title	Session Objectives / Activities
1. Everything starts with the seeds.	▪ Introduction to the group. ▪ Establish expectations, ground rules, and boundaries for the group. ▪ Coach participants to planting shootings in pots and outdoor garden.
2. Get close to the earth.	▪ Learn horticulture activities of potting, digging, mixing soil, and watering ▪ Guide participants to make 'grass ball babies' (creative activity with plants) to enhances participants' interest and satisfaction.
3. Creative succulent plants design.	▪ Learn how to fertilize for planting. ▪ Guide participants to combine and arrange plants in pots or vase. ▪ Learn to be creative, to appreciate their own work and of each other.
4. Herbs and mood.	▪ Introduce herbs, their characteristics, their smell and use. ▪ Guide participants to make 'Gift Pots', for sending to their loved ones.
5. Trimming plants.	▪ Learn plant pruning. ▪ Help participants to learn to observe and appreciate plants and natural environment. ▪ Learn about organic farming.
6. A date with flowers.	▪ Using plants (mainly herbs) with different smell and aroma, guide participants to learn about soothing effects of plants. ▪ Origami activities to enhance participants self-appreciation.
7. Botannical rubbing.	▪ Learn skills of horticulture: how to keep soil fertile. ▪ Botanical (fruit) rubbing activity.
8. Enjoy Harvest & Party.	▪ Cook and share food made from farm produce, appreciate the process of horticulture. ▪ Craft activity using flowers and plants.

Table 2

Comparison of the Background Information of the Treatment and Comparison Groups

Variables	Group				x^2
	Treatment (n=25)		Control (n=25)		
	n	%	n	%	
Categorical Variables					
Sex					
Male	19	38.0	17	34.0	0.39
Female	6	12.0	8	16.0	
Diagnosis					
Schozophrenia	17	34.0	23	46.0	- - -
Paranoid Schizophrenia	8	16.0	1	2.0	
Schizoaffective Disorder	0	0	1	2.0	
Interval Variables	M	SD	M	SD	t
Age	61.92	8.60	66.08	13.76	1.29
Years from onset	37.92	10.93	35.54	13.85	0.67

Table 3

Comparison of the Outcomes of the Treatment and Comparison Groups

Measures	Measures	Post	F Group X Time	t	Effect Size
EMAS					
Personal-Competence Component					
Treatment	2.19(0.80)	2.50(0.67)	10.54***	- - -	.17[a]
Comparison	2.28(0.79)	2.07(0.63)			
Social-Experiential Components					
Treatment	2.26(0.70)	2.46(0.72)	4.95*	- - -	.10[a]
Comparison	2.32(0.78)	2.15(0.67)			
C-SWEMWBS					
Treatment	3.09(0.67)	3.37(0.54)	4.31*	- - -	.08[a]
Comparison	3.03(0.87)	2.94(0.65)			
Perceived Benefits					
Treatment	- - -	46.52 (7.35)	- - -	5.56*	.45[b]
Comparison	- - -	44.38 (10.60)			

Note. EMAS = Engagement in Meaningful Activities Survey; C-SWEMWBS = Chinese Version of the Short Warwick-Edinburgh Mental Well-Being Scale.

[a] effect size is ηp2, [b] effect size is Cohen's d

Table 4

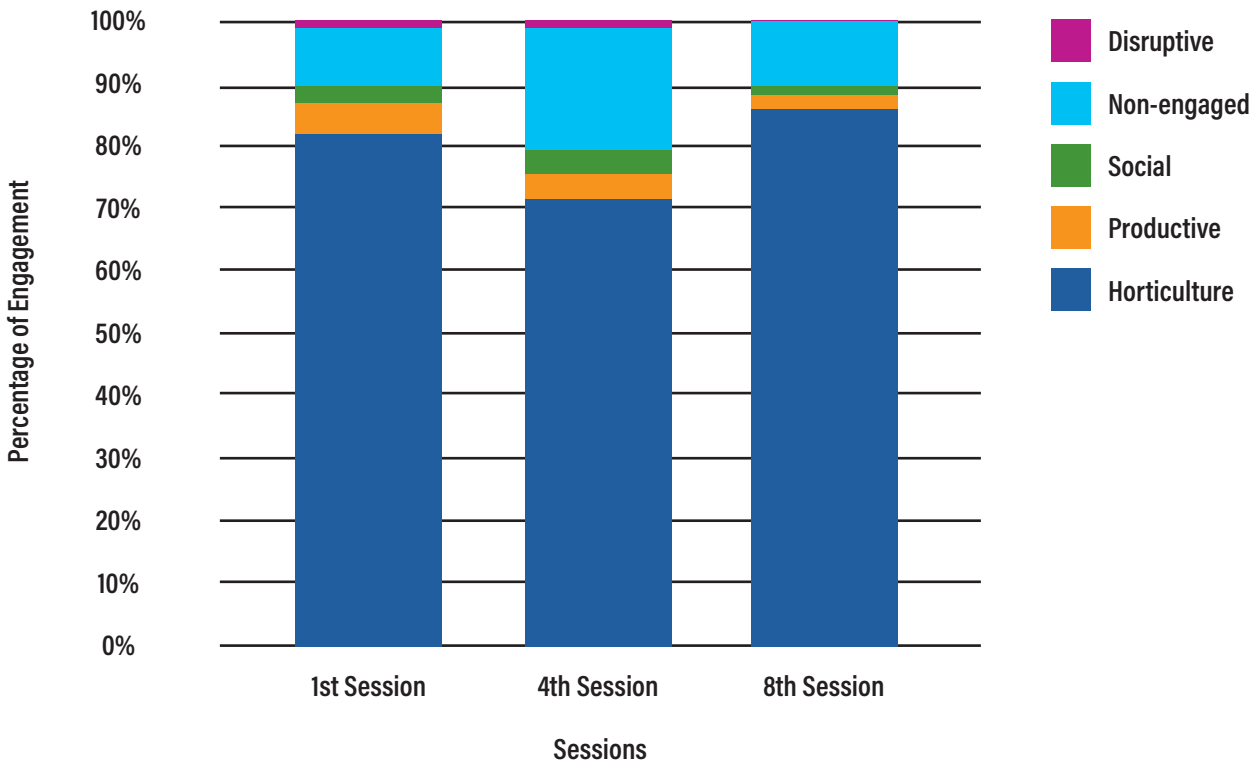
Perceived Benefits of Horticultural Therapy vs. Comparison Group.

Perceived benefits of activities	Group	M (SD)	t	P
1. Everything starts with the seeds.	Intervention	3.24 (.88)	2.067	.044
	Comparison	3.08 (1.08)		
2. Interests and leisure pursuits	Intervention	3.28 (1.06)	2.493	.016
	Comparison	3.00 (1.11)		
3. Relaxation	Intervention	3.52 (1.16)	1.900	.063
	Comparison	3.35 (1.13)		
4. Satisfaction	Intervention	3.40 (1.04)	1.096	.278
	Comparison	3.31 (1.12)		
5. Make decisions	Intervention	3.12 (1.24)	2.998	.004*
	Comparison	3.10 (1.24)		
6. Social skills	Intervention	3.04 (1.06)	3.446	.001*
	Comparison	13.04 (1.17)		
7. Competence	Intervention	2.56 (1.12)	3.100	.003*
	Comparison	2.51 (1.21)		

Note. With Bonferroni correction (0.05 / 7), results are marked significant if $p < 0.007$)

Figure 1

Participants' Engagement in Different Activities during Three Horticultural Therapy Sessions



Biographies

Dr. Andrew M.H. Siu is a mental health specialist in occupational therapy practice. He is Reader in Occupational Therapy at Brunel University London. His research interests are in the areas of nature-based therapy (horticulture, forest bath, healing garden), virtual reality interventions in mental health, and resilience in people with chronic illness and disabilities. He published over 105 research journal papers and reviews in mental health, developmental disabilities, and chronic illness.

Dr. Benson, W.M. Lau is Associate Professor at the Hong Kong Polytechnic University. His research interest is to elucidate the importance of neuroplasticity in emotions and behaviors. Using animal models which simulate emotional and behavioural symptoms including depression, anxiety, phobia and sexual dysfunction, his research explores the neurological basis of these symptoms and the mechanisms underlying the respective treatment methods, especially in use of rehabilitation treatment modalities for these conditions.

COVID-19 and Horticulture for Health: Positive Impacts on Gardening, Urban Agriculture, Food Security, Green Space, Plant Trends and Horticultural Therapy

Lesley Fleming MA, HTR

Abstract

Examining the health impacts from COVID-19 where horticulture played a role reveals positive outcomes across therapeutic, nutrition, landscape, and horticulture sectors validated by research. While COVID-19 was responsible for devastating loss of human life it has also generated better understanding of human health and responses to pandemics. Examining the literature from the lens of the horticulture for health domains (Fleming, 2021) allows for a multi-faceted review that also identifies inter-related effects from the COVID-19-horticulture relationships where food security, production and consumption, role of gardens and green spaces, health interventions like horticultural therapy, and consumer trends for plants intersect. The impact across sectors reflects the complexities of life during and after COVID-19, and a new paradigm of research, one that underscores connections between horticulture and health, these continuing to broaden in modern day life.

Introduction

The global pandemic COVID-19 and variations of it continue to exist worldwide. Research is shedding light on how to live with and respond to challenges such pandemics present. Horticulture-involved responses, behaviors and health interventions have provided some positive outcomes prompted by the pandemic. These are broad in their applications and reach, from greater interest and involvement in home gardening, food production and food security, examination of green spaces and their role in wellbeing, expanded valuation of nature connections, and effective mechanisms in support of social interactions during a time when isolation was the preferred safety protocol.

The horticulture for health framework, an umbrella term referring to a multi-sector inclusion of activities, programs, services and concepts identifies domains where horticulture in various capacities and applications positively impact health (Fleming, 2021). The framework spans disciplines and sectors—health services, business and green industry, education, food production, and landscapes. The horticulture for health framework is able to holistically view impacts from COVID-19 (COVID) through this specific viewpoint. The breadth of such a framework allows for a comprehensive examination of COVID, and how one common element—horticulture—emerged as an important factor during the global pandemic. The five key categories within the horticulture for health framework provide a structure for examining and categorizing COVID research: health services that use horticulture as an integral part with a therapeutic modality framework; groups or movements using horticulture as the catalyst for social interactions; landscapes for health, specifically designed landscapes; food, nutrition and food action; and horticultural practices. Synthesizing and categorizing the copious amount of research in this way allowed examination of relevant studies, and subsequent presentation of the material in an organized manner.

Using a broad overlay like the horticulture for health framework supports a view of world crises where integrating multiple strategies or concepts across sectors can more effectively deal with human health challenges. While horticulture is not the only focus or answer to health challenges of this nature, consideration of horticulture-centric strategies can be one of several instruments that can improve humankind. The general public embraced many of the horticulture-based activities during the pandemic. The research validates this response and provides insights into the COVID pandemic and potential ideas and strategies for future crises.

Themes in the Literature

Examining the literature where horticulture has played a role from the onset of COVID to present time reveals a broad array of topics and applications across sectors, significant enough to warrant examination of this unexpected pandemic

response. Research identifies positive impact from horticulture during COVID in forestry, nutrition and food, agri-business, land use policy, public health, environmental health, landscape urban planning, ethnobiology, and health areas of pediatrics, cardiology, preventative disease, gynecology, psychiatry and mental health. A review of the research identified several specific themes. The horticulture for health framework provided methodology for identifying significant categories for such an examination.

Expanded Role of Gardening, Home Gardens and Urban Agriculture

The level of increased gardening activity during COVID was unexpected in the initial stages of the pandemic. With the need to isolate, gardening and home gardens became outlets for stress reduction, safe activity and outdoor time, and food production. Gardening has long been a leisure activity enjoyed by many worldwide. With COVID it expanded, particularly noticeable in demographics that had not been known for gardening activity – millennials and younger people (San Fratello et al., 2021; Chenerides et al., 2021). Interrelated, COVID spurred an increase in home food production and urban agriculture, greater attention to connections to nature (in gardens and elsewhere), and the importance of green spaces during mandated isolation. Each of these impacted mental health and wellbeing during a time of distress.

Historic Use of Gardens for Health Improvements

Pre-COVID, during previous global crises, gardens have been important as respite settings and food production sites. Most notable and relatable to COVID-19 are the Victory and allotment gardens during world wars. Their functions included resiliency, both psychological and food resiliency (Maltz, 2015), and collective community action addressing food shortages. Referencing these historical gardens in their studies, similar strategies for addressing COVID were identified, particularly the resurgence of food gardens (Andreatta, 2015; McFarling, 2020; Tham & Fleming; 2022; Giraud et al., 2021). Examining pandemic gardening disruptions to urban farms, community and school gardens, a line of inquiry and proposed solution related to allotment gardening during COVID emerged (Kacprzak & Szczepansha, 2024; Kato & Boules, 2022).

The literature on COVID's impact on home gardens covers a few key areas, characterized by people's relationships with gardens and the benefits they provided, referred to as ecological medicine (Gordon-Rawlings & Russo, 2023; Zhang et al., 2021). Research by Egerer et al. validated the general understanding that gardening during the pandemic relieved stress (2022). Their scoping review identified home gardens as serving multiple purposes. Most prominent of these - reducing stress by gardening and connections to nature, along with increasing plant biodiversity, increased physical exercise, melatonin production, social interactions that allowed for social distancing, and food production. Gardeners' perceptions of home gardens, motivations for urban gardening during the early and later stages of the pandemic, and safety provided by home gardens shed light on the role home gardens played (Cortez et al, 2022; Kingsley et al., 2022; Cattivelli, 2023; Theodoron et al., 2021). Several studies published in diverse journals like *BMC Public Health, Nutrition, Metabolism and Cardiovascular Disease, and Human Ecology* looked at impacts and revisions to home green space - conversions to home gardens, increased home food procurement, changes in food choices and diet (Niles et al., 2021; Bracale & Vaccaro, 2020; Sofo & Sofo, 2020; Katz, 2020).

Expanded Role of Urban Agriculture

A primary focus of research on COVID's impacts, has been on expanded gardening and urban agriculture as mechanisms for food production. A renewed focus on sustainable food production including sites like community gardens, home gardens, and edible landscapes was evident in the literature. Research identified intense pressure for expanding urban green infrastructure during the pandemic including techniques for hydroponics,

rooftop gardening, and vertical gardens as mechanisms contributing to stronger food supply (Khan et al, 2020; Lal, 2020). Demand for urban community gardening before, during and after the COVID-19 pandemic validated the increase related to COVID (Bieri et al., 2024).

Research data (and methodology) demonstrating greater adaptability of urban gardens, new markets for local food sales, and increased community cohesion measured by material and social benefits from urban agriculture expansion during COVID across five countries, supported positive outcomes (Schoen et al., 2021). Home spaces were converted to gardens, plants were credited with psychological and physical improvements during social isolation, and positive economic, self-sufficiency and sustainability outcomes were identified (Sofo & Sofo, 2020; Harding et al., 2022). There was greater awareness about food sovereignty, understanding of small and large food production, importance of farm workers and grocery store employees, and need for government involvement in food production during pandemics (Loker & Francis, 2020). COVID impacts where horticulture was involved included forced negative impacts on international barriers to food access including border closures, higher export costs and increased food losses (Pulighe & Lupia, 2020).

The expansion of urban agriculture during COVID-19, including home gardens, was documented by multiple studies with a common theme of fragility of food systems, evidenced by changes to commercial and urban food production (Khan et al., 2020; Cerda, 2020). Chandra's 2020 article published in *World Economics Forum* analyzed this globally. *Agribusiness* journal's empirical analysis of participation in urban agriculture before and during the pandemic, and examinations of home food gardening (in Canada) in response to COVID shed light on this response (Chenerides et al., 2021; Mullins et al., 2021). Transforming urban food systems, an issue of concern pre-COVID, and discussed across urban policy, agriculture and food security sectors, was accelerated during the pandemic (Sassano et al., 2022).

A cautionary article on the role of urban agriculture in disasters and emergencies, published well before COVID, suggesting crises have in the past, led to greater use of small-scale food gardening was voiced in subsequent articles on agroecology, food system issues, and food access disruptions during COVID, with a case for strengthening small scale food production and new food systems (Adam-Bradford & van Veenhuizen, 2015; Altieri & Nicholls, 2020).

There were positives. COVID-induced expansion of urban agriculture, new community and home gardens, better sanitary and food handling practices in community gardens, greater awareness and expansion of alternative food sourcing and food production sites, and better support for local economies and local producers when shifts in demand from institutions like schools and restaurants occurred (Schoen et al., 2021). Programs like Grow This in support of home gardening emerged during COVID as a public health strategy (McCartney et al., 2022).

COVID has generated new land use policies across communities as a response to the need for small scale and home garden food production. The potential for revised land use policies in the wake of the pandemic and reviews of municipal home food gardening programs in Canada were initiated during the crisis, with expansion in both areas, perceived as positive results and responses to COVID (Music et al., 2021; Music et al., 2022). The body of research related to COVID impacts on home gardens and urban agriculture provides strong evidence that this sector and its context within food production, gardening green space and land use policy has generated positives from the devastating global health crisis (Egerer et al., 2022).

The horticulture for health framework provides a baseline from which to examine multi-sector, multi-issue impacts and responses during COVID

(Fleming, 2021). Having identified inter-related issues and the interplay between horticulture-based social behavior, horticulture practices and landscapes, an examination of the expanded role of gardening, home gardens and urban agriculture from COVID was examined from the multi-discipline perspective of the horticulture for health framework.

Food Security Impacts

Food Consumption & Food Security

Food insecurity has existed throughout history and has been identified as a global health issue by the World Health Organization for many years (2022). COVID exacerbated all facets of access to food with many people worldwide experiencing barriers to food availability, changes to food production and diet. Food security during COVID was examined for example, in the early stages of the pandemic, along with the increase in food insecurity of low-income U.S. adults, where a "clear gradient effect based on the severity of food security" (Niles et al., 2020; Wolfson & Leung, 2020).

The literature reveals studies focused on multiple components of food insecurity during COVID. These included a systematic literature review investigating rural food security in high income countries during COVID including the U.S., determining that food supplies across the globe, access to food, changes to food utilization, reduced food quality and food safety were impacted (Kent et al., 2022; Fang et al., 2022; Turnsek et al., 2022). More narrowly-focused studies examined ethnically diverse households in Central Texas and transitions in food insecurity during the early stages of COVID, and a rural American Appalachia community where COVID disrupted food scarcity in grocery stores, with responses like expanded federal food assistance and benefits, expanded local food resources, and home gardening which "more than accounted for any food access shortages" (Janda et al., 2021; Cardelli et al., 2021). Studies on rural Latino immigrants in California identified school closures, reduced incomes, limited transportation, legal status and stigma as factors impacting food insecurity during the pandemic (Payan et al., 2021; Payan et al., 2022). Payan's research postulated that these were off-set by coping strategies including food substitutions, local charity food support, food pantries, federal government food and nutrition assistance, with a caveat that food insecurity and nutrition health disparities exist, and will continue to exist, with ongoing need for policies focused on food insecurity. The research was not restricted to the U.S. experience. COVID-food insecurity impacts in poorer countries like Indonesia, Iran and Nepal, with a specific focus on rural communities were investigated by several studies (Syafiq et al., 2022; Ghanbari et al., 2022; Singh et al., 2021).

