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Yuko Mori
Loma Linda University – USA, yukomori8@gmail.com


Julie Kugel
Loma Linda University – USA, jkugel@llu.edu

Dragana Krpalek
Loma Linda University – USA, dkrpalek@llu.edu

Heather Javaherian-Dysinger
Loma Linda University – USA, hjavaherian@llu.edu

Lida Gharibvand
Loma Linda University – USA, lgharibvand@llu.edu

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Occupational Therapy and Therapeutic Horticulture for Women with Cancer and Chronic Pain: A Pilot Study

Abstract

Background: Chronic pain among individuals with cancer can adversely affect quality of life (QOL) and physical, social, and emotional functioning. Therapeutic horticulture has been shown to be effective for treating various medical conditions; however, the focus on cancer survivors with chronic pain is marginal. This study evaluated the effectiveness of therapeutic horticulture for women with cancer living with chronic pain.

Method: A mixed methods experimental design was used to examine the impact of a 6-week therapeutic horticulture program with seven females with cancer who presented with chronic pain for longer than 3 months. Perception of pain, QOL, and functional fitness were examined using quantitative measures followed by interviews and focus group discussions to explore the subjective experience of the program.

Results: Participation in the therapeutic horticulture program resulted in significant improvement in vitality ($p = 0.018$), lower body flexibility ($p = 0.043$), and agility and dynamic balance ($p = 0.043$). There were no significant changes in perception of pain. Four themes emerged from the qualitative data, illustrating the factors that contributed to the experience of the program.

Conclusion: Therapeutic horticulture is potentially beneficial as an occupation-based intervention for individuals with cancer living with chronic pain to improve vitality, lower body flexibility, and agility.

Keywords

therapeutic horticulture, cancer survivors, chronic pain, quality of life, fitness

Cover Page Footnote

The study was approved by the Loma Linda University Institutional Review Board and is registered as a clinical trial (ClinicalTrial.gov identifier: NCT03951922). This work was supported by a grant from the California Foundation of Occupational Therapy and Loma Linda University.

Credentials Display

Yuko Mori, OTR/L; Julie Kugel, OTD, OTR/L; Dragana Krpalek, PhD, OTR/L; Heather Javaherian, OTD, OTR/L; Lida Gharibvand, PhD

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Chronic pain is defined as “persistent or recurrent pain lasting longer than 3 months” (Treede et al., 2015, p. 1004). It is a highly disabling condition requiring specialized treatment using a multidisciplinary approach (Treede et al., 2015). Chronic pain impacts nearly 20% of adults living in the United States (International Association for the Study of Pain, 2019) and approximately half of individuals diagnosed with cancer (