Research on food consumption and dietary changes resulting from COVID identified disparities between food secure and food insecure people, specifically the intake of nutritious fruits and vegetables (Bracale et al., 2020; Litton & Beavers, 2021). Investigations into home food procurement during COVID (including but not limited to gardening), identified expanded activity and correlation to greater consumption of fruits and vegetables, significant only in food secure households, food price increases as obstacles to food acquisition, and vulnerable groups where strategies of eating less preferred food, reduced portions and fewer number of meals were identified (Niles et al., 2021; Jafri et al., 2021). Homemade plant-based foods and beverages during COVID across high- and low-income countries where ethnobotanical patterns influenced consumption, particularly greater levels of ginger, garlic, onion, turmeric and lemon, and American consumer preferences for growing and purchasing fruits, vegetables (and processed wine and beer) pre and post COVID were correlated with factors like engagement with horticulture and conservation before the pandemic, along with attitudes about growers and their role during COVID (Pieroni et al., 2020; Rombach et al., 2022). Strategies addressing food insecurity during

COVID included expanding urban gardening, these on the radar for many years prior to COVID, becoming more prominent in the context of greater food insecurity during the pandemic (Cerda, 2020; Giraud et al., 2021; Harding et al., 2022)

The significance of these varied studies demonstrates the breadth of food insecurity, food access, food consumption and home-based food production where horticulture played a role during COVID. The impacts across the globe, in business, health and communities, document the responses to COVID, and reflects the horticulture for health perspective of cross-sector connections. Some COVID impacts were positive, including recommendations for future strategies for coping with global pandemics: the use of U.S. federal emergency food assistance programs, a comprehensive U.S. policy response, and strengthening of social capital and local mechanisms like food pantries and food banks (Cardelli et al., 2021; Wolfson & Leung, 2020; Payan et al., 2021; Schoen et al., 2021; Sofo & Sofo, 2021). Recommendations for greater focus on ethnomedicine and ethnogastronomy research because of the role they played during COVID, specifically their importance as edible medicines as cultural and community health care strategies were made (Pieroini et al., 2020).

The horticulture for health framework identified food insecurity as impactful on human health (Fleming, 2021). Examining COVID impacts on food security from this perspective where food insecurity models, contexts and inter-related issues across horticulture for health categories of food, nutrition, food production, and horticultural practices provided an understanding of the complexities and dimensions exacerbated by COVID.

Green Space

Green Space Connections to Covid and Its Importance During the Pandemic

The role of green spaces during COVID has garnered a lot of attention and research. A special issue of *Urban For Urban Green* journal compiled research across disciplines, providing a platform for sharing data and perceptions in this new area of COVID research (Davies & Sanesi, 2022). The importance of green spaces contributing to human health and wellbeing has been well documented and validated previously (Hartig et al., 2014; McKinney & VerBerkmoes, 2020). Examining how it played a role during COVID has clarified concepts and outcomes associated with public land green spaces, and specifically, parks as public health platforms during a pandemic (Lopez et al., 2021; Ugolini et al., 2020; Razami et al., 2020). Green spaces playing a protective function during COVID, relationships between proximity to green infrastructure and mental health during COVID (using spatial statistical analysis), and an increasing focus on mental health connections (see next section) were identified in the research (Klompmaker et al., 2021; Jato-Espino et al., 2022). Studies addressed issues like park usage in compliance with COVID restrictions, visitor capacity, quantifying accessibility to UK parks, and suggestions for future use of allocation systems to comply with social distancing requirements (Yue et al., 2021; Shoari et al., 2020; Volenec et al., 2021).

Connections Between Green Spaces and Mental Health During COVID

One of the big revelations during COVID was the extent that green spaces—parks, gardens and forests—emerged as important spaces for mental health and wellbeing during the crisis. Extensive research on green spaces as restorative places capable of remediating stress, anxiety, and depressive symptoms was well known in horticulture, landscape and green care sectors. COVID propelled this to the forefront of public knowledge. The research revealed the nature and extent of human behavior that was influenced by COVID that resulted in greater engagement and visitation to green spaces.

Several investigations into the buffering effect of green spaces during the global crisis looked at

mental, behavioral, emotional and physical health, strengthening the empirical evidence of mental health-green space connections (Contini et al., 2022; Corley et al., 2021). Reviews on disparities in urban green space usage provided a global perspective, including research on Belgium's responses (Kleinschroth et al., 2024; Da Nicola et al., 2021). Data-driven analysis of individual and community health psychosocial impacts was investigated, less prominent than the transmission of the disease, but important to consider based on historical crises and current understanding of mental health where trauma can evolve into long-lasting health problems (Torales et al., 2020). Research teased out specific scenarios. Dzhambov et al. studied indoor and outdoor greenery as an escape or support for mental health during COVID-19's quarantine (2021). Heo et al. explored barriers to green spaces by demographics, use of green spaces related to anxiety and depression symptoms and deprivation of these to mental health using an online survey (2021). Larson et al.'s research supported the concept of green space associated with less emotional distress of U.S. college students (2022). Investigation into contact with blue and green spaces during COVID including gardens and public outdoor nature spaces provided strategies for future lockdowns in support of maintaining mental health and resiliency (Pouso et al., 2021).

The COVID-focused literature included parks and forests in addition to gardens as examples of green spaces. Increased forest visitations driven by the pandemic, forests identified as important ecological, infrastructure components, and studies identifying access to parks, forests and green spaces as significant strategies for addressing stress during COVID emerged (Derks et al., 2020; Weinbrenner et al., 2021; Slater et al., 2020; Larson et al., 2022). Home gardens were included in this green space category, identified as safe havens during COVID, and as a tool combating the spread of COVID and associated stress (Theodorou et al., 2021). Gardening activity, distinct from green space visitation was identified as contributing to stronger mental health and resiliency during the pandemic (Gerdes et al., 2022; Sia et al., 2022). These studies identified several horticulture-focused strategies that were used to combat mental health distress including park visitation, home gardens and gardening, and policies providing access to forests and parks, these recommended for future crises.

Expanding Connections to Nature

The research validating positive correlations between green spaces and mental health continues to grow. These are directly related to health benefits of connecting with nature. Some make a distinction between green space and nature. Others view green space as nature.

Examining connections to nature during COVID sheds light on the distinctions and benefits that emerged as important health factors. *Experiences* in nature which can include urban green spaces, gardens, parks, forests and other natural areas that occurred during COVID expanded the literature (Mintz et al., 2021; Cordero, 2021; Naomi, 2020). Several publications focused on nature connections during COVID including *Why Society Needs Nature* (Armstrong et al., 2021), *Engagement with Nature Before and During COVID Restrictions* (O'Brien & Forster, 2020), and *Engagement with Nature and COVID-19 Restrictions* (O'Brien & Forster, 2021). These had a distinct global perspective with research from multiple countries. They determined that "increased engagement with nature significantly helped to support many people in maintaining their physical and mental health and wellbeing during the restrictions and stresses of living through the global pandemic", that socio-economic status and age influenced people's ability to access nature, and interactions with nature was individualized with varying degrees (Armstrong et al., 2021; Chaudhury & Banerjee, 2020). Engagement with trees, woodlands, fields, farmlands and countryside were studied as separate forms of nature connection by O'Brien and Forster (2020), these providing more resiliency

to restrictions than other nature spaces. Families with children visited woods more than the other spaces, increasing their appreciation of trees. O'Brien and Forster also undertook an online study re engagement with nature, noting that many respondents were already "connected to nature via interest prior to COVID, and that the role and importance of trees, woodlands and wider nature can play a part of people's everyday lives and in supporting and protecting their wellbeing under the very difficult circumstances of a global pandemic" (2021).

Particular populations were studied to determine the impact of nature connections during COVID. These included American adults, anxiety and connections to nature and gardening as mechanisms reducing anxiety; older people and benefits of nature, outdoor and parks visitation; COVID impact on people of color and inequitable changes to time spent in urban nature; and general population contact with nature and wellbeing during a strict lockdown in Israel. The latter study found that both viewing nature, and being in nature increased wellbeing, and that exposure to nature was more valuable for women than men, noting gender differences (questionnaire methodology) (Gerdes et al. 2022; Levinger et al., 2022; Nay et al., 2022; Kaplan Mintz et al., 2021).

Increased Physical Activity in Green Spaces

The need for urban green spaces, and correlations with desire for physical activity during the pandemic were investigated. Studies included initial lockdown measures and physical activity measured by data from google search request "go for a walk", physical and mental health connections to green space during COVID in older adults, and levels of physical activity and wellbeing (Kleinschroth & Kowarik 2020; Corley et al., 2021; Engels et al., 2021). Additional studies examined COVID as a catalyst for starting, stopping or continuing outdoor recreation, and connections between perceptions of hope/hopelessness, stress, anxiety and depression involving outdoor activity including gardening (Taff et al., 2021; Johnson et al., 2023; O'Brien & Forster, 2021).

The impact of COVID on physical activity occurring in green spaces was a subject of multiple studies in a variety of contexts: perception of greenery, social distancing and overcrowding in parks, and perceptions of green space usage as health strategies (Dzhambov et al.; 2021; Lopez et al., 2021; Marchi et al., 2022; Da Nicola et al., 2021; Hansen et al., 2022). Correlations between access to urban green space, sense of belonging (in NYC), socio-demographic/economic differences and urban green space discerned increased valuation of green spaces used for recreation during crises, response of temporary closure of some vehicle street use, and need for more parks, development of urban green infrastructures, and planning healthier cities (Pipitone & Jovic, 2021; Liu & Wang, 2021). In line with these was research on creative leisure activities and mental health during a 5-month COVID lockdown (Bone et al., 2023).

Green Space Suggestions and Solutions

Several papers included calls for action. Geary et al., theorized that "improving urban green spaces can reduce health inequalities exacerbated by COVID-19" (2021). Simulating access during crises could help manage access to these spaces, with recommendations for keeping parks accessible, and greater use of pocket parks (Geneletti et al., 2022; Slater et al., 2020; Liu & Wang, 2021). Newer technology applications like use of social media data analyzing urban green space use, and remote sensing and geographic information system techniques capturing urban green space per capita usage contributed to understanding how green space was used, and how it can be managed during pandemics presently and in the future (Cui et al., 2022; Pouya & Aghlmand, 2022).

Studies with the focus of urban green space benefits during COVID had a heavy influence on environmental planning. Evident in a wide variety of journals publishing articles on impacts of green

space during COVID, *Preventative Medicine, Frontiers in Ecological Environment, International Journal Environmental Research and Public Health, Pediatrics, and PLoS One* articles suggested the impacts of COVID crossed sectors and was of interest and importance to practitioners across disciplines.

Increasing global evidence suggests that contact with nature during COVID contributed to positive perceptions, wellbeing and resiliency. Though the contact and benefits vary by gender, age, socio-economic status, country and ability to access nature, the overwhelming research supports the positive impact contact with nature can have during a pandemic, this validating previous studies on contact with nature pre-COVID.

The horticulture for health framework and its cross-category perspective provided an example where recognizing and understanding connections between sectors provided a broader understanding of inter-relatedness and scope of events and impacts (Fleming, 2021). In the case of COVID and green spaces, the connections between landscapes for health, a horticulture for health category, and increased usage of parks and green spaces, connections to nature and impacts on mental health, falling within the horticulture for health category of health services, referenced the framework's approach to understanding cross-category, cross-sector examples.

Health Interventions During Covid: Horticultural Therapy

The horticulture for health framework includes health services where horticulture is a component part of interventions. A limited number of studies are available relating to disruptions of horticulture-focused health interventions during COVID. The delivery of horticultural therapy and therapeutic horticulture programs was impacted in many communities in large part because of social distancing protocols. Some practitioners in Canada indicated increases in their contracted HT services; some facilities restricted the number of service providers but increased the number of sessions the fewer number of HT practitioners delivered (Creamer, personal communication, 2022).

Delayed or forgone medical care during the pandemic were identified, this impacting food security and nutrition where gardening and food access were part of interventions (Bertoldo et al., 2022). Of note were specific populations where health interventions using gardens and gardening continued during the pandemic. Older cancer survivors involved in *Harvest for Health* were able to continue vegetable gardening, part of the randomized controlled trial investigating impacts on lifestyle behavior, consumption of fruits and vegetables, and physical functioning during COVID (Bail et al., 2022). Other studies investigated changes to pediatric obesity during COVID and the relationship to neighborhood green space, and older cardiac rehabilitation patients engaged in gardening to maintain physical functioning during the pandemic (Mayne et al., 2022; Ogura et al., 2022). Previously mentioned research by Zhang et al. (2021) included references to horticultural therapy, eco-healing across populations specific to mental health during COVID. So, while some services were disrupted, others were not. The pandemic necessitated adaptation of services.

The emergence of virtual horticultural therapy during COVID using digital platforms was one such adaptation. Digital delivery of therapeutic services (counseling, social work) became a widespread practice. In some cases, plant materials were delivered or available for pick-up, with HT/TH sessions delivered virtually. Research by Ryzhikov assessed feasibility of a virtual therapeutic horticulture program for adults with intellectual/developmental disabilities who due to COVID were more isolated (2021). Miyake et al. (2022) examined this form of HT/TH delivery identifying challenges of connecting digitally, need for multiple cameras, less interactions and engagement due to limited

view of faces among other factors, and limitations reducing outdoor sessions. While virtual delivery of HT/TH did not allow for close contact like hand-on-hand use of tools, or sharing/distributing materials by group members to one another (for social therapeutic goals), and less engagement with clients compared to in-person interventions, some services did continue. Horticultural therapy practitioners expanded their skill sets to include use of digital platforms, adaptations to activities appropriate and effective where a therapist did not need to be physically present, and delivery of services in settings that allowed for computer/internet connections. Some sessions were held outdoors as an adaptation for compliance with social distancing.

The demand for horticultural therapy and other therapeutic services in some locations increased during COVID with a particular need for mental health interventions (Takiguchi et al., 2022; Andzaurova & Nartova-Bochaver, 2023). These included people with mental health diagnoses as well as wellness populations where stress and restricted social interactions negatively impacted their mental health.

Research investigated the demand for and disruption of medical and health services during COVID. Of the ones where horticulture was a component of care, the role of ethno-phytomedicine (traditional, culturally used plant-based medicines), and gardening as laparoscopic technique practice in lieu of actual patient surgery were identified (Nasir & Hughes, 2022; Ma, 2021). Connections between COVID mortality and incidence, and exposure to greenness in the U.S. was examined by Klompmaker et al. (2021). Coronophobia and coping mechanisms among the bereaved was examined including the mediating role of gardening (De los Santos et al., 2022). A conceptual model investigating the rapid increase in food insecurity related to economic impacts and public health during the pandemic suggested factors that may contribute to short and long-term health outcomes from COVID, and its impact on acute chronic disease complications, lingering after COVID with downstream health impacts (Leddy et al., 2020). Further studies are expected to reveal the extent of disruptions and ultimately the impact on human health and wellbeing.

The horticulture for health framework and its identification of health interventions pre-COVID was a reference point for health interventions during COVID. Models and populations included in the horticulture for health framework were reiterated, reflecting COVID use of similar interventions, adaptations to these including virtual delivery of HT/TH, increased interest in ethno-phytomedicine, and medical techniques developed using gardening. COVID has expanded the applications that should be included in the horticulture for health framework.

Consumer Plant Trends During Covid

The horticulture for health framework, and its breadth of categories, identifies horticulture trends and plant-related businesses as part of the broader understanding of the role horticulture can play with human health. Having had these identified in the framework lead to the examination of horticultural practices and their potential impacts from COVID. Restrictions on consumers' movements, food intake, leisure activities and businesses causing shifts in activity impacting health were identified. The research revealed a significant area involved consumers purchasing plants, with large increases fueling massive growth in the green industry (Beeson, 2022; Campbell et al., 2021; San Fratello et al., 2021). One example – Hawaiian breadfruit crops; it was more resilient to market fluctuations with COVID demand expanding its value (Berning et al., 2022). Human behavior described as the plant parenting trend was studied, as was psychological reassurance responses attributed to plants in residential homes (Rivas & Biana, 2022; Cordero, 2021; Perez-Urrestarazu et al., 2021). Research suggested that plants improved sense of wellbeing, with some research focused specifically on ornamental plants (Malakar & Beruto, 2023).

Gardening motivations of U.S. plant purchasers during the pandemic, and consumer attitudes towards growing or purchasing plants including wine and beer and the role of homemade plant-based foods and beverages linked to ethnobotany were also examined (Behe et al., 2022; Romback et al., 2022; Pieroni et al., 2020). A wider vision for horticulture, small scale agriculture, and plant-based products including food and flowers emerged from COVID. Retail florists for example, used new approaches for expanding sales during the pandemic (Pulighe & Lupia, 2020; Etheredge & DelPrince, 2021).

The horticulture for health framework's inclusion of horticulture practices category effecting human health, less obvious than health interventions like horticultural therapy, has expanded the role and understanding of these horticulture facets, and as such, were examined as part of the literature review for this paper (Fleming, 2021). In this case, impacts from horticulture practices, producer supplies, and consumer preferences were examined for COVID impacts with the horticulture for health framework providing an established paradigm that included horticulture practices.

DISCUSSION

Positive outcomes from COVID tied to horticulture

There is no denying human health was negatively impacted from COVID. However, there were some positive outcomes resulting from the pandemic, particularly in areas where horticulture and health intersected. The increase in home gardening, related food production from these, and greater activity at urban and community gardening sites like urban farms, community gardens, Victory and allotment gardens did provide additional food for individuals and communities. While they were not sufficient to end food insecurity, the greater awareness and activity involving these food production initiatives did create greater collective awareness about responses during pandemics, fragility of food systems, and action that can be taken when world crises emerge.

Another significant area positively impacted by COVID was the recognition of and use of green spaces to ease mental health disruptions, stress and fear. Gardens, parks, forests and other nature settings became refuges and safe spaces, where social distancing protocols could be implemented, and where connecting with nature was feasible. Greater understanding of health benefits—mental, physical and social benefits—related to green spaces and connecting with nature became part of the general public's knowledge. Behavioral change and increased activity resulting from this awareness emerged as did the call for, and implementation of policies relating to land use (urban garden zoning etc.), in particular, access to parks. The body of knowledge relating to horticulture-health connections, importance of green spaces, particularly in urban areas, and the mediating role connection with nature can play in human health expanded in an accelerated timeline from COVID.

Impacts across sectors

The research highlights that COVID impacted health in multiple domains, and that studies across disciplines responded by investigating, analyzing and recommending strategies for COVID-19 and future pandemics. Greater use of horticulture and gardening for health improvements in physical, mental, nutrition and social domains has been supported by the research. In addition, other horticulture-health intersections emerged from COVID: government policies re food security, community re-zoning, surgeons' practice of gardening in leu of actual surgery, increased online educational content for gardening, cooking with home-grown produce, and green industry expansion addressing the demand for more plants. These reflect the multi-sector responses in horticulture, government, community, education, medicine and business.

The development of virtual services, evident in therapeutic services including horticultural therapy expanded skills of practitioners while expanding the professions. Adaptations within therapeutic services expanded as well, with some services delivered outdoors in compliance with social distancing.

Horticulture can play a connective role across fields during a pandemic

The lens using the horticulture for health framework was a useful tool for identifying horticulture-involved activity across fields for examining COVID impacts. Landscapes for health—green spaces and urban gardens—gained prominence during the pandemic as well as positive impacts on food security, nutrition and the role horticulture played as a catalyst for safe pandemic social interactions. Horticulture practices impacting health included new consumer trends, expanded horticulture product purchases, some for new home gardens, some for interior plants. Health services like horticultural therapy expanded their versatility to include virtual services. The inter-relatedness of these—home gardens, more food production in home gardens, safe social interactions in green spaces including gardens, demand for new plants and plant products—touched on the five key categories of horticulture for health. The point of the horticulture for health framework is the connectiveness between horticulture-based activity that spans multiple sectors, this demonstrated in the COVID review.

Summary

COVID-19 wrought terrible and catastrophic outcomes for humans worldwide. Amidst this were strategies that were able to address, alleviate and further the understanding of responding to a pandemic. Unexpectedly, horticulture, in many capacities and applications, played an important role in all of the health domains – easing mental stress, providing physical outlets through gardening and contact with nature, supporting food production and enhanced food security for some, offering social distancing and social interactions outdoors in gardens and green spaces, and the continuation of health services like horticultural therapy outdoors or in modified delivery. Perhaps the most significant horticulture-centric outcome of COVID-19 has been the wider acceptance and use of gardens and nature environments playing a restorative role during global pandemics. The prominent and positive role that horticulture in various capacities has played during COVID has been documented through research. The horticulture for health framework provides a holistic approach for understanding the complexities of COVID and multi-faceted and inter-related effects from it, where horticulture could and did play a role. This has expanded the understanding between horticulture and health using a theoretical framework rooted in practice, and now including a global crisis. The horticulture for health framework provided a reference for the examination of research where horticulture played a role in health during the COVID pandemic.

References

Adam-Bradford, A., & van Veenhuizen, R. (2015). Role of urban agriculture in disasters and emergencies. In de Zeeuw & Dreschsel (Eds.), *Cities and agriculture developing resilient urban food systems*. Routledge.

Altieri, M.A., & Nicholls, C.I. (2020). Agroecology and the reconstruction of a post-COVID-19 agriculture. *Journal of Peasant Studies, 47*, 881-898.

Andreatta, S.L. (2015). Through the generations: Victory gardens for tomorrow's tables. *Culture, Agriculture, Food and Environment, 37*(1), 38–46. https://doi.org/10.1111/cuag.12046

Andzaurova, P.O., & Nartova-Bochaver, S.K. (2023). Gardening and garden therapy as a resource for human psychological well-being. *RUDN Journal of Psychology and Pedagogics, 20*(2), 331-351. doi: https://doi.org/10.22363/2313-1683-2023-20-2-331-351

Armstrong, A., Brockett, B., Eustice, T., Lorentzon, A., O'Brien, L., & Williams, S. (2021). *Why society needs nature lessons from research during COVID-19*. http://www.forestresearch.gov.uk/documents/8053/Why_Society Needs Nature.

Bail, J.R., Blair, C.K., Smith, K.P., Oster, R.A, Kaur, H., Locher, J.L., Frugé, A.D., Rocque, G., Pisu, M., Cohen, H.J., & Demark-Wahnefried, W. (2022). Harvest for Health, a randomized controlled trial testing a home-based, vegetable gardening intervention among older cancer survivors across Alabama: An analysis of accrual and modifications made in intervention delivery and assessment during COVID-19. *Journal of Academy of Nutrition and Dietetics, 122*(9), 1629-1643. doi: 10.1016/j.jand.2022.05.005

Beeson, L. (2022). COVID-19 pandemic fueled massive growth in green industry. *USA Today* https://news.uga.edu/covid-19-pandemic-fueled massive-growth-in-green-industry/

Behe, B.K., Huddleston, P.T., & Hall, C.R. (2022). Gardening motivations of U.S. plant purchasers during the COVID-19 pandemic. *Journal of Environmental Horticulture, 40*(1), 10-17.

Berning, E.H., Andersen, C.V.H., Mertz, O., Dickinson, N., Opgenorth, M, Lincoln, N.K., Rashford, J.H., & Rønsted, N. (2022). Resilience of breadfruit agro-ecosystems in Hawai'i during the COVID-19 pandemic. *CABI Agriculture and Bioscience, 3*(1), 56. doi: 10.1186/s43170-022-00125-3

Bertoldo, J., Wolfson, J.A., Sundermeir, S.M., Edwards, J., Gibson, D., Agarwal, S., & Labrique, A. (2022). Food insecurity and delayed or forgone medical care during the COVID-19 pandemic. *American Journal of Public Health, 112*, 776–785. doi: 10.2105/AJPH.2022.306724

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. https://doi.org/10.1016/j.ufug.2024.128206

Bone, J. K., Fancourt, D., Sonke, J. K., Fluharty, M. E., Cohen, R., Lee, J. B., & Bu, F. (2023). Creative leisure activities, mental health and well-being during 5 months of the COVID-19 pandemic: A fixed effects analysis of data from 3725 US adults. *Journal of Epidemiology and Community Health, 77*(5), 293-297. doi: 10.1136/jech-2022-219653

Bracale, R., & Vaccaro, C.M. (2020). Changes in food choice following restrictive measures due to Covid-19. *Nutrition, Metabolism and Cardiovascular Disease, 30*(9), 1423-1426. doi: 10.1016/j.numecd.2020.05.027

Campbell, B., Campbell, J.H., & Rihn, A. (2021). Impact of the coronavirus pandemic on plant purchasing in the Southeast. *Agribusiness International Journal, 37*(1), 160-170. https://doi.org/10.1002/agr.21685

Cardarelli, K.M., DeWitt, E., Gillespie, R., Graham, R.H., Norman-Burgdolf, H., & Mullins, J.T. (2021). Policy implications of the COVID-19 pandemic on food insecurity in rural America: Evidence from Appalachia. *International Journal of Environmental Research and Public Health, 18*(23), 12792. doi: 10.3390/ijerph182312792

Cattivelli, V. (2023). Review and analysis of the motivations associated with urban gardening in the pandemic period. *Sustainability, 15*(3), 2116. https://doi.org/10.3390/su15032116

Cerda, C. (2020). Urban gardening as a response to food supply issues in dense urban areas during the COVID-19 crisis. *The nature of cities*. John Hopkins University Press.

Chaudhury P., & Banerjee, D. (2020, Dec.). Recovering with nature: A review of ecotherapy and implications for the COVID-19 pandemic. *Frontiers in Public Health., 10*(8), 604440. doi: 10.3389/fpubh.2020.604440

Chandran, R. (2020). Grow your own: Urban farming is flourishing during the coronavirus lockdowns. *World Economic Forum*. https://www.weforum.org/agenda/2020/04/grow-your-own-urban-farming-flourishes-in-coronavirus-lockdowns/

Chenarides, L., Grebitus, C., Lusk, J.L., & Printezis, I. (2021). Who practices urban agriculture? An empirical analysis of participation before and during the COVID-19 pandemic. *Agribusiness* (N Y NY), 37(1), 142-159. doi: 10.1002/agr.21675

Cui, N., Malleson, N., Houlden, V., & Comber, A. (2022). Using social media data to understand the impact of the COVID-19 pandemic on urban green space use. *Urban For Urban Green, 74*, 127677. doi: 10.1016/j.ufug.2022.127677

Contini, P., Di Nuovo, S., Sinatra, M., Osmanaj, E., & Monacis, L. (2022). Investigating the buffering effects of greenery on the adverse emotional, mental and behavioral health during the pandemic period. *International Journal of Environmental Research in Public Health, 19*(14), 8749. doi: 10.3390/ijerph19148749

Cordero, D.A. Jr. (2021). Green and furry friends to the rescue: Plants and pet parenting during the COVID-19 pandemic. *Evolution, Medicine, and Public Health, 9*(1), 287-288. doi: 10.1093/emph/eoab023

Corley, J., Okely, J.A., Taylor, A.M., & Page, D. (2021). Home garden use during COVID-19: Associations with physical and mental wellbeing in older adults. *Journal of Environmental Psychology, 73*, 101545. doi: 10.1016/j.jenvp.2020.101545

Cortez, S., Diekmann, L. et al. (2022). Gardening during COVID-19: Experiences for gardeners around the world. *University of California Agriculture and Natural Resources*. https://anrcatalog.ucanr.edu/pdf/6720.pdf

Da Nicola, S., Amy, P., Koos, F., Manuel, W., Dagmar, H., Silvija, K.O., Ivana, Ž., Dijana, V., Jakob, D., Clive, D., Raffaele, L., Dennis, R., Georg, W., & Rik, D.V. (2021). The impact of the COVID-19 pandemic on the use of and attitudes towards urban forests and green spaces: Exploring the instigators of change in Belgium. *Urban For Urban Green, 65*.

Davies, C., & Sanesi, G. (2022). COVID-19 and the importance of urban green spaces. *Urban For Urban Green, 74*, 127654. doi: 10.1016/j.ufug.2022.127654

De los Santos, J.A.A., Daiz, G.B., & Rosales, E. (2022). Coronaphobia and coping among the bereaved: The mediating role of gardening during the Covid-19 pandemic. *Nurse Media Journal of Nursing, 12*(1). https://doi.org/10.14710/nmjn.v12i1.44769

Derks, J., Giessen, L., & Winkel, G. (2020). COVID-19-induced visitor boom reveals the importance of forests as critical infrastructure. *Foreign Policy Economics., 118*, 102253. doi: 10.1016/j.forpol.2020.102253

Dzhambov, A.M., Lercher, P., Browning, M.H.EM., Stoyanov, D., Petrova, N., Novakov, S., & Dimitrova, D.D. (2021). Does greenery experienced indoors and outdoors provide an escape and support mental health during the COVID-19 quarantine? *Environmental Research*, 196, 110420. doi: 10.1016/j.envres.2020.110420

Egerer, M., Lin, B., Kingsley, J., Marsh, P., Diekmann, L., & Ossola, A. (2022). Gardening can relieve human stress and boost nature connection during the COVID-19 pandemic. *Urban For Urban Green, 68*, 127483. doi: 10.1016/j.ufug.2022.127483

Engels, E.S., Mutz, M., Demetriou, Y., & Reimers, A.K. (2021). Levels of physical activity in four domains and affective wellbeing before and during the Covid-19 pandemic. *Archives of Public Health, 79*(1), 122. doi: 10.1186/s13690-021-00651-y

Etheredge, C.L., & DelPrince J. (2021). Retail florists use novel sales approaches during the COVID-19 pandemic. *HortTechnology, 31*(6). https://doi.org/10.21273/HORTTECH04920-21

Fang, D., Thomsen, M.R., Nayga, R.M., Jr., & Yang, W. (2022). Food insecurity during the COVID-19 pandemic: Evidence from a survey of low-income Americans. *Food Security, 14*, 165–183. doi: 10.1007/s12571-021-01189-1

Fleming, L. (2021). Horticulture for health framework. *ISHS Acta Horticulturae 1330: XV International People Plant Symposium and II International Symposium on Horticultural Therapies: The Role of Horticulture in Human Well-being and Social Development*, 63-74. doi: 10.17660/ActaHortic.2021.1330.9

Geary, R.S., Wheeler, B., Lovell, R., Lovell, R., Jepson, R., Hunter, R., & Rodgers, S. (2021). A call to action: Improving urban green spaces to reduce health inequalities exacerbated by COVID-19. *Preventative Medicine, 145*, 106425. doi: 10.1016/j.ypmed.2021.106425

Geneletti, D., Cortinovis, C., & Zardo, L. (2022). Simulating crowding of urban green areas to manage access during lockdowns. *Landscape and Urban Planning, 219*, 104319. doi: 10.1016/j.landurbplan.2021.104319

Gerdes, M.E., Aistis, L.A., Sachs, N.A., Williams, M., Roberts, J.D., & Rosenberg Goldstein, R.E. (2022). Reducing anxiety with nature and gardening (RANG): Evaluating the impacts of gardening and outdoor activities on anxiety among U.S. adults during the COVID-19 pandemic. *International Journal of Environmental Research in Public Health, 19*(9), 5121. doi: 10.3390/ijerph19095121

Ghanbari Movahed, R., Maleki Fard, F., Gholamrezai, S., & Pakravan-Charvadeh, M.R. (2022). The impact of COVID-19 pandemic on food security and food diversity of Iranian rural households. *Frontiers in Public Health, 10*, 862043. doi: 10.3389/fpubh.2022.862043

Giraud, E.G., El-Sayed, S., & Opejin, A. (2021). Gardening for food well-being in the COVID-19 era. *Sustainability, 13*(17), 9687. https://doi.org/10.3390/su13179687

Gordon-Rawlings, T., & Russo, A. (2023). Exploring the effects of the Covid-19 pandemic on people's relationships with gardens. *Emotion, Space and Society, 46*, 100936. doi: 10.1016/j.emospa.2022.100936

Hansen, L., Browning, M.H.E.M., Dzhambov, A.M., Zhang, G., & Yang, C. (2022, July). Green space for mental health in the COVID-19 era: A pathway analysis in residential green space users. In Ugolini & Pearlmutter (Eds.), Effects of the COVID-19 pandemic on the use and perceptions of urban green space. *Land*. https://doi.org/10.3390/land11081128

Harding, D., Lukman, K.M., Jingga, M., Uchiyama, Y., Quevedo, J.M.D., & Kohsaka, R. (2022). Urban gardening and wellbeing in pandemic era: Preliminary results from a socio-environmental factors approach. *Land, 11*(4), 492. https://doi.org/10.3390/land11040492

Hartig, T., de Vries, S., & Frumkin, H. (2014). Nature and health. *Annual Review of Public Health, 35*(1). doi: 10.1146/annurev-publhealth-032013-182443

Heo, S., Desai, M.U., Lowe, S.R., & Bell, M.L. (2021). Impact of changed use of greenspace during COVID-19 pandemic on depression and anxiety. *International Journal of Environmental Research in Public Health, 18*(11), 5842. doi: 10.3390/ijerph18115842

Jafri, A., Mathe, N., Aglago, E.K., Konyole, S.O., Ouedraogo, M., Audain, K., Zongo, U., Laar, A.K., Johnson, J., & Sanou, D. (2021). Food availability, accessibility and dietary practices during the COVID-19 pandemic: A multi-country survey. *Public Health Nutrition, 24*, 1798–1805. doi: 10.1017/S1368980021000987

Janda, K.M., Ranjit, N., Salvo, D., Nielsen, A., Lemoine, P., Casnovsky, J., & van den Berg, A. (2021). Correlates of transitions in food insecurity status during the early stages of the COVID-19 pandemic among ethnically diverse households in Central Texas. *Nutrients, 13*, 2597. doi: 10.3390/nu13082597

Johnson, M., Waliczek, T.M., Etheredge, C., & Bradley, J.C. (2023). The connection between gardening and outdoor activity during the COVID-19 pandemic and perceptions of hope, hopelessness, and levels of stress, anxiety, and depression. *HortTechnology, 33*(2), 168-175. doi:10.21273/HORTTECH05109-22

Jato-Espino, D., Moscardó, V., Rodríguez, A.V., & Lázaro, E. (2022). Spatial statistical analysis of the relationship between self-reported mental health during the COVID-19 lockdown and closeness to green infrastructure. *Urban For Urban Green, 68*. doi: 10.1016/j.ufug.2021.127457

Kacprzak, E., & Szczepańska, M. (2024). Will allotment gardening save us again? Allotment gardens during a COVID-19 pandemic in a city with a shortage of plots. *Sustainability, 16*(5), 1981. https://doi.org/10.3390/su16051981

Khan, M.M., Akram, M.T., Janke, R., Qadri, R.W., Al-Sadi, A.M., & Farooque, A.A. (2020). Urban horticulture for food secure cities through and beyond COVID-19. *Sustainability, 12*, 9592. https://doi.org/10.3390/su12229592

Kaplan Mintz, K., Ayalon, O., Nathan, O., & Eshet, T. (2021). See or be seen? Contact with nature and well-being during COVID-19 lockdown. *Journal of Environmental Psychology, 78*, 101714. doi: 10.1016/j.jenvp.2021.101714

Kato, Y., & Boules, C. (2022). Pandemic gardening: Variant adaptations to COVID-19 disruptions by community gardens, school gardens, and urban farms. *Journal of Urban Affairs*, 1-21. https://doi.org/10.1080/07352166.2022.2110887

Katz, H. (2020). Crisis gardening: Addressing barriers to home gardening during the COVID-19 pandemic. *The Australian Food Network: Melbourne, Australia*, 1-47.

Kent, K., Alston, L., Murray, S., Honeychurch, B., & Visentin, D. (2022). The impact of the COVID-19 pandemic on rural food security in high income countries: A systematic literature review. *International Journal of Environmental Research in Public Health, 19*(6), 3235. doi: 10.3390/ijerph19063235

Khan, M.M., Akram, M.T., Janke, R., Qadri, R.W., Al-Sadi, A.M., & Farooque, A.A. (2020). Urban horticulture for food secure cities through and beyond COVID-19. *Sustainability, 12*, 9592. doi: 10.3390/su12229592

Kingsley, J., Diekmann, L., Egerer, M.H., Lin, B.B., Ossola, A., & Marsh, P. (2022). Experiences of gardening during the early stages of COVID-19 pandemic. *Health & Place, 76*, 102854. doi: 10.1016/j.healthplace.2022.102854

Kleinschroth, F., Savilaakso, S., Kowarik, I., Julia, P., Chang, Y., Jakstis, K., Schneider, J., & Fischer, L. K. (2024, January). Global disparities in urban green space use during the COVID-19 pandemic from a systematic review. *Nature Cities*, 1-14. doi: 10.1038/s44284-023-00020-6

Kleinschroth, F. & Kowarik, I. (2020). COVID-19 crisis demonstrates the urgent need for urban greenscapes. *Frontiers in Ecological Environment, 18*(6), 318-319. https://doi.org/10.1002/fee.2230

Klompmaker, J.O., Hart, J.E., Holland, I., Sabath, M.B., Wu, X., Laden, F., & James, P. (2021). County-level exposures to greenness and associations with COVID-19 incidence and mortality in the United States. *Environmental Research*, 199. doi: 10.1016/j.envres.2021.111331

Lal, R. (2020). Home gardening and urban agriculture for advancing food and nutritional security in response to the COVID-19 pandemic. *Food Security, 12*(4), 871-876. doi:10.1007/s12571-020-01058-3

Larson, L.R., Mullenbach, L.E., Browning, M.H.E.M., Rigolon A, Thomsen J, Metcalf EC, Reigner NP, Sharaievska I, McAnirlin O, D'Antonio A, Cloutier S, Helbich M, & Labib, S.M. (2022). Greenspace and park use associated with less emotional distress among college students in the United States during the COVID-19 pandemic. *Environmental Research, 204*(Pt D), 112367. doi: 10.1016/j.envres.2021.112367.

Leddy, A.M., Weiser, S.D., Palar, K., & Seligman, H. (2020). A conceptual model for understanding the rapid COVID-19-related increase in food insecurity and its impact on health and healthcare. *American Journal of Clinical Nutrition, 112*, 1162–1169. doi: 10.1093/ajcn/nqaa226

Levinger, P., Cerin, E., Milner, C., & Hill, K.D. (2022). Older people and nature: The benefits of outdoors, parks and nature in light of COVID-19 and beyond- where to from here? *International Journal of Environmental Health Research, 32*(6), 1329-1336. doi: 10.1080/09603123.2021.1879739

Litton, M.M., & Beavers, A.W. (2021). The relationship between food security status and fruit and vegetable intake during the COVID-19 pandemic. *Nutrients, 13*(3), 712. doi: 10.3390/nu13030712

Liu, S., & Wang, X. (2021). Reexamine the value of urban pocket parks under the impact of the COVID-19. *Urban For Urban Green, 64*. doi: 10.1016/j.ufug.2021.127294

Loker, A., & Francis, C. (2020). Urban food sovereignty: Urgent need for agroecology and systems thinking in a post-COVID-19 future. *Agroecology and Sustainable Food Systems, 44*(9), 1118-1123. doi: 10.1080/21683565.2020.1775752

Lopez, B., Kennedy, C., Field, C., & McPhearson, T. (2021). Who benefits from urban green spaces during times of crisis? Perception and use of urban green spaces in New York City during the COVID-19 pandemic. *Urban For Urban Green, 65*, 127354. doi: 10.1016/j.ufug.2021.127354

Ma, K. (2021). Minimal access gardening: Laparoscopic techniques during Coronavirus disease lockdown. *Journal of Minimal Invasive Gynecology, 28*(1), 22-23. doi: 10.1016/j.jmig.2020.05.004

Malakar, M., & Beruto, M. (2023). The benefits of ornamental plants on human health in the context of the COVID-19 pandemic. *Chronica Horticulturae, 63*(1). https://www.ishs.org/chronica-horticulturae/vol63nr1

Maltz, A. (2015). Plant a victory garden: Our food is fighting: Lessons of food resilience from World War. *Journal of Environmental Studies and Sciences, 5*(3), 392–403. https://doi.org/10.1007/s13412-015-0293-1

Marchi, V., Speak, A., Ugolini, F., Sanesi, G., Carrus, G., & Salbitano, F. (2022). Attitudes towards urban green during the COVID-19 pandemic via Twitter. *Cities, 126*, 103707. doi: 10.1016/j.cities.2022.103707

Mayne, S.L., Kelleher, S., Hannan, C., Kelly, M.K., Powell, M., Dalembert, G., McPeak, K., Jenssen, B., & Fiks, A.G. (2022). Neighborhood greenspace and changes in pediatric obesity during COVID-19. *American Journal of Preventative Medicine, S0749-3797*(22), 00411-1. doi: 10.1016/j.amepre.2022.07.014

McKinney, M.L., & VerBerkmoes, A. (2020, June). Beneficial health outcomes of natural green infrastructure in cities. *Current Landscape Ecology Reports, 5*(5). doi:10.1007/s40823-020-00051-y

McCartney, K., Wood, G., Gabbert, K., Warner, M., & Tompkins, N.O. (2022). Home gardening resurgence during COVID: Motivations and perceived benefits of participating in Grow This! *Health Promotion Practices, 1*, 15248399221102919. doi: 10.1177/15248399221102919

McFarling, U.L. (2020). A resurgence of victory gardens. *The Huntington*. https://www.huntington.org/verso/2020/07/resurgence-victory-gardens

Miyake, Y., Isomura, Y., & Fleming, L. (2022). Virtual horticultural therapy: A qualitative study capturing university students' perspectives on benefits, challenges and future issues. *Health Education & Public Health, 5*(2), 488-48. doi: 10.31488/HEPH.176

Mullins, L., Charlebois, S., Finch, E., & Music, J. (2021). Home food gardening in Canada in response to the COVID-19 pandemic. *Sustainability, 13*, 63056. https://doi.org/10.3390/su13063056

Music, J., Mullins, L., Charlebois, S., Large, C., & Mayhew, K. (2022). Seeds and the city: A review of municipal home food gardening programs in Canada in response to the COVID-19 pandemic. *Humanities and Social Science Communication, 9*(1), 273. doi: 10.1057/s41599-022-01301-6

Music, J., Finch, E., Gone, P., Toze, S., Charlebois, S., & Mullins, L. (2021). Pandemic victory gardens: Potential for local land use policies. *Land Use Policy, 109*, 105600. https://doi.org/10.1016/j.landusepol.2021.105600

Naomi, A.S. (2020). Access to nature has always been important; With COVID-19, it is essential. *HERD, 13*(4), 242-244. doi: 10.1177/1937586720949792

Nay, A., Kahn, P.H., Lawler, J.J., & Bratman, G.N. (2022). Inequitable changes to time spent in urban nature during COVID-19: A case study of Seattle, WA with Asian, black, Latino, and white residents. *Land, 11*(8), 1277. https://doi.org/10.3390/land11081277

Nasir Ahmed, M., & Hughes, K. (2022). Role of ethno-phytomedicine knowledge in healthcare of COVID-19: Advances in traditional phytomedicine perspective. *Journal of Basic Applied Science, 11*(1), 96. doi: 10.1186/s43088-022-00277-1

Niles, M.T., Wirkkala, K.B, Belarmino, E.H., & Bertmann, F. (2021). Home food procurement impacts food security and diet quality during COVID-19. *BMC Public Health, 21*(1), 945. doi: 10.1186/s12889-021-10960-0

Niles, M.T., Bertmann, F., Belarmino, E.H., Wentworth, T., Biehl, E., & Neff, R. (2020). The early food insecurity impacts of COVID-19. *Nutrients, 12*, 2096. doi: 10.3390/nu12072096

O'Brien, L., & Forster, J. (2020). Engagement with nature before and during the COVID-19 restrictions. Quantitative analysis. *Forest Research*.

O'Brien, L., & Forster, J. (2021). Engagement with nature and COVID-19 restrictions survey 2021: Key results. *Forest Research*.

O'Brien, L., & Forster, J. (2021). Physical activity supporting connection to nature, and helping to maintain wellbeing during the COVID-19 restrictions in England. *Environmental Research and Public Health, 18*(9), 4548. doi: 10.3390/ijerph18094585

Ogura, A., Izawa, K.P., Tawa, H., Kureha, F., Wada, M., Harada, N., Ikeda, Y., Kimura, K., Kondo, N., Kanai, M., Kubo, I., Yoshikawa, R., & Matsuda, Y. (2022). Older phase 2 cardiac rehabilitation patients engaged in gardening maintained physical function during the COVID-19 pandemic. *Heart Vessels, 37*(1), 77-82. doi: 10.1007/s00380-021-01892-1

Payán, D.D., Diaz Rios, L.K., Ramirez, A.S., & De Trinidad Young, M.E. (2021). Structural barriers influencing food insecurity, malnutrition, and health among Latinas during and after COVID-19: Considerations and recommendations. *Journal of the Academy of Nutrition and Dietetics, 121*, 837–843. doi: 10.1016/j.jand.2021.01.005

Payán, D.D., Perez-Lua, F., Goldman-Mellor, S., & Young, M.T. (2022). Rural household food insecurity among Latino immigrants during the COVID-19 pandemic. *Nutrients, 14*(13), 2772. doi: 10.3390/nu14132772

Perez-Urrestarazu, L., Kaltsidi, M.P., Nektarios, P.A., Markakis, G., Loges, V., Perini, K., & Fernandez-Canero, R. (2021). Particularities of having plants at home during the confinement due to the COVID-19 pandemic. *Urban Forestry and Urban Green, 59*, 126919. doi: 10.1016/j.ufug.2020.126919

Pieroni, A., Vandebroek, I., Prakofjewa, J., Bussmann, R.W., Paniagua-Zambrana, NY., Maroyi, A., Torri, L., Zocchi, DM., Dam, AT., Khan, SM., & Ahmad, H. (2020). Taming the pandemic? The importance of homemade plant-based foods and beverages as community responses to COVID-19. *Journal of Ethnobiology and Ethnomedicine, 16*(1), 75. doi: 10.1186/s13002-020-00426

Pipitone, J.M., & Jović, J. (2021). U.S. green equity and COVID-19: Effects on park use and sense of belonging in New York City. *Urban For Urban Green, 65*. doi: 10.1016/j.ufug.2021.127338

Pouso, S., Borja, A., Fleming, L.E., Gomez-Baggethun, E., White, M.P., & Uyarra, M.C. (2021). Contact with blue-green spaces during COVID-19 pandemic lockdown beneficial for mental health. *Science of the Total Environment, 756*, 143984. doi: 10.1016/j.scitotenv.2020.143984

Pouya, S., & Aghlmand, M. (2022). Evaluation of urban green space per capita with new remote sensing and geographic information system techniques and the importance of urban green space during the COVID-19 pandemic. *Environmental Monitoring and Assessment, 194*(9), 633. doi: 10.1007/s10661-022-10298-z

Pulighe, G., & Lupia, F. (2020). Food first: COVID-19 outbreak and cities lockdown a booster for a wider vision on urban agriculture. *Sustainability, 12*, 5012. https://doi.org/10.3390/su12125012

Razani, N., Radhakrishna, R., & Chan, C. (2020). Public lands are essential to public health during a pandemic. *Pediatrics, 146*(2), e20201271. doi: 10.1542/peds.2020-1271.

Rivas, V.A., & Biana, H.T. (2022). Plants, public health and the pandemic. *Journal of Public Health (Oxf), 44*(2), e336-e337. doi: 10.1093/pubmed/fdab244

Rombach, M., Dean, D.L., Baird, T., & Kambuta, J. (2022). Should I pay or should I grow? Factors which influenced the preferences of US consumers for fruit, vegetables, wine and beer during the COVID-19 pandemic. *Foods, 11*(11), 1536. doi: 10.3390/foods11111536

Ryzhikov, K. (2021). Virtual therapeutic horticulture – A social wellness program for adults with intellectual and developmental disabilities. *ISHS Acta Horticulturae 1330: XV International People Plant Symposium and II International Symposium on Horticultural Therapies: The Role of Horticulture in Human Well-being and Social Development*. doi: 10.17660/ActaHortic.2021.1330.8

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 For Urban Green, 68*, 127448. doi: 10.1016/j.ufug.2021.127448

San Fratello, D., Campbell, B.L., Secor, W.G., & Campbell, J.H. (2021). Impact of the COVID-19 pandemic on gardening in the United States: Postpandemic expectations. *American Society of Horticultural Science, 32*(1). doi: https://doi.org/10.21273/HORTTECH04911-21

Sassano, A., Mayes, C., & Paradies, Y. (2023). The pandemic boom of urban agriculture: challenging the role of resiliency in transforming our future urban (food) systems. *Urban Policy and Research, 41*(1), 84-97. https://doi.org/10.56261/jars.v21.263294

Schoen, V., Blythe, C., Caputo, S., Fox-Kämper, R., Specht, K., Fargue-Lelièvre, A., Cohen, N., Poniży, L.L., & Fedeńczak Konstancja, F. (2021). We have been part of the response: The effects of COVID-19 on community and allotment gardens in the global north. *Frontiers in Sustainable Food Systems, 5*. doi: 10.3389/fsufs.2021.732641

Shoari, N., Ezzati, M., Baumgartner, J., Malacarne, D., & Fecht, D. (2020). Accessibility and allocation of public parks and gardens in England and Wales: A COVID-19 social distancing perspective. *PLoS One, 15*(10), e0241102. doi: 10.1371/journal.pone.0241102

Singh, D.R., Sunuwar, D.R., Shah, S.K., Sah, L.K., Karki, K., & Sah, R.K. (2021). Food insecurity during COVID-19 pandemic: A genuine concern for people from disadvantaged community and low income families in Province 2 Nepal. *PLoS One, 16*(7), e0254954. doi: 10.1371/journal.pone.0254954

Slater, S.J., Christiana, R.W., & Gustat, J. (2020). Recommendations for keeping parks and green space accessible for mental and physical health during COVID-19 and other pandemics. *Preventative Chronic Diseases, 17*, E59. doi: 10.5888/pcd17.200204

Sofo, A. & Sofo, A. (2020). Converting home spaces into food gardens at the time of Covid-19 quarantine: All the benefits of plants in this difficult and unprecedented period. *Human Ecology, 48*, 131–9. doi: 10.1007/s10745-020-00147-3

Syafiq, A., Fikawati, S., & Gemily, S.C. (2022). Household food security during the COVID-19 pandemic in urban and semi-urban areas in Indonesia. *Journal of Health, Population and Nutrition, 41*(1), 4. doi: 10.1186/s41043-022-00285-y

Taff, B.D., Rice, W.L., Lawhon, B., & Newman, P. (2021). Who started, stopped, and continued participating in outdoor recreation during the COVID-19 pandemic in the United States? Results from a national panel study. *Land*. https://doi.org/10.3390/land10121396

Takiguchi, Y., Matsui, M., Kikutani, M., & Ebina, K. (2022). The relationship between leisure activities and mental health: The impact of resilience and COVID-19. *Applied Psychology Health Well Being*. doi: 10.1111/aphw.12394

Tham, S.Y., & Fleming, L. (2022). Victory gardens to pandemic victory gardens. *Cultivate, 2*(3), 7-9.

Theodoron, A., Panno, A., Carrus, G., Carobone, G.A., Massulo, 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. doi: 10.1016/j.ufug.2021.127091

Torales, J., O'Higgins, M., Castaldeli-Maia, J.M., & Ventriglio, A. (2020). The outbreak of COVID-19 coronavirus and its impact on global mental health. *International Journal of Social Psychiatry, 66*(4), 317-320. doi: 10.1177/0020764020915212

Turnšek, M., Gangenes Skar, S.L., Piirman, M., Thorarinsdottir, R.I., Bavec, M., & Junge, R. (2022). Home gardening and food security concerns during the COVID-19 pandemic. *Horticulturae, 8*(9), 778. https://doi.org/10.3390/horticulturae8090778

Ugolini, F., Massetti, L., Calaza-Martínez, P., Cariñanos, P., Dobbs, C., Ostoic, S.K., Marin, A.M., Pearlmutter, D., Saaroni, H., Šaulienė, I., Simoneti, M., Verlič, A., Vuletić, D., & Sanesi, G. (2020). Effects of the COVID-19 pandemic on the use and perceptions of urban green space: An international exploratory study. *Urban For Urban Green, 56*, 126888. doi: 10.1016/j.ufug.2020.126888

Volenec, Z.M., Abraham, J.O., Becker, A.D., & Dobson, A.P. (2021). Public parks and the pandemic: How park usage has been affected by COVID-19 policies. *PLoS One, 16*(5), e0251799. doi: 10.1371/journal.pone.0251799

Weinbrenner, H., Breithut, J., Hebermehl, W., Kaufmann, A., Klinger, T., Palm, T., & Wirth, K. (2021). The forest has become our new living room – the critical importance of urban forests during the COVID-19 pandemic. *Frontiers For Global Change, 4*, 672909. doi:10.3389/ffgc.2021.672909

Wolfson, J.A., & Leung, C.W. (2020). Food insecurity and COVID-19: Disparities in early effects for US adults. *Nutrients, 12*, 1648. doi: 10.3390/nu12061648

World Health Organization. (2022). *The state of food security and nutrition in the world 2022*.

Yue, Z., Burley, J.B., Cui, Z., Lei, H. & Zhou, J. (2021). Visitor capacity considering social distancing in urban parks with agent-based modeling. *International Journal of Environmental Research in Public Health, 18*(13), 6720. doi: 10.3390/ijerph18136720

Zhang, X., Zhang, Y., & Zhai, J. (2021). Home garden with eco-healing functions benefiting mental health and biodiversity during and after the COVID-19 pandemic: A scoping review. *Frontiers in Public Health, 9*, 740187. https://doi.org/10.3389/fpubh.2021.740187

Biography

Lesley Fleming, MA, HTR began identifying research related to impacts from COVID-19 on horticulture for health domains for inclusion in the Florida Horticulture for Health Network's online Resource Hub. This *Journal of Therapeutic Horticulture* article synthesizes the data through the lens of the horticulture for health framework. Her other recent projects include leading the collaborative initiative establishing a free online Therapeutic Horticulture Activities Database and an online webinar Addressing Self-Regulation Challenges Using Horticultural Therapy & Therapeutic Horticulture. She continues her role as editor in chief of *Cultivate* and *Digging In* epublications for the Florida Horticulture for Health Network and the Nova Scotia Horticulture for Health Network with articles she wrote or co-authored on social emotional learning, active and passive engagement with plants: incorporating interoception, proprioception and vestibular senses for therapeutic outcomes, and therapeutic techniques applicable for people-plant programming.

Therapeutic Horticulture and Therapeutic Goals: Expanding the Scope and Practice Through the Therapeutic Horticulture Activities Database and Its Use of Health Domain-Specific Goals

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Abstract

Therapeutic goals are foundational in the practice of horticultural therapy. They are integral to the therapeutic process for both the clinical modality of horticultural therapy and the less formalized practice of therapeutic horticulture. Expanding the scope and understanding of therapeutic goals across health domains can provide practitioners, allied health professionals, and clients with a more thorough framework and result in stronger health outcomes. Developments within the field are propelling a renewed focus on therapeutic goals and how they are used by practitioners. This is timely given the American Horticultural Therapy's Association's new professional designation of Therapeutic Horticulture Practitioner.

The launch of the Therapeutic Horticulture Activities Database in early 2024 and its inclusion for each activity of therapeutic goals in the five primary health domains has helped to expand the awareness of therapeutic goals that are applicable to the practice of horticultural therapy, and specifically for therapeutic horticulture.

Introduction

Therapeutic Horticulture (TH) is defined by the American Horticultural Therapy Association as "the participation in horticultural activities facilitated by a registered horticultural therapist or other professionals with training in the use of horticulture as a therapeutic modality to support program goals. Therapeutic horticulture is the process through which participants enhance their well-being through active or passive involvement in plant and plant-related activities" (AHTA, 2024). This modality is delivered to individuals and groups, with the intention of improving health outcomes. Though clinical charting is not typically used in TH interventions, the use of therapeutic goals is an essential component, as is the framework of the therapeutic process, horticultural therapy (HT) standards of practice, and reliance on the American Horticultural Therapy Association's (AHTA) code of ethics. AHTA differentiates HT from TH based on the development and documentation of individualized treatment plans and goals. For that reason, the development, documentation, and monitoring of therapeutic goals is essential in horticultural therapy practice. While goal development and tracking is not a requirement of therapeutic horticulture practice, its inclusion undoubtedly strengthens programing.

Therapeutic Goals Used in Horticultural Therapy and Therapeutic Horticulture

The use of therapeutic goals within HT has been promoted since the inception of the profession and is one of the praxes on which the field relies. Currently, there is not a centralized source where therapeutic goals are listed or inventoried. Three HT textbooks, *Horticulture as Therapy: Principles and Practice* (2003), *Horticultural Therapy Methods* (2006, 2017) and *The Profession and Practice of Horticultural Therapy* (2019), have been the primary references for therapeutic goals and have included information on goals and goal setting, with information spread throughout each.

The Expanding Therapeutic Goal Paradigm

Both HT and TH have seen expansion of therapeutic goals in the field. Greater numbers of allied health professionals are enrolling in HT coursework, incorporating HT/TH into their practices, and contributing to knowledge transfer about therapeutic goals in mental health, social work, and speech therapy as well as occupational, physical and recreation therapy disciplines. Increasing exploration and knowledge of the relationship between neuroscience, human behavior, self-regulation, mental health, and HT/TH has expanded HT literature, foundational

knowledge, and practice (Fleming et al., 2023). With these connections have come therapeutic goals related to brain functioning, self-regulation, and sensory integration, among others (Fleming et al., 2023; Poláčková et al., 2023).

Therapeutic Horticulture Activities Database

The Therapeutic Horticulture Activities Database (THAD), launched in early 2024, was created by registered horticultural therapists and leaders of regional HT groups. Diane Relf, HTR, PhD., a pioneer in HT, envisioned a free online TH activity database for use by practitioners as a key aspect in the further development of the field. Part of the THAD development included using five primary health domains for expressing potential therapeutic goals of each activity: cognitive/intellectual, physical, psychological/emotional, sensory, and social. These primary health domains were selected by the THAD Working Group whose members are Diane Relf, Lesley Fleming, Leah Diehl, Trish Hildinger, Gerry Sherman, and Catherine Crowder.

This paper seeks to identify and index therapeutic goals applicable to TH, organized by health domains and supported by examples from THAD. This list is not definitive but demonstrates the expanding depth, clarity, and scope of TH practice. It should be noted that many goals can fall into more than one health domain, such as those related to self-regulation or stress, so an attempt to place them in a primary domain was made based on specific or typical presenting health challenges. The THAD examples identify multiple therapeutic goals for each activity, drawn from the five domains, though typically only one or two would be emphasized in a given session. The intention of identifying goals across domains was to broaden awareness and applications by practitioners. The THAD examples have been hyperlinked in the paper.

Cognitive/Intellectual Health Domain: Therapeutic Goals + THAD Activity Examples

Many TH goals and activities seek to improve or maintain cognitive function, seen most frequently with populations living with dementia, intellectual disabilities, stroke-related impairment, or brain injury. Goals are often stated in very general terms in HT, such as *improve quality of life*, or *improve cognitive function*, and lack what facet of cognitive function is being addressed. Goals such as *improve memory, follow sequential steps*, or *learn new skills* are more focused, providing useful direction to TH activities and clients (Fleming, 2024). For example, cognitive stimulation therapy provides a reference point for goals related to dementia and cognition, used in other therapeutic disciplines, and can help inform TH activities targeting memory recall, decision-making, concentration, and attention, and adapting or adjusting to negative thoughts (Cove et al., 2014; Streater et al., 2016).

Table 1 includes functional areas and related goals and TH activities in the cognitive/intellectual health domain that can be used by a range of populations and target a variety of goals and outcomes.

Cognitive and intellectual goals have been grouped together in the THAD platform. They can be quite different, however, and depending on the client and population, may require practitioners to have understanding of brain health and processing. Depending on the complexity of the client's needs and goals, they may be best delivered in partnership with interdisciplinary treatment teams. As researchers develop a better understanding of the brain and the nuances of its relationship to behavior, there will be more opportunities for incorporating TH activities in treatment for additional client groups such as those with PTSD or social emotional learning challenges.

Table 1

Functional Areas of Cognitive/Intellectual Health, Related Goal Areas, and Examples of TH Activities

Functional Area	Goal Areas for Healthy Function	Examples of THAD Activities
Planning and Organization	Sequencing	Making Salsa Hardening Off Plants
	Prioritization, Time Management & Goal Setting	Vocational Horticulture Tasks
	Reasoning & Problem Solving	Herb Propagation from Seed Games with Weird & Wonderful Plants Forcing Paperwhites & Other Bulbs*
	Flexible Thinking	Plant Puns on Pots* Science Experiment: Avocado 3 Ways* Pansies in Pumpkins*
Memory	Working Memory/Short-term Memory/Recall	Peeling Vegetables Matching Game: Photos to Live Plants
	Long-term Memory/Recall	Creating a Plant Teleidoscope
	Reminiscence	Lavender Cookies
Focus	Attention to Task	Planting Microgreen Seeds
	Concentration	Transplanting Herbs to Outdoor Garden
	Following Directions	Hardwood Stem Cuttings
	Self-Restraint & Emotion Control	Daily Gardening Tasks*
Knowledge Acquisition, Leisure Skills & Job Skills Development	Observation & Perception	Color Wheel Challenge with Plants Growing Mindful Awareness in TH Activities Photographing Nature's Micro Patterns
	Task Initiation	Planting a Tea Pot Garden Alphabet Garden*

Table 1

Functional Areas of Cognitive/Intellectual Health, Related Goal Areas, and Examples of TH Activities

Functional Area	Goal Areas for Healthy Function	Examples of THAD Activities
Knowledge Acquisition, Leisure Skills & Job Skills Development	Language & Number Concepts	Plant Parts & Plant Parts Rap* In the Garden Slide Show Seed Tape
	Curiosity	What Plant Speaks to You?*

Note. This table lists an assortment of TH activities that could be employed to provide support in the domain of cognitive/intellectual function. It is not an exhaustive list and many of the activities listed could support work in other goal areas as well.

* This activity does not explicitly state the associated goal but could be adapted to do so.

Physical Health Domain: Therapeutic Goals + THAD Activity Examples

Therapeutic horticulture goals in the physical domain are primarily focused on improving mobility, physical strength, range of motion, balance, fine and gross motor skills, cardiovascular health, and adaptations for tasks and skills involving physical components. Gardening tasks used in TH have led to improvements in these areas. Physical function goals related to specific health conditions such as stroke, cerebral palsy, arthritis, and even developmental disability can be targeted to the needs of each type of client group. The scope of goals used in TH within the physical health domain can also include goals related to pain management and physiological aspects of self-regulation, as well as compensatory strategies and adaptations in using artificial limbs and assistive mobility devices.

Table 2 is not a definitive inventory but rather a sample of the extensive range of therapeutic goals possible for physical challenges across health diagnoses, injury, and levels of physical functioning. The goals in the physical health domain included here suggest the types of therapeutic goals that can be used for a variety of physical health issues where TH interventions can contribute to improved health outcomes.

Knowledge transfer from occupational and physical therapy disciplines has elevated TH. HT professionals at hospitals and rehab centers have long been involved in developing HT interventions for regaining physical function, which begins with understanding numerous types of injuries and conditions, the complex nature of these physical challenges, and the physiology of muscles, joints and other body parts involved in healthy functioning.

Table 2

Functional Areas of Physical Health, Related Goal Areas, and Examples of TH Activities

Functional Area	Goal Areas for Healthy Function	Examples of THAD Activities
Motor Function	Fine Motor Skills	Seed Self Portraits Fall Leaf Luminaries
	Gross Motor Skills	Game: Gathering Nature's Treasures
	Mobility & Gait	Field Trip to Community Garden
Coordination	Eye-Hand Coordination	Insect Hotel
	Balance & Stability	Seed Planting in Trays Preparing Soil in Raised Beds
	Range of Motion	Pounding Pansies
Strength & Exercise	Grip	Celery Shenanigans Don't Pick the Flowers
	Endurance	Physical Exertion – Substance Use Addiction Adaptive Gardening: Repetitive Motion Disorders
Healthy Lifestyle	Nutrition	Nutrition Veggie Snack Packs* Plan, Plant & Eat the Rainbow
	Sleep	Gardening, Melatonin & Sleep
	Daily Exercise	Green Exercise – Dementia Populations

Note. This table lists an assortment of TH activities that could be employed to provide support in the domain of physical function. It is not an exhaustive list and many of the activities listed could support work in other goal areas as well.

*This activity does not explicitly state the associated goal but could be adapted to do so.

Table 3

Functional Areas of Psychological/Emotional Health, Related Goal Areas, and Examples of TH Activities

Functional Area	Goal Areas for Healthy Function	Examples of THAD Activities
Psychological	Managing Challenges	Harvesting Herbs Grown for Leaves
	Rational Thinking	Care of Houseplants Kitchen Waste: Regrow Avocado Seeds
	Self-Confidence	Moss Frame
	Security/Sense of Safety	Spacing Plants & Boundaries Expanding a Sense of Safety Pruning Your Fears
Emotional	Mood Enhancement	Fring Frang Acadian Potato Dish Cut flower Arrangement in a Meaningful Container
	Recognizing & Acknowledging Emotion	Positive Energy Sun Satchel Amaryllis Bulb Planting
	Self-Esteem & Empowerment	Teacup Planting Herb Propagation from Seed
	Self-Control	That's Bananas
	Trauma and Grief Processing	Poem + Nature Walk - Bereaved
	Anxiety & Stress Reduction	Lavender Soap Balls Calming Exercises in the Garden
Behavioral	Self Regulation	Forcing Blooms in Winter Weeding the Herb Garden Waiting for Water Chant

Psychological/Emotional Health Domain: Therapeutic Goals + THAD Activity Examples

This health domain does not have finite parameters. Generally, psychological health and related challenges pertain to the ability to manage difficult situations, think rationally, and make decisions (Dressler, n.d.; The Phoenix Recovery Center, 2023). It can involve emotional health, defined as one's ability to manage moods, feelings, and responses. Mental health encompasses both psychological and emotional components. Additionally, a distinction is drawn by medical and therapeutic professionals between mental health and behavioral health.

Table 3

Functional Areas of Psychological/Emotional Health, Related Goal Areas, and Examples of TH Activities

Functional Area	Goal Areas for Healthy Function	Examples of THAD Activities
Behavioral	Coping Strategies	Checking Seed Germination Rate I'm Tired: Plants & People
	Self-Efficacy/Personal Agency	Tending Garden Beds - Dementia
	Personal Growth & Creativity	Living Art with Moss Exploring Renewal & Personal Growth

Note. This table lists an assortment of TH activities that could be employed to provide support in the domain of psychological and emotional wellness. It is not an exhaustive list and many of the activities listed could support work in other goal areas as well.

*This activity does not explicitly include the associated goal but can be adapted to do so.

Behavioral health focuses on actions affecting wellbeing and their impact on physical and mental health, not on psychological inputs (Gillette, 2023). Stress is an example where both emotional and behavioral thoughts and responses are linked.

The therapeutic horticulture activities database (THAD) combines psychological, emotional, and behavioral goals within the psychological/emotional domain. For many health professionals these may need to be further distinguished based on individuals and populations with specific challenges and prioritized goals (e.g. survivors of human trafficking) (Poláčková et al., 2023). Like many health domains, mental health challenges are not black and white and may fall into several domains.

Psychological/emotional therapeutic goals typically used in TH practice include *increasing self-esteem, sense of self, and/or empowerment, developing coping strategies, pursuing personal growth,* and *using reminiscing for emotional health*. Goals relating to sense of safety, defining love, recognizing unhealthy relationships and safe outlets for expressing fear, coping with fatigue (psychological and physical), overcoming and managing symptoms of depression or anxiety, and finding moments of awe as inspiration are also found in TH practice.

There has been expanding interest and applications of TH and HT for self-regulation dysfunction, which have psychological, emotional, and physiological connections (Fleming et al., 2023; Poláčková et al., 2023). The breadth and complexity of self-regulation challenges across populations (children, veterans, incarcerated) and their impact on other health domains can result in multidimensional goals in TH practice. Table 3 identifies the scope of therapeutic goals that can be used in the psychological/emotional health domain.

The scope and variety of therapeutic goals in this health domain are extensive as are mental health challenges. TH programs focused on this domain serve populations experiencing addiction, depression, eating disorders, pain, psychosis, PTSD, and social anxiety, among others. Stress and anxiety related to political events, climate change, and other divisive issues are on the rise and TH programs can help address these stressors using a variety of therapeutic goals.

Sensory Health Domain: Therapeutic Goals + THAD Activity Examples

This health domain is not widely referenced in current literature to the same degree as other health domains. Sensory stimulation is a basic element of HT/TH activities because hands-on plant and gardening activities include extensive sensory opportunities. A broader understanding of proprioception, interoception, vestibular sense of balance, and self-regulation is emerging as important components of sensory integration and have significant bearing on human functioning and dysfunction. (Barker et al., 2021; Fleming & Grimes, 2024; Gabaldo, 2019; Pathways, 2023). Ayres' foundational theory on the nervous system's interpretation of sensory input continues to be relevant for sensory processing, and research in the field of sensory integration therapy continues to expand knowledge across disciplines (Ayres, 1962, 1965, 1972; Dean et al., 2019; Gomez et al., 2021).

In current HT practice sensory *stimulation* is an oft-used therapeutic goal. Commonly employed sensory goals include *mood enhancement, stress relief, memory stimulation*, and *anxiety reduction*.

TH activities submitted to THAD suggest a growing use of goals for sensory integration and sensory motor activities. This may reflect an expanding understanding of the importance of sensory inputs on human functioning. Traditionally, the role of sensory integration as building blocks for developmental skills and behavior has been focused on children and those with dyspraxia, ADHD, or ASD. However, sensory integration has broad applications beyond these groups including those living with PTSD, trauma, stroke, and TBI, among other conditions (Autism CRC, 2024; Jang & Lee, 2016; Poláčková et al., 2023; Thielen et al., 2023; Whitehouse et al., 2020).

Table 4

Functional Areas of Sensory Health, Related Goal Areas, and Examples of TH Activities

Functional Area	Goal Areas for Healthy Function	Examples of THAD Activities
Sensory Stimulation	Visual	Nature's Colors Game
	Tactile	Flower Vase Bouquet: Hand Held Method
	Gustatory	Eating Plant Parts – Immigrant/Refugee Taste & Spit Vegetables
	Olfactory	Smelling Culinary Herbs
	Auditory	Conflict Resolution Sensory Path
	Stress and Anxiety Relief	Making a Walking Stick
	Mood Enhancement	Air Drying Leafy Herbs Dream Pillows
Sensory Awareness	Proprioceptive	Holiday Pine Bough Door Swag
	Interoceptive	Transplanting Herbs to Outdoor Gardens
	Vestibular	Sensory Bin
Sensory Integration & Processing	Sensory Motor	Hapa-zome Leaf Dye Origami Calendar with Seeds & Pressed Flowers Spring Kokedama in Vases
	Self-Regulation	Garden Style Floral Arrangement Bird Feeder Outdoor Obstacle Course Nature Artwork – Bereaved
	Sensory Tolerance	Propagating Herbs by Division Foot & Hand "Bath" with Fresh Herbs Playing with Soil, Sand & Water Earth Day Hanging Kokedama

Note. This table lists an assortment of TH activities that could be employed to provide support in the domain of sensory interaction and integration. It is not an exhaustive list and many of the activities listed could support work in other goal areas as well.

*This activity does not explicitly state the associated goal but could be adapted to do so.

Social Health Domain: Therapeutic Goals + THAD Activity Examples

Social functioning encompasses social skills, social behavior, cognition, and communication essential during inter-personal interactions. The fields of psychology, neuroscience, education, and mental health identify social interactions and challenges or deficits to these, as important throughout the lifespan (Cordier et al., 2015). Therapeutic services addressing challenges in the social health domain are critical.

Typical TH goals have included *working cooperatively in groups, mastering socially appropriate dress and attitude* (particularly in vocational settings), *reducing verbal and physical outbursts or threats, developing nurturing skills for plants and humans, and responding appropriately to social cues.*

Social health and wellbeing are understood to have multiple factors impacting social interaction including predisposition, personality and temperament, family history, socioeconomics, and culture (Cordier et al., 2015). The breadth of this health domain and its interrelatedness to other domains is evident where terms like socio-cognitive, socio-emotional, and psycho-social are used in the literature.

Social goals can be specific to individuals, populations, diagnostic characteristics, or circumstances. For example, therapeutic goals for people living with autism spectrum disorder may include the improvement of relationship skills, self-awareness, social awareness, self-management, and responsible decision-making. These goals may be identified by special education teachers, social workers, or HT practitioners and the person/client(s) themselves (Positive Action, 2024).

Self-regulation and social emotional learning are two areas within TH programming that have received increased attention. The use of individual educational plans (IEPs), the practice of conscious discipline and positive action strategies, and the encouragement of intrinsic self-motivation improving behavior and attitudes can be successfully integrated into TH programs and activities (CASEL, 2020; Conscious Discipline, n.d.; Grimes, 2024). Communication skills, community participation, awareness and empathy, and other interpersonal skills are integral to healthy social function and relationships and can be employed as therapeutic goals for all populations regardless of age, population, and therapeutic discipline intervention (Aakre, n.d.).

Discussion

Therapeutic Horticulture Practitioner Designation – Impact on Therapeutic Goals

Implementation of a new professional designation by AHTA in 2024 signals a recognition of the degree to which TH is being used (Stowell et al., 2021). The new professional registration level seeks to recognize, legitimize, and expand the number of trained and credentialed professionals delivering TH.

A concern that could surface, related to the THP designation, is a reduced emphasis on identifying and applying therapeutic goals as part of TH services. The AHTA (2024) definition of TH mentions program goals, in contrast to the definition of HT requiring "specific goals in an established treatment, rehabilitation, or vocational plan." The success of the discipline is reliant on practitioner ethics and use of standards of practice including therapeutic goals in both TH (group based) and HT (individually based) programs. The creation of the THP provides an opportunity to bring more awareness of the HT/TH profession and in turn the myriad goals and activities that can be used to address client needs. The purpose of THAD is just that; to provide an expanding resource to support THPs and HTRs in addressing their client's needs.

Table 5

Functional Areas of Social Health, Related Goal Areas, and Examples of TH Activities

Functional Area	Goal Areas for Healthy Function	Examples of THAD Activities
Social Perception	Social Awareness	Ring In the New Year: Plant Connections
	Sharing Feelings/ Empathy	Personal Growth Metaphor: Deciduous Fruit Tree Pruning
	Social Anxiety	Bulb Lasagna Planting Stone Angels, Guardian Angels & Behavior
	Recognizing Social Cues	Nature Masks
	Tolerance	Lettuce Be Different
	Mentalizing	Mixing Soil Starting Jade Plants in Soil
Social Interaction	Appropriate Communication	Herbal Tea
	Engagement	Making Agua Fresca Harvesting for Communal Meal
	Cooperation	Milk Jug 2 Mini Greenhouse Sowing Seeds in Winter
	Solving Communication Challenges	Drying Herb Flowers
	Pro-Social Behavior	Watering Can Pass-Off Repotting Plants
	Managing Social Responsibilities & Relationships	Community Gardening – Dementia Populations Service Project: Making Photo Plant Cards
Work Interaction	Appropriate Communication	Harvesting Herbs Grown for Roots, Rhizomes & Bulbs
	Teamwork & Collaboration	Newcomer Plot Gardening on Hospital Grounds* Paper Sunhat Ready, Set Grow the Hydroponics Way
	Managing Expectations	Pre-employment Program Activities at Hospital Market Garden

Note. This table lists an assortment of TH activities that could be employed to provide support in the domain of social interaction. It is not an exhaustive list and many of the activities listed could support work in other goal areas as well.

*This activity does not explicitly state this goal but could be adapted to do so.

Therapeutic Horticulture Activities Database (THAD)

The new, expanding, and free Therapeutic Horticulture Activity Database is an important contribution to the growing body of knowledge within HT/TH. The collaborative nature of THAD's development and growth is a strength, evidenced by its tested TH activities used in actual practice that include multiple adaptation ideas. The identification of therapeutic goals in each health domain for every activity broadens its usefulness to practitioners. As additional THAD activities are added, it is anticipated that more classification categories will be included.

Other Health Domains

This paper and THAD are using five health domains to examine therapeutic goals specific to TH. Other health and wellness domains are identified in the literature, including spiritual, creative, occupational, environmental, and financial (University of Utah, n.d.). Health issues can fall within multiple health domains even when a single deficit or goal has been identified for treatment or intervention. For example, self-regulation, social emotional learning, and stress are multi-faceted and impact the physiological, psychological, and social domains of human functioning. As the HT/TH practice continues to mature, additional domains and greater distinction within current domains may evolve, bringing greater definition to therapeutic services.

Knowledge Transfer from Allied Health Professions Will Expand Knowledge Base

As identified in the paper, knowledge transfer between allied health professions has occurred, specifically where similar therapeutic goals are used across disciplines. There are several areas where this knowledge transfer will continue to expand, and deeper understanding will benefit the HT/TH profession. These areas include trauma, physical functioning, self-regulation, mind-body integration, and social-emotional learning (Fleming et al., 2023; Fleming & Grimes, 2024). Therapeutic goals related to these areas are becoming more evident in TH practice.

Summary

The creation of an index of the many therapeutic goals applicable to TH interventions is an essential step in advancing the core knowledge and delivery of HT/TH services. This paper has initiated this process by examining therapeutic goals, their relationship to HT and allied health practice, and presenting activity examples available in THAD. What becomes evident in this process are the many additional goals that can be incorporated into TH practice, particularly when considering them in the context of health domains. While it is not possible to include a listing of all possible therapeutic goals in this paper, it is possible to acknowledge the broadening scope of therapeutic goals within and across health domains.

With the addition of the THP credential, it is hoped that more practitioners will be recognized for the work they are doing and that, in turn, may lead to greater recognition of the benefits of HT/TH practice. This could serve as a turning point for the profession, however an increase in the understanding and use of TH goals will be essential in solidifying the credibility of HT/TH. THAD is a critical resource in these expansion efforts and plays an intrinsic and supportive role in the therapeutic process, HT/TH practice, and the growth of the field.

References

Aakre, C.A. (2021). Fibromyalgia screening in patients with unexplained chronic fatigue. *Menopause, 28*(1), 93-95. DOI: 10.1097/GME/00000000001656

American Horticultural Therapy Association. (2024). Definitions and positions: Practice definitions. AHTA Definitions and Positions

Autism CRC. (2024). Sensory-based interventions. https://www.autismcrc.com.au/interventions-evidence/category-overview/sensory

Ayres, A. J. (1965). Patterns of perceptual-motor dysfunction in children: A factor analytic study. *Perceptual and Motor Skills, 20*, 335–368.

Ayres, A. J. (1969). Deficits in sensory integration in educationally handicapped children. *Journal of Learning Disabilities, 2*, 160-168.

Ayres, A.J. (1972). Sensory Integration and Learning Disorders. Los Angeles, CA: WPS. ISBN 978-0874243031.

Barker, M., Brewer, R., & Murphy, J. (2021). What is interoception and why is it important? *Frontiers*. https://kids.frontiersin.org/articles/10.3389/frym.2021.558246

Collaboration for Academic, Social and Emotional Learning (CASEL). (2020). SEL as a lever of equity: 5 part webinar series from CASEL. https://consciousdiscipline.com/sel-as-a-lever-for-equity-5-part-webinar-series-from-casel/#:~:text=Conscious%20Discipline%20believes%20that%20trauma,not%20only%20possible%2C%20but%20essential

Conscious Discipline. (n.d). Conscious discipline methodology. https://consciousdiscipline.com

Cordier, R., Speyer, R., Chen, YW., Wilkes-Gillan, S., Brown, T., Bourke-Taylor, H., Doma, K., & Leicht, A. (2015). Evaluating the psychometric quality of social skills measures: A systematic review. *PLoS One, 10*(7), e0132299. DOI: 10.1371/journal.pone.0132299.

Cove, J., Jacobi, N., Donovan, H., Orrell, M., Stott, J., & Spector, A. (2014). Effectiveness of weekly cognitive stimulation therapy for people with dementia and the additional impact of enhancing cognitive stimulation therapy with a career training program. *Clinical Interventions in Aging, 9*, 2143-2150.

Dean, E., Little, L. M., Wallisch, A., & Dunn, W. E. (2019). Sensory processing in everyday life. In B. Schell & G. Gillen (Eds.), *Willard and Spackman's Occupational Therapy* (13th ed., pp. 942–964). Wolters Kluwer Health.

Dressler, J. (n.d.). The difference between mental and emotional health: What your organization can do to support both. *Web MD Health Services.* https://www.webmdhealthservices.com/blog/the-difference-between-mental-and-emotional-health-what-your-organization-can-do-to-support-both/

Fleming, L. (2024). A practitioner tool: Listing of therapeutic horticulture goals with THAD activity examples: Cognitive domain. *Cultivate, 5*(1).

Fleming, L., Bethel, M., & Roberts, T. (2023). Self-regulation, its neuroscience foundations and horticultural therapy: Growing the connections. *Journal of Therapeutic Horticulture, 33*(1), 19-39.

Fleming, L., & Grimes, K. (2024). Active and passive engagement with plants: Incorporating interoception, proprioception and vestibular senses for therapeutic outcomes. *Cultivate, 4*(1).

Gabaldo, M. (2019). Perspective and technique: Sensory processing. In Haller, Kennedy & Capra (Eds.), *The Profession and Practice of Horticultural Therapy*. CRC Press.

Gillette, H. (2023). What's the difference between mental health and behavioral health? *Healthline.com*. https://www.healthline.com/health/mental-health-vs-behavioral-health

Gomez, INB., Calsa, AP., Esguerra, JT., Penetrante, PJH., Porlucas, K., Santos, ME., Umali, CB., & Lai, CYY. (2021). Psychometric properties of the sensory processing and self-regulation checklist: English version. *Occupational Therapy International, 2021*, 6658786. DOI: 10.1155/2021/6658786

Grimes. K. (2024). Waiting for water chant. *University of Florida Therapeutic Horticulture Activities Database*.

Jang, S.H., & Lee, J.H. (2016). Impact of sensory integration training on balance among stroke patients: Sensory integration training on balance among stroke patients. *Open Medicine (Warsaw, Poland), 11*(1), 330–335. https://doi.org/10.1515/med-2016-0061

Pathways. (2023). What is proprioception? Understanding the "body awareness" sense. *Pathways.org*

Poláčková, Z., Fleming, L., Brown, J., & Kelijian, H. (2023). Horticultural therapy health interventions with female survivors of human trafficking: Program models. *Journal of Therapeutic Horticulture*, 33(1), 40-60.

Positive Action. (2024). What is positive action? https://www.positiveaction.net/

Stowell, D.R., Fly, M., Klingeman, W.E., Beyl, C.A., Wozencroft, A.J., Airhart, D.I., & Snodgrass, P.J. (2021). Current state of horticultural therapy profession in the United States. *HortTechnology, 31*(4), 330-338.

Streater, A., Specter. A., Orrell, M., Aguirre, E., & Orrell, M. (2016). Cognitive stimulation therapy (CST) for people with dementia in practice: An observational study. *British Journal of Occupational Therapy, 79*(12). https://doi.org/10.1177/0308022616668358

The Phoenix Recovery Center. (2023). Mental health vs psychological health. https://thephoenixrc.com/mental-health-vs-psychological-health/#:~:text=Focus%3A%20Mental%20health%20predominantly%20focuses,research%2C%20assessment%2C%20and%20therapy

Thielen, H., Tuts, N., Welkenhuyzen, L., Huenges Wajer, I.M.C., Lafosse, C., & Gillebert, C.R. (2023). Sensory sensitivity after acquired brain injury: A systematic review. *Journal of Neuropsychology, 17*(1), 1–31. https://doi.org/10.1111/jnp.12284

University of Utah Health. (n.d.). 7 domains of health. https://uofuhealth.utah.edu/coe-womens-health/seven-domains-health

Whitehouse, A., Varcin, K., Waddington, H., Sulek, R., Bent, C., Ashburner, J., Eapen, V., Goodall, E., Hudry, K., Roberts, J., Silove, N., & Trembath, D. (2020). Interventions for children on the autism spectrum: A synthesis of research evidence. *Autism CRC*, Brisbane, 2020.

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Contributors of THAD activities listed in **Table 2: Physical Health Domain: Therapeutic Goals and THAD Activity Examples** include L. Fleming, S. Morgan, D. Relf, Z. Poláčková, M. Hewson, G. Sherman, G. Stivland, T. Hildinger, M. Bethel, and A. Chance.

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Kathryn E. Grimes (Katie), HTR, MAT is the Education and Volunteer Manager at Wonder Gardens, a small, historic botanic garden and zoo in Bonita Springs, Florida. She holds a Master of Arts in Teaching degree and a concentration in special education from Trinity University in San Antonio, Texas, and has been a registered horticultural therapist since 2017. Katie has guided outdoor and garden-based programming for over 20 years in contexts that include schools, a community garden, parks and recreation, early learning environments, and the oldest and largest AZA-accredited zoo in Texas. As a registered horticultural therapist and a Certified Interpretive Guide, she has designed and implemented therapeutic and sensory gardens, programs, walks, tours, and interactions that focus on care for the environment and affect human well-being. Katie appreciates nature as a model for diversity and believes that improving access will benefit both the environment and the people, animals, and plants who live there.

Rest, Reconnect, Restore; A Hypothesis Towards A Theory Of How Pleasurable Biological Nature May Restore The Human Condition Of Loneliness.

Robert Hoover, MLA

Abstract

*Scientists have been studying nature and its connection with human restoration and well-being for at least the past four decades and have discovered evidence that strongly supports nature as being an effective, non-pharmacological resource for improving wellbeing (McMahan, 2015) (Beil, 2021). However, while most of the research has focused on the empirical world of science, such as improved cognition, decreased stress, lower blood pressure, increased self-esteem, and less pain medication, few studies have focused on nature's relationship with the non-science, non-empirical world of Originating Life, and the role it plays in the restoration of human beings. The primary objectives of this hypothesis "**Rest, Reconnect, Restore**," are threefold. First, to put forth the **RRR** hypothesis that pleasurable biological nature restores human well-being, specifically loneliness, via unconditional love. Second, to present a case for the need to include the non-empirical, spiritual world, alongside the empirical world of science when examining and evaluating how nature may restore human beings. Third, to put forth a framework which could lead towards a theory around which to encourage and guide future scientific research.*

Definitions

RRR hypothesis includes several complex areas of study that cannot possibly be explored in one paper. For example, what is originating life? What is nature? What is the difference between the brain and mind? Therefore, to put forth RRR as a hypothesis, and to help mitigate future confusion, this paper provides several definitions, up front, applicable to this paper only.

Empirical World = The earth with its inhabitants and all things upon it, subject to verification by observation or experiment.

- Empirical = Subject to verification by observation or experiment (Merriam-Webster, 2016).
- World = The earth with its inhabitants and all things upon it (Merriam-Webster, 2016).

Non-Empirical World = The earth with its inhabitants and all things upon it, not subject to verification by observation or experiment.

- Non = Not (Merriam-Webster, 2016).
- Empirical = Subject to verification by observation or experiment (Merriam-Webster, 2016).
- World = The earth with its inhabitants and all things upon it (Merriam-Webster, 2016).

Life Essence = The State of an organism characterized especially by capacity for metabolism, growth, reaction to stimuli, and reproduction. It's fundamental nature or quality. (see Originating Life)

- Life = State of an organism characterized especially by capacity for metabolism, growth, reaction to stimuli, and reproduction (Merriam-Webster, 2016).
- Essence = Fundamental nature or quality (Merriam-Webster, 2016).

Originating Life = That which gives rise to the quality that distinguishes a vital and functional being from a dead body or inanimate matter. (See Life Essence)

- Originating = To give rise to (Merriam-Webster, 2016).
- Life = The quality that distinguishes a vital and functional being from a dead body or inanimate matter (Merriam-Webster, 2016).

Pleasurable Biological Nature = A pleasant response relating to, or produced by biology, or life and living processes of the natural scenery.

- Pleasurable = Pleasant (Merriam-Webster, 2016).

- Biological = Relating to, or produced by biology, or life and living processes (Merriam-Webster, 2016).

- Nature = Natural scenery (Merriam-Webster, 2016).

Unconditional Love = Unselfish, loyal, and benevolent concern for others, not limited in any way.

- Unconditional = Not limited in any way (Merriam-Webster, 2016).

- Love = Unselfish, loyal, and benevolent concern for others (Merriam-Webster, 2016).

Existing Theories

Currently there are three commonly accepted theories that suggest how nature may restore human beings. They are Psycho-evolutionary Theory, Attention Restoration Theory, and The Biophilia Hypothesis. While it is fundamental to understand their underpinnings, considering the numerous papers and books that have already been written about these theories, the following existing theory discussion will be in summary format.

Theory #1, Psycho-evolutionary Theory. It has been recognized for some time that chronic stress can have a profound negative effect on human health (Larzelere & Jones, 2008). In 1983, Ulrich put forth a "Psycho-evolutionary" framework around which to explore the effects of nature on human beings and recovery from stress. As an evolutionary survival mechanism, according to Ulrich nature may have a greater restorative impact than urban environments (Ulrich, 1981) (Ulrich, 1983). Ulrich suggests that upon interacting with nature, an immediate, unconscious response is generated prior to the first conscious thought, and that this reaction is cross-cultural, implying that the response is inherited and genetically based. Ulrich elaborated on his earlier paper by clearly stating, "Accordingly modern humans might have a biologically prepared readiness to quickly and readily acquire restorative responses with respect to many unthreatening natural settings but have no such preparedness for most urban or built contents and configurations." (Ulrich et al., 1991). To test this hypothesis, Ulrich subjected 120 individuals to a stressor, in this case a rather stressful movie, and then to videos of either a nature-based setting or an urban setting. Using a wide range of stress recovery indicators such as self-rating, heart rate, muscle tension, skin electrical conductance, and pulse transit time (the amount of time it takes for a pulse pressure wave to travel from the aortic valve to the periphery of the body), they found these indicators to be consistent in indicating positive restorative effects from stress after viewing compatible nature versus urban environments. They concluded, "The results strongly support the conclusion that recuperation was faster and more complete when subjects were exposed to the natural settings rather than the various urban environments" (Id.). More recently, Ulrich's theory has taken on the moniker of "SRT, Stress Reduction Theory". Numerous studies including several meta-analysis findings have generally supported the theory of stress reduction from exposure to natural settings. (Berto, 2014) (Frumkin et al., 2017) (Yao et al., 2021) (Gaekwad et al., 2023).

Theory #2, Attention Restoration Theory. The underpinnings of this theory can be found in the idea of natural biological environments and their apparent effect in improving recovery from a particular type of mental fatigue called "directed attention" (Kaplan & Kaplan, 1989) (Kaplan, 1995). This form of mental effort, if continuous and not rested, can lead to fatigue for that part of the mind/brain which can negatively impact one's cognition and ability to function and in turn hamper our thought process, actions, perceptions, and feelings. It appears Nature can be quite effective when it comes to allowing the mind to disengage from directed attention effort and switch to the non-effort part of cognition, called involuntary attention. This shift in thinking allows directed attention to rest and recharge, which in turn improves one's

sense of well-being. Specifically, ART consists of four elements of the restorative experience in natural settings. They are "Being Away," "Extent," "Compatibility" and "Fascination" (Kaplan, 1995). Accordingly, "being away" is the idea of being away in nature, which affords the possibility of turning off or slowing down the use of directed attention, thus enabling that part of the mind to rest. Second, the "extent" of nature experiences must include several levels of complexity, of which they must be coherent, easy to understand and engaging. Third, nature experiences must be "compatible" so that the individual feels comfortable with that experience. And lastly "fascination," which generates effortless attention and requires little or no effort, to function.

Theory #3, The Biophilia Hypothesis. The term biophilia, first introduced by Eric Fromm, defined it as, "The passionate love of life and of all that is alive" (Fromm, 1973). E.O. Wilson fine-tuned the term Biophilia to read, "The object of the reflection can be summarized by a single word, biophilia, which I will be so bold as to define as the innate tendency to focus on life and lifelike processes" (Wilson, 1984). What's important to recognize here, is Wilson's introduction of the idea that humans respond positively to biological nature out of an "innate" relationship with life's essence, not as object. While this innate relationship between humans and biological nature could be nothing more than evolution, the use of the word "innate" suggests the delicate introduction of a connection with what RRR calls pleasurable biological nature, and what might be a doorway into the non-empirical universe's role in human restoration. This could be thought of as a fundamental difference between Biophilia and the prior two theories. Stephen Kellert in concert with Wilson no longer walked quite so gingerly around the subject, and placed both their feet squarely in the non-empirical world when they refined the definition of Biophilia to include the discussion of spirituality. "The biophilia hypothesis proclaims a human dependence on nature that extends far beyond the simple issues of material and physical sustenance to encompass as well the human craving for aesthetics, intellectual, cognitive, and even spiritual meaning and satisfaction" (Kellert & Wilson, 1993). While not specifically a subject of this paper, it's important to acknowledge the parallel theory of Biophobia. "The concept of Biophobia is thought to entail both our innate physiological responses to the perceived danger from non-human threats such as spiders and snakes and our cultural attachment to material comfort" (Patuano, 2020). It is with Biophobia in mind that RRR developed the term and definition of pleasurable biological nature to distinguish between the two.

Psycho-evolutionary Theory and Attention Restoration Theory have provided frameworks for scientific studies in pursuit of better understanding how compatible biological nature may restore human beings' mental and physical well-being and improve associated health outcomes (Joye & Van de Berg, 2011) (Basu et al., 2019). However, both theories do not address the role of the invisible, non-empirical, spiritual world and its impact on well-being and health outcomes. The Biophilia Hypothesis on the other hand, begins to explore just that. "Our labors will have been successful if we legitimatize and stimulate future inquiry into this critical element of the human condition" (Kellert & Wilson, 1993, p. 21). The RRR Hypothesis is a direct response to this "future inquiry". As of today, it is very difficult to scientifically study the role of the non-empirical world in human healing and restoration via pleasurable biological nature and unconditional love. Alan Lightman, speaking at MIT said,

> "I think both the sciences and the humanities are seeking understanding and truth, but those truths are different in my view. In science the truth is the external, inanimate, disembodied world of atoms and stars and neurons. In the humanities the truth ultimately lies in human beings, our nature, our society, values motivations, and actions. These are profound differences…"

(YouTube, 2014).

Discussions concerning the non-empirical world and human well-being are not new. Accepting for the moment, the non-empirical world is related to originating life, consider Plato.

> "But our king Zalmoxis,' who is a god, says that just as one should not attempt to cure the eyes apart from the head, nor the head apart from the body, so one should not attempt to cure the body apart from the soul. And this, he says, is the very reason why most diseases are beyond the Greek doctors, that they do not pay attention to the whole as they ought to do, for if the whole is not in good condition, it is impossible that the part should be" (Cooper & Hutchinson, 1997, p. 643).

RRR suggests the non-empirical world of originating life does play a role in human well-being and could be the missing leg of the three-legged, mind-body-spirit stool of which Plato spoke. And provides a potential framework around which to systematically explore the non-empirical world of originating life and, its role in healing human loneliness.

RRR Hypothesis, Step One: Rest

"I sit on my favorite rock, looking over the brook, to take time away from busyness, time to be … it's something we all need for our spiritual health" (L'Engle, 2016).

REST is the phase of RRR when we interact with the empirical world of pleasurable biological nature, and in so doing, we quiet down our brain/mind, we reside in the moment, and behold the essence of the moment, or life itself. The active brain/mind, with its incessant chatter, focused on everything and anything except the very moment at hand, is what Eckhart Tolle calls, "The Thinker" (Tolle, 1999). According to Tolle, we quiet down The Thinker, we become The Observer, and as The Observer we awaken (id).

Engagement with pleasurable biological nature can be achieved in many ways. We can actively hike up a mountain or take a leisurely stroll along the ocean shore. We can passively sit in a comfy chair and look out the window at a bright red cardinal, or we can simply inhale the smell of the freshly cut flowers sitting in a vase on a table.

In how Rest works, RRR suggests resting in pleasurable biological nature is like the psychological and physiological practice of mindfulness. (Van Gordon et al., 2018). It appears both practices slow down thinking and assist in keeping the brain/mind out of the past and the future, which in turn allows the individual to focus solely on the essence at hand. Kabat-Zinn describes meditation as "The awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment" (Kabat-Zinn, 2003). The practice of mindfulness appears to correlate well with resting in pleasurable biological nature. There is a significant amount of supporting evidence. For example, "Results revealed that mindfulness significantly mediated the association between connection to nature and psychological well-being" (Huynh & Torquati, 2019), a Meta-analysis, "Across studies there is a significant association between connection to nature and mindfulness" (Schutte & Malouff, 2018) and "Research has also shown that mindfulness mediates the relationship between nature connectedness and wellbeing" (Van Gordon et al., 2018).

This act of resting the brain/mind does not mean the mind/brain turns off and goes to sleep. On the contrary, it remains quite active, only in different regions. The meditative practice of mindfulness generates significant psychological and physiological changes such as reduction in respiratory rate, resting heart rate, lower oxygen consumption and a feeling of well-being. (Wallace, 1971) (Benson, 1974). Similarly, the practice of incorporating pleasurable biological nature

using imagery and mindful meditation have been visualized using functional magnetic resonance imaging, fMRI (Guleria, 2013) (Lazar, 2000). This technology is well on its way to providing strong empirical evidence that mindful meditation provides a similar physiological response as experiencing pleasurable biological nature. (Tanga, et al., 2017).

In summary, having rested in pleasurable biological nature, having quieted down The Thinker, we become The Observer, and we awaken. Awakened, the stage for Step Two has now been set. The personal journey of engaging with the non-empirical world has begun, whether we are consciously aware or not.

Step Two: Reconnect

"The beginning of freedom is the realization that you are not the possessing entity - the thinker. Knowing this enables you to observe the entity. The moment you start watching the thinker a higher level of consciousness becomes activated. You then begin to realize that there is a vast realm of intelligence beyond thought, that thought is only a tiny aspect of that intelligence. You also realize that all the things that truly matter beauty, love, creativity, joy, inner peace, arise from beyond the mind. You begin to awaken" (Tolle, 1999).

Having awakened RRR suggests we reconnect with our own life essence, which is born of, comes from, and is part of what RRR defines as originating life. Step Two hypothesizes, reconnected to our own life essence we automatically reconnect with originating life. It is here the individual has awakened to something greater than self, something greater than the empirical world of knowledge. Step Two suggests pleasurable biological nature is a conduit through which human beings of the empirical world, can reconnect with originating life of the non-empirical world. Fortunately, or unfortunately, the question what is originating life, or what even is Life, are questions that have been discussed and debated for as long as humans have been able to communicate, and as of today, science still does not have the answers (Pross, 2016). As Madeleine L'Engle wrote;

> "This questioning of the meaning of being, and dying, and being, is behind the telling of stories around tribal fires at night, behind the drawing of animals on the walls of caves, the singing of melodies of love in the spring, and the death of green in autumn..." (L'Engle, 1980, p. 13).

Lao Tsu, who is reported to have authored the Tao Te Ching in the sixth century BC, attempted to answer these questions in verse number one.

> "The Tao that can be told is not the eternal Tao. The name that can be named is not the eternal name. The nameless is the beginning of heaven and earth. The named is the mother of 10,000 things. Ever desire less, one can see the mystery. Ever desiring, one can see the manifestations. These two spring from the same source but differ in name. This appears as darkness. Darkness within darkness. The gate to all mystery" (Feng & English, 1972).

Albert Einstein tried to define originating life, by asking himself the question, what motivated humans beings to search for an answer to these profound questions? Turning to religion, he identified three elements of motivation. The first one was fear, fear of running out of survival basics such as food or water. The second motivation was the desire for moral guidance in communities. The third motivational element he termed, "cosmic religious sense" a motivation he recognized as "... hard to make clear to those who do not experience it" (Einstein, 1930).

Similarly, Carl Jung alluded to originating life as "the collective unconsciousness". He wrote,

> "My thesis, then, is as follows: in addition to our immediate consciousness, which is of a thoroughly personal nature and which we believe

to be the only empirical psyche, there exists a second psychic system of a collective, universal, and impersonal nature which is identical in all individuals" (Jung, 2014).

Fast forward to today and the world of "hard" science. Quantum Mechanics is studying the mystery of how one particle can be in two separate places at the exact same time, until when observed, the two points merge and become one. "…the quantum connection between two particles can persist even if they are on opposite sides of the universe" (Greene, 2004). Physicists continue to search for a theory that unites all four forces of nature. It is often referred to as the "Theory of Everything" (Nicolaides, 2020). Particle Physicists using the Hadron Collider continue to search for the smallest particle that exists, to better understand how the Universe and Life began. In 2022 it was reported, "…the Large Hadron Collider (LHC) has observed three never-before-seen particles: a new kind of pentaquark and the first-ever pair of tetraquarks which includes a new type of tetraquark" (Karliner & Rosner, 2022). The search continues. Astrophysicists report all matter in the universe empirically known to exist, is estimated to make up only +/- 5% of the known universe and that the remaining +/-95% is made up of what they call Dark Matter and Dark Energy. And while most scientists agree Dark Matter and Dark Energy has been verified based on mathematics by studying the "bending of starlight via gravity" (Arun et al., 2017), they do not know what 95% of the universe is. Astronomers using the J.W. Webb Space Telescope recently discovered six new galaxies too large and residing too close to the "beginning of the Universe, the Big Bang," to conform with the Big Bang Theory (Pitkänen, 2023). It appears the beginning of the universe is not what science thought it was. And let's not forget molecular biology and chemistry and their pursuit of understanding what life is and where life came from. They still don't know (Das, 2021). In fact, it seems as if the most recent scientific findings only deepen the mystery of originating life and the universe.

Putting all of this together, Step Two suggests, having rested in pleasurable biological nature, and having transitioned from the thinker to the observer, we have reconnected to our life's essence. Reconnected to our life's essence, we automatically have reconnected with Lao Tsu's mystery of originating life, Einstein's cosmic religious belief and his "spooky" physics of quantum mechanics, Jung's collective unconscious, Physicists smallest particle that exists, Astrophysicists and 95% of the unknown universe, or what was there before the Big Bang. No one knows for sure. Still, they all can say there is something. We just don't know what it is. For RRR, that something, that mystery, is called originating life. Reconnected with originating life of both the empirical world (our essence) and non-empirical world (originating life) we are now ready to be restored.

Step Three: Restore

"Those who dwell, as scientists or laymen, among the beauties and mysteries of the earth are never alone or weary of life" (Carson, 1998).

According to Terry Hartig, to establish a restoration hypothesis in the world of science, something in need of restoration needs to be identified. "First, a theory must specify some condition from which a person becomes restored" (Hartig, 2004). The three previous three theories focus on stress reduction (Ulrich, 1981, 1983, 1991), restoration of a fatigued mind (Kaplan & Kaplan, 1989) (Kaplan, 1995), and an affinity with life as being fundamental to our wellbeing (Wilson, 1984) (Kellert & Wilson, 1993). Step three suggests restoration from loneliness, not solitude which is considered a positive experience, is what is in need of restoration and is missing in the previous three theories. As Hawkley and Cacioppo stated "Our research on loneliness suggests this may be an important oversight." (Hawkley & Cacioppo, 2003)

Loneliness is clearly more than just an unhealthy feeling (Holt-Lunstad et al., 2010). The 19th Surgeon

General, Vivak Murthy defines loneliness as including several subcategories. They are "intimate loneliness" which refers to personal relationships, "social loneliness" which refers to social support, and "collective loneliness" which refers to a sense of purpose and belonging (Murthy, 2020). Murthy came to understand and believe that while opioids, obesity, diabetes, stress, and heart disease were often mentioned as serious health problems, something else, something far more fundamental and universal perhaps even shared by all these health problems, was involved.

> "But one recurring topic was different. It was not a frontline complaint. It was not even identified directly as a health ailment. Loneliness ran like a dark thread through many of the more obvious issues that people brought to my attention, like addiction, violence, anxiety, and depression" (id.).

Today loneliness is often referred to as a "worldwide epidemic" (Jeste et al., 2020). Whether or not Loneliness has reached the level of an "epidemic" is debatable (Buecker et al., 2021). The point of this paper is not to make that determination. What does not appear to be debatable is the harmful effect loneliness has on human well-being, mortality, patient recovery, and overall happiness (Rico-Uribe et al., 2018) (Sharma et al., 2020) (Waldinger & Schultz, 2023).

Metaphorically speaking, loneliness could be thought of as a hole in one's heart, or as Plato said, "It's because, as I said, we used to be complete wholes in our original nature, and now "Love" is the name for our pursuit of wholeness, for our desire to be complete" (Cooper & Hutchinson, 1997, p. 476). Step Three suggests, to be loved unconditionally, for who you are just the way you are, no strings attached, could be thought of as an effective non-pharmacological medicine for healing loneliness and restoring that hole in one's heart.

What is unconditional love? Philosophically speaking, it could be said unconditional love takes root in Aristotelian virtue, moral ethics. This ethic alludes to unconditional love as a giving of oneself and asking for nothing in return (Enright et al., 2022). This form of love is called agape. "Agape is a moral virtue in which a person willingly and unconditionally offers goodness, at the cost to the giver, to another or others in need" (id., p.222). Having reconnected in Step Two with our own life's essence and that of Originating Life, Step Three suggests we experience Originating Life of the non-empirical plain and empirical plain, as unconditional love as only Originating Life is capable. Whereas humans being what they are, human, can only practice and strive for such an ethic.

Carl Rogers, an American psychologist and one of the founders of the humanistic approach in psychology, is credited with a psychotherapy method known as client-centered therapy. In Roger's theory, one begins to gain a glimpse of the difference between conditional and unconditional love. Rogers believed that a single force of life built into every human instinctively places a high value on love, affection, and nurturing. Rogers also believed it was society that introduced the notion of conditional love, not originating life. That is, receiving love, affection or nurturing only if we do what we are supposed to do (Boeree, 1998, 2006). Erich Fromm, another prominent psychologist, sociologist, and humanistic philosopher agreed. He wrote, "Unconditional love corresponds to one of the deepest longings, not only of the child, but of every human being; on the other hand, to be loved because of one's merit, because one deserves it, always leaves doubt" (Fromm, 2006).

Scientifically speaking, beginning in the 1970's, Dr. Dean Ornish began studying heart disease and exploring what happened when you combined "lifestyle interventions" such as exercise, diet, and meditation to reverse heart disease without drugs or surgery. Coincidentally, or not, he called this program, "The Opening Your Heart Program" (Ornish, 1990). Throughout his work, chronic stress (versus acute stress) was often associated with poor

health. He wondered why some people developed heart disease while others did not. During this work with groups of people, he began to suspect there was another underlying reason, isolation.

> "Over time, I began to realize that the group support itself was one of the most powerful interventions, as it addressed what I am beginning to believe is a more fundamental cause of why we feel stressed and, in turn, why we get illnesses like heart disease: the perception of isolation" (id., p.87).

Beginning in the early 2000's, there has been a robust scientific focus on the effects of loneliness and humankind. Drawing upon the meta-analysis as one of the more thorough forms of scientific study, one such analysis reported, "Individuals with adequate social relationships have a 50% greater chance of survival when compared to those with poor or insufficient social relationship." This analysis summarized the negative health impact of loneliness as being equal to smoking up to fifteen cigarettes per day. (Hold-Lunstad et al., 2010). A 2015 meta-analysis suggested social connections were related to mortality. "Substantial evidence now indicates that individuals lacking social connections, (both objective and subjective social isolation) are at risk for premature mortality" (Holt-Lunstad et al., 2015).

A 2017 meta-analysis studied several compassion-based (a form of unconditional love) interventions and their effect on health outcomes, specifically depression, anxiety, psychological distress, and well-being. They reported, "Significant moderate effects were found for reducing suffering-based outcomes of depression, anxiety, and psychological distress" and "Significant moderate effects were also found for well-being" (Kirby et al., 2017). And several other meta-analyses (Park et al., 2020), (Sharma et al., 2020), (Vila, 2021), indicate strong links between human health, wellbeing and loneliness.

More recently, Robert Waldinger, along with his coauthor Marc Schulz, wrote a book titled, "The Good Life. Lessons From The World's Longest Scientific Study Of Happiness" (Waldinger, & Schultz, 2023). In it they summarized the findings of the world's longest running (80 years) scientific study of happiness by tracking "two generations of individuals from the same families of people for more than eighty years" (id.). Consistent with all the previously mentioned studies, they concluded, "The part that surprised us was that the people who are happiest, who stayed healthiest and who lived the longest were the people who had the warmest connections with other people" (id.).

Pleasurable biological nature is not a pill or procedure and could be thought of as a living, delivery system, connecting the empirical world of human beings with the non-empirical world of originating life, all of which is experienced as unconditional love. Experiencing unconditional love, we are no longer alone, no longer judged, no longer do we feel like deep down inside there is something wrong with us. Instead, we are accepted just the way we are, for who we are, as is, no questions asked. Being loved unconditionally, our loneliness for that moment in time melts away, the hole in our heart is filled and we are restored. As Charles Lewis said, "Plants are nonjudgmental, nonthreatening, and nondiscriminating" and, "It does not matter whether one is black or white, has been to kindergarten or college, is poor or wealthy, healthy or ill" (Lewis, 1966).

Challenges

It is important to acknowledge three fundamental challenges to the RRR Hypothesis. First, the mystery of originating life is just that, a mystery. As of today, science cannot confirm or deny its existence. There simply is no direct scientific evidence of what exactly originating life is. Second, while understandable, RRR recognizes it can be very difficult for the "hard sciences" such as physics, cosmology, biology, and chemistry to

work alongside and incorporate the so called "soft sciences," such as philosophy, anthropology, psychology and sociology (Shapin, 2022). Getting these culturally segregated (and for good reasons) silos of knowledge to work together is a real challenge. Third, RRR recognizes separating pleasurable biological nature from unpleasurable biological nature could be considered an unscientific sleight of hand. The question of how nature can cause so much harm, so much pain, and yet at the same time be the delivery system of unconditional love, is philosophically a challenging idea in need of further exploration and clarification.

Conclusion

Regarding Psycho-evolutionary Theory, why are we so stressed in the first place? Regarding Attention Restoration Theory, why are our minds so fatigued? And regarding Biophilia Hypothesis, why do we feel the need to love life, engage it, connect with it? RRR suggests one possible answer to all these questions might be found in the notion of human beings disconnect from their very own life essence and therefore, originating life and that this disconnect is experienced as chronic loneliness which results in a slow, methodical chipping away of our mind, body, spirit, via chronic stress and overly worked mind/brains. RRR puts forth the idea that one may be able to find restoration from loneliness by accessing unconditional love by entering a relationship with pleasurable biological nature. As a result, RRR hypothesizes by doing so, we humans may be better able to manage stress and to protect our mind/brains from chronic fatigue, and fill the "hole" in our hearts, when we reconnect with our life essence and originating life which is unconditional love.

The totality of evidence suggesting the negative health effects of loneliness is strong (Park et al. 2018). The evidence demonstrating the positive health effects of biological nature is strong (Ulrich et al., 2008). The evidence generated from touch therapy suggesting life needs to be loved (which can only come from another life) to thrive is strong (Packheiser, et al. 2023) (Whitley, & Rich, 2008) (Leder, & Krucoff, 2007). The question, however, remains. How does internally and externally sourced unconditional love, what could be thought of as non-pharmacological medicine, morph into internalized Psychophysiological effects that positively influence our loneliness and our well-being?

E.O. Wilson suggests the answer to these questions may lie somewhere other than the scientific world when he says, "…whereas art and science are basically different in execution, they are convergent in what they might eventually discover about human nature" (Wilson, 1984). And there are other theories, which appear to be making a comeback, suggesting much the same, such as, Panpsychism (Goff, 2017), Biocentrism (Botar, 2017), and Metaphysics, (Van Inwagen, 2018). And while a direct connection between originating life, biological nature, unconditional love and their effects on loneliness, have not been well studied, some of the latest research using brain imaging, immune response, stress hormones, and even gene expression, indicate this could be the case (Cacioppo & Patrick, 2008).

Rest, Reconnect, Restore Hypothesis could someday serve as a unifying theory compatible with Psycho-evolutionary Theory, Attention Restoration Theory and Biophilia Hypothesis as well as for explaining how Pleasurable Biological Nature restores the human condition of loneliness. It could be said, to be loved unconditionally is a universal human need. As Murthy says, "The irony is that the antidote to loneliness, human connection, is also a universal connection" (Murthy, 2020). Someday science may have answers to these questions. However, until that point in time, is it so hard to accept The Mystery as a reasonable hypothesis when it comes to RRR, and the potential role it could play in our lives, in our well-being? As Coleridge identified when discussing poetry "…that willing suspension of disbelief for the moment, which constitutes poetic faith" (Leitch, 2010). Might this be a prerequisite

leap of faith the world of science might consider in its epistemological approach to knowledge? As Nobel Laureate, Dr. Gerald M. Edelman wrote, "The position I have taken is that the naturalization of epistemology must account not only for scientific truth, but also for the biological origins in human thought and consciousness of the various other forms of truth (Edelman, 2006).

RRR could provide a framework around which humans can learn what love is and how to love all life. As Murthy said, "Loneliness and building a more connected future, is an urgent mission that we can and must tackle together" (Murthy, 2020). To be loved and to love could be the single highest calling of humanity. With it, the human species thrives. Without it, the human species might only survive. Perhaps it is in recognizing unconditional love expressed to all via pleasurable biological nature that we could have a framework around which to redefine what home, family, community, country, and even the world means. A "culture of social support" (Vila, 2021), so that, at our core, our very essence, we recognize we are all the same. We are all in search of the same, to be loved unconditionally. It is hoped that the RRR Hypothesis will evolve into a theory that will encourage future research based on its hypothetical framework into studying the subjects of pleasurable biological nature, life's essence, love, unconditional love, and their interconnectedness with restoring the human condition of loneliness and by extension, our interconnectedness with each other, with the world and our planet. In the end, RRR, its manifestation and our metamorphosis, is a personal journey of which Joseph Campbell calls, "the hero's journey" (Flowers, (Ed.), 1988).

Future Research

Better understanding the fundamental human need to be loved unconditionally, could provide invaluable information and a road map for our restoration as a species and as a planet. It is recognized numerous variables exist and identifying any cause-and-effect correlation between pleasurable biological nature, life's essence, originating life, unconditional love and loneliness is a very real challenge. RRR Hypothesis provides one possible framework around which to conduct future research based on combining two approaches. Approach number one resides in the scientific world of "hard" empirical scientific evidence and approach number two resides in the spiritual world of "soft" empirical scientific evidence.

Based on the concept of homeostasis, one approach suggests gathering empirically measurable (hard) scientific evidence focused on the Sympathetic and Parasympathetic Nervous Systems (Autonomic Nervous Systems), physiological responses when chronically lonely humans are exposed to expressions of life and pleasurable biological nature via living plant material versus non-living plant material (that appears alive), or no plant material at all. Data points to measure these therapeutic mechanisms might include blood pressure, heart rate, heart rate recovery time, heart rate variability, respiration rate, systolic and diastolic blood pressure, peripheral and cerebral oxygen saturation, increased salivary cortisol to name but a few. The other approach suggests gathering empirically measurable (soft) scientific evidence focused on the spiritual psychophysiological qualities experienced when chronically lonely humans are exposed to expressions of life via pleasurable biological nature and those mechanisms that are therapeutic such as feelings of awe, peace, non-judgmental acceptance, love and a deep unconditional connectedness with the ineffable.

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References

Arun, K., Gudennavar, S. B., & Sivaram, C. (2017). Dark matter, dark energy, and alternate models: A review. *Advances in Space Research, 60*(1), pp. 166-186.

Basu, A., Duvall, J., & Kaplan, R. (2019). Attention restoration theory: Exploring the role of soft fascination and mental bandwidth. *Environment and Behavior, 51*(9-10), 1055-1081.

Beil, K., (2021). Nature therapy: Part one: Evidence for the healing power of contact with nature. *Journal of Restorative Medicine*, (11)1.

Benson, H., Beary, J., & Carol, M. (1974). The relaxation response. *Psychiatry, 37*(1), 37-46.

Berto, R., (2014). The role of nature in coping with psycho-physiological stress: a literature review on restorativeness. *Behavioral Sciences, 4*(4), 394-409.

Boeree, C. G., (1998, 2006). Carl Rogers, 1902-1987.

Botar, O. A., (2017). Defining biocentrism. *Biocentrism and Modernism*, 15-45.

Buecker, S., Mund, M., Chwastek, S., Sostmann, M., & Luhmann, M. (2021). Is loneliness in emerging adults increasing over time? A preregistered cross-temporal meta-analysis and systematic review. *Psychological Bulletin, 147*(8), 787.

Cacioppo, J. T., & Patrick, W. (2008). *Loneliness: Human nature and the need for social connection*. WW Norton & Company.

Carson, R. (1956, 1998). *The sense of wonder*. Introduction by Linda Lear. Photographs by Nick Kelsh. HarperCollins Publishers.

Cooper, J. M., & Hutchinson, D. S. (Eds.). (1997). *Plato: complete works*. Hackett Publishing.

Das, S. (2021). Our universe: The known, unknown, and some speculations. *Selected Progresses in Modern Physics: Proceedings of TiMP 2021* (pp. 251-256).

Edelman, G. M. (2006) *Second Nature: Brain science and human knowledge*. Yale University Press. pp. 73-74

Einstein, A. (1930). *Albert Einstein on Religion and Science*: New York Times Magazine. Pp. 1-4.

Enright, R., Xu, J., Rapp, H., et al. (2022) The Philosophy and Social Science of Agapa Love. *Journal of Theoretical and Philosophical Psychology*. Vol. 42. No. 4. 220-237.

Feng, G. F., & English, J. (1972). *Tao te Ching: a new translation by Gia-fu Feng and Jane English*. Vintage Books a Division of Random House.

Flowers, B. S. (Ed.), (1988). *Joseph Campbell The Power of Myth* with Bill Moyers. Doubleday.

Fromm, E. (1973). *The anatomy of human destructiveness*. Holt, Rinehart, Winston. p.406.

Fromm, E. (2006). *The art of loving* (2nd ed.). Harper Perennial Modern Classics. (Original work published 1956). Pp. 39.

Frumkin, H., Bratman, G. N., Breslow, S. J., Cochran, B., Kahn Jr, P. H., Lawler, J. J., Levin, P. S., Tandon, Varanasi, U., Wolf, K. L., & Wood, S. A. (2017). *Nature contact and human health: A research agenda. Environmental Health Perspectives, 125*(7), 075001.

Gaekwad, J. S., Moslehian, A. S., & Roös, P. B. (2023). A meta-analysis of physiological stress responses to natural environments: Biophilia and Stress Recovery Theory perspectives. *Journal of Environmental Psychology*, 102085.

Goff, P. (2017). The case for panpsychism. *Philosophy Now*, 121, 6-8.

Greene, B., (2004). The Fabric of the Cosmos. Space, time and the texture of reality. Vintage Books.

Guleria, A., Kumar, U., Kishan, S. S. K., & Khetrapal, C. L. (2013). Effect of "SOHAM" meditation on the human brain: an fMRI study. *Psychiatry Research: Neuroimaging*, 214(3), 462-465.

Hartig, T. (2004). Restorative Environments. *Encyclopedia of Applied Psychology*, 3, 273-279.

Hawkley, L.C., Cacioppo, J.T., (2003). Loneliness and pathways to disease. *Brain, Behavior and Immunity*, 17 S98-S105.

Holt-Lunstad, J., Smith, T. B., Baker, M., Harris, T., & Stephenson, D. (2015). Loneliness and social isolation as risk factors for mortality: a meta-analytic review. *Perspectives on Psychological Science*, 10(2), 227-237.

Holt-Lunstad, J., Smith, T. B., & Layton, J. B. (2010). Social relationships and mortality risk: a meta-analytic review. *PLoS Medicine*, 7(7), e1000316.

Howell, A., Dopko, R., Passmore, H., (2011) Nature connectedness: Associations with well-being and mindfulness. *Journal of Personalities and Individual Differences*. Vol. 51, Issue 2. Pp 166-171.

Huynh, T., & Torquati, J. C. (2019). Examining connection to nature and mindfulness at promoting psychological well-being. *Journal of Environmental Psychology, 66*, 101370.

Jeste, D. V., Lee, E. E., & Cacioppo, S. (2020). Battling the modern behavioral epidemic of loneliness: suggestions for research and interventions. *JAMA Psychiatry*, 77(6), 553-554.

Joye, Y., & Van den Berg, A. (2011). Is love for green in our genes? A critical analysis of evolutionary assumptions in restorative environments research. *Urban Forestry & Urban Greening*, 10(4), 261-268.

Jung, C. G. (1959). *The archetypes and the collective unconscious*. (2nd Ed 1968). Princeton University Press. p. 43.

Kabat-Zinn, J. (2003). Mindfulness-based interventions in context: Past, present, and future. *Clinical Psychology: Science and Practice*, 10(2), 144–156. https://doi.org/10.1093/clipsy.bpg016

Kaplan, R. & Kaplan, S. (1989). *The experience of biological nature: A psychological perspective*. Cambridge University Press.

Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology*, 15(3), 169-182. 15(3), 169-182).

Karliner, M., & Rosner, J. L. (2022). New strange pentaquarks. Physical Review D, 106(3), 036024. *Physical Review D*, 106(3), 036024.

Kellert, S., & Wilson, E. O., (1993). The biophilia hypothesis. Island Press. Pp. 20.

Kirby, J. N., Tellegen, C. L., Steindl, S. R., (2017). A Meta-analysis of compassion-based interventions: Current state of knowledge and future directions. *Behavior Therapy*, 48, (6) 778-792

Larzelere, M. M., & Jones, G. N. (2008). Stress and health. *Primary Care: Clinics in Office Practice*, 35(4), 839-856.

Lazar, S. W., Bush, G., Gollub, R. L., Fricchione, G. L., Khalsa, G., & Benson, H. (2000). Functional brain mapping of the relaxation response and meditation. *Neuroreport*, 11(7), 1581-1585.).

Leder, D., & Krucoff, M. W. (2008). The touch that heals: the uses and meanings of touch in the clinical encounter. *The Journal of Alternative and Complementary Medicine*, 14(3), 321-327.

Leitch, V. B., & Cain, W. E. (Eds.). (2010). *The Norton anthology of theory and criticism*. WW Norton & Company.

L'Engle, M. (2016). Walking on Water: Reflections on Faith and Art. Convergent Books. Pp. 12.

Lewis, C. A. (1996). Green Nature/Human Nature: the meaning of plants in our lives. University of Illinois press. p. 66, p. 134.

McMahan, E. & Estes, D. (2015). The effect of contact with natural environments on positive and negative affect: A meta-analysis. *The Journal of Positive Psychology*, 10(6), 507-519, p. 516).

Merriam-Webster (2016). *The Merriam-Webster Dictionary New Edition*. Merriam-Webster Incorporated.

Murthy, V. (2020). *Together: The Healing Power of Human Connection in a Sometimes Lonely World*. HarperCollins. p.8.

Nicolaides, D. (2020). *In search of a theory of everything: The philosophy behind physics*. Oxford University Press.

Ornish, D. (1990). *Dr. Dean Ornish's Program for Reversing Heart Disease, The only system scientifically proven to reverse heart disease without drugs or surgery*. Ballantine Books, Inc. p. 87.

Packheiser, J., Hartmann, H., Fredriksen, K., Gazzola, V., Keysers, C., & Michon, F. (2023). The physical and mental health benefits of touch interventions: A comparative systematic review and multivariate meta-analysis. *medRxiv*, 2023-06.

Park, C., Majeed, A., Gill, H., Tamura, J., Ho, R. C., Mansur, R. B., Nasar, F., Lee, Y., Rosenblat, J. D., Wong, E., McIntyre, R. S. (2020). The effect of loneliness on distinct health outcomes: a comprehensive review and meta-analysis. *Psychiatry Research*, 294, 113514.

Patuano, A. (2020). Biophobia and urban restorativeness. *Sustainability*, 12(10), 4312.

Pitkänen, M. (2023). TGD view of the paradoxical findings of the James Webb telescope.

Pross, A. (2016). What is life? How chemistry becomes biology. Oxford University Press

Rico-Uribe, L. A., Caballero, F. F., Martín-María, N., Cabello, M., Ayuso-Mateos, J. L., Miret, M., (2018) Association of loneliness with all-cause mortality: A meta-analysis. *PLoS ONE* 13(1): e0190033.

Shapin, S. (2022). Hard science, soft science: A political history of a disciplinary array. *History of Science*, 60(3), 287-328.

Sharma, A., Pillai, D. R., Lu, M., Doolan, C., Leal, J., Kim, J., & Hollis, A. (2020). Impact of isolation precautions on quality of life: a meta-analysis. *Journal of Hospital Infection*, 105(1), 35-42.

Schutte, N. S., & Malouff, J. M. (2018). Mindfulness and connectedness to nature: A meta-analytic investigation. *Personality and Individual Differences*, 127, 10-14.

Tang, I. C., Tsai, Y. P., Lin, Y. J., Chen, J. H., Hsieh, C. H., Hung, S. H., Sullivan, W. C., Tang, H. F., Chang, C. Y. (2017). Using functional Magnetic Resonance Imaging (fMRI) to analyze brain region activity when viewing landscapes. *Landscape and Urban Planning*, 162, 137-144.

Tolle, E. (1999). Practicing the power of now. Essential teachings, meditations, and exercises from the power of now. New Library, California. p. 18.

Tolstoy, L., (2022). *What is art?* (Maude, A., Translated) Ancient Crow Press. (Original Russian edition 1898). First published in United States 1904.

Ulrich, R. (1981). Natural Versus Urban Scenes: Some Psychophysiological Effects. *Environment and Behavior.* 13, 523-556

Ulrich, R. (1983). Aesthetic and Affective Response to Natural Environment. *Behavior and the Natural Environment.* (pp. 85-125).

Ulrich, R., Simons, R., Losito, B., Fiorito, E., Miles, M., & Zelson, M. (1991). Stress recovery during exposure to natural and urban environments. *Journal of Environmental Psychology*. 11(3), 201-230.

Ulrich, R. S., Zimring, C., Zhu, X., DuBose, J., Seo, H. B., Choi, Y. S., Quan, X., Joseph, A., (2008). A review of the research literature on evidence-based healthcare design. *Health Environments Research & Design Journal*, 1(3), 61-125.

Van Gordon, W., Shonin, E., & Richardson, M. (2018). *Mindfulness and nature. Mindfulness*, 9(5), 1655-1658.

Van Inwagen, P. (2018). Metaphysics. (4th Ed.). Routledge.

Vila, J., (2021). Social Support and Longevity: Meta-Analysis-Based Evidence and Psychobiological Mechanisms. *Frontiers in Psychology*. Vol. 12. Art. 717164.

Waldinger, R., Schultz, M., (2023) The Good Life: Lessons from the World's Longest Scientific Study of Happiness. Simon Schuster.

Wallace, R. K., Benson, H., & Wilson, A. F. (1971). A wakeful hypometabolic physiologic state. *American Journal of Physiology-Legacy Content*, 221(3), 795-799.

Whitley, J. A., & Rich, B. L. (2008). A double-blind randomized controlled pilot trial examining the safety and efficacy of therapeutic touch in premature infants. *Advances in neonatal care*, 8(6), 315-333.

Wilson, E. O. (1984). Biophilia. Harvard University Press. (p. 1.)

Yao, W., Zhang, X., & Gong, Q. (2021). The effect of exposure to the natural environment on stress reduction: A meta-analysis. Urban Forestry & *Urban Greening, 57*, 126932.

YouTube, (2014) Ultimate Truths: Comparing science and the humanities. MIT Communications Forum Special Session. (14min. 5sec.)

Biographies

Rob earned his Bachelor of Science in 1978 from the University of Massachusetts, Environmental Design Studio Option. He earned his Master of Landscape Architecture from the Harvard University Graduate School of Design in 1985. At graduation, Harvard honored Rob as one of three students to graduate with "Distinction", one of their highest honors, as well as the American Society of Landscape Architect's "Merit Award for Excellence in the Study of Landscape Architecture."

In 1987, Rob founded Studio LA in Portland Maine. Picking up where he left off at Harvard, Rob focused on exploring landscape as sculpture and how it impacted the human experience of living life. In 1990 he was elected to the Maine Arts Commission as a "Sculptor" and in 1993 he was elected to the Maine Arts Commission as a "Maine Touring Artist". It was during this time, he was awarded three, One Percent for Art, landscape sculpture commissions and was a finalist in five other competitions.

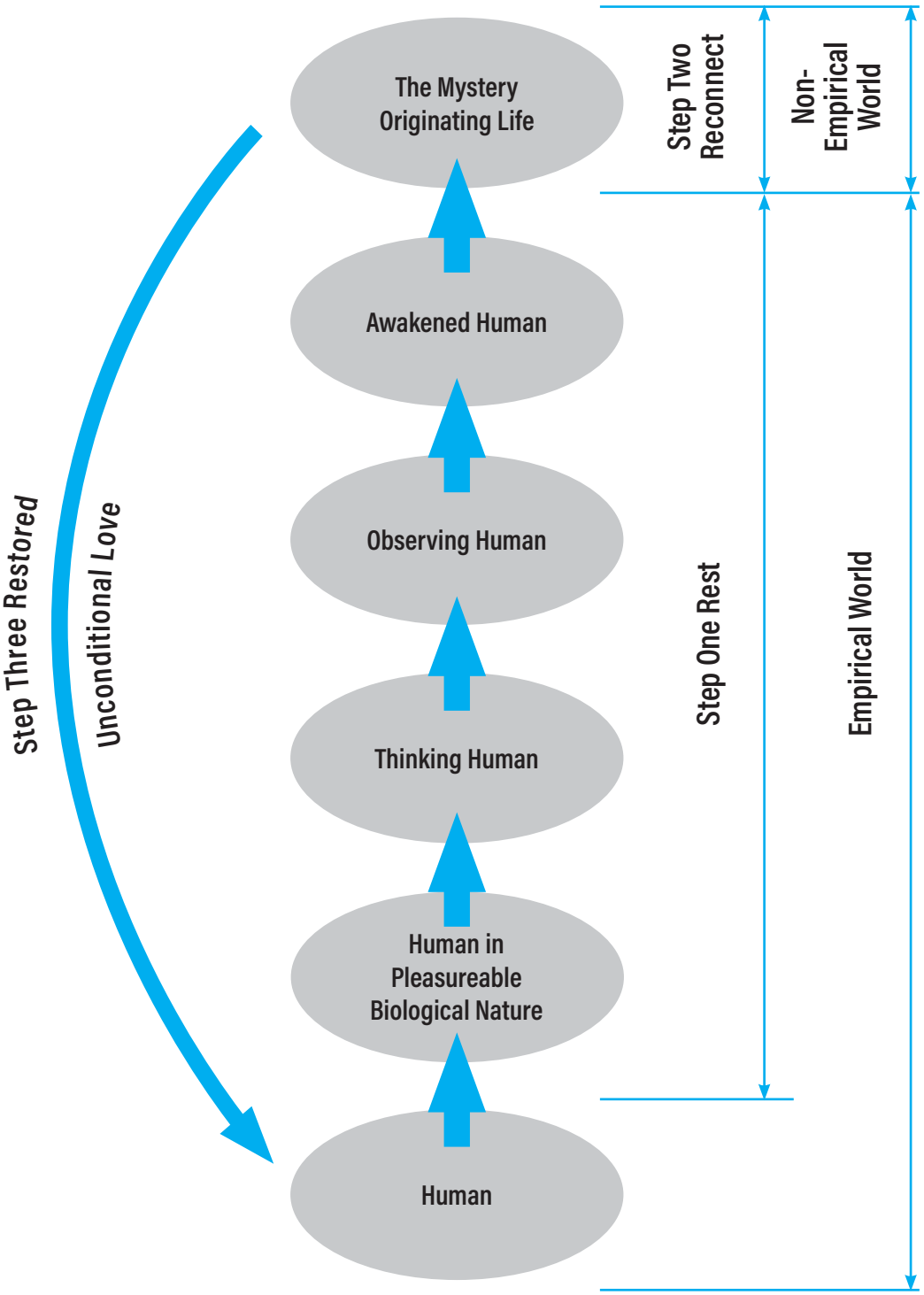
In 1994, based on the questions he was asking about landscape as art, Rob slowly began what he considered a logical transition to studying landscape as healer. His breakthrough came in 1994 when he was asked to design Sedgewood Commons, a state of the art, 90 bed, Alzheimer's project in Falmouth, Maine. After being recognized with numerous national awards, the project went on to be recognized by the international community at the European Reminiscence Conference, for its cutting-edge landscape design for Alzheimer's disease. Taking his cues from Sedgewood Commons, Rob researched, developed, and published the first-of-its-kind, therapeutic landscape design theory based on disease characteristics for the complete spectrum of Alzheimer's disease. The paper, "Healing Gardens and Alzheimer's Disease", was published in 1995, March / April issue of The American Journal of Alzheimer's Disease and to this day remains remarkably relevant. Thus was the beginning of the evolution from artist and Studio LA to landscape architect and HBLA Inc., a landscape architecture firm specializing in permitting, site planning, site design and site engineering, with a specialty in designing evidence informed, therapeutic gardens for CCRC's, Senior Living, Assisted Living, Alzheimer's, Hospice, Rehabilitation, Hospitals, and those most in need. He has personally designed well over one hundred healthcare related built projects. His designs have been honored with over fifty awards or special recognition, including numerous publications, speaking engagements as well as being internationally exhibited.

Recognized as a subject matter expert, leader, and true pioneer in this field of specialization, in 2001 Rob was invited to participate in the establishment of the Chicago Botanic Garden's flagship Healthcare Garden Design Certificate Program. This program, since terminated via COVID, attracted students from throughout the country as well as internationally and was the only advanced professional certificate of its kind in the country. During its sixteen-year run, Rob served as program advisor, faculty, teacher, and lecturer. Rob is published, has taught numerous classes, and has lectured throughout the country.

After practicing for approximately 40 years, Rob semi-retired, again found himself in transition. This time from designing gardens as healer, into public service, researcher, and writer as healer. In 2023 he was elected to Georgetown, MA. select board to begin his three-year term. His previous public service included one year appointed Zoning Board of Appeals, three years elected School Committee, ten years elected Planning Board and numerous other sub-committees.

Figure 1

Conceptual "flow" model identifying stages of development.



Author Guidelines

You are invited to submit manuscripts for consideration for publication in the Journal of Therapeutic Horticulture. Manuscripts may include research projects, case studies, program and services descriptions, therapeutic practice descriptions, therapeutic horticulture philosophies, therapeutic design project descriptions, relevant book reviews, and other related topics.

Manuscripts should be submitted to one of the following sections:

Research
Includes manuscripts of research reports and case studies that contain research components such as a research question, objective, literature review, data collection and analysis, and results and conclusion.

Practice Forum
Includes manuscripts describing horticultural therapy and related programs, case reports, teaching techniques and tools, and other related items.

Therapeutic Landscape and Garden Design
Includes manuscripts on the design, history, and/or theory of gardens and other landscapes as they relate to the field of horticultural therapy.

Issues in the Profession
Includes manuscripts on such topics as education and training, professional or organizational issues, legislative issues, or other related areas.

Horticultural Therapy and the Community
Includes manuscripts on the interaction of horticultural therapy issues and the community at large.

Upon Reflection
Includes thoughts on the more philosophical, reflective, and/or spiritual aspects of therapeutic horticulture.

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Manuscript submissions to the JTH should be sent as an e-mail attachment in Microsoft Word. Manuscripts must represent original material that has not been previously published or that is not under consideration for publication elsewhere. In addition, authors are required to submit an abstract of the manuscript and a brief biography. If the author does not have mastery of the English language, the manuscript must be professionally translated before being submitted.

Authors are asked to follow AHTA's published definitions when describing horticultural therapy and related programs in their manuscript, please include funding and conflict of interest statements. References should follow the author-date format. The authority for style is the Publication Manual of the American Psychological Association. For more information on style and formatting, please contact the editor-in-chief.

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Send cover letter, manuscript, abstract, brief biography, include funding, author contributions and conflict of interest statement.

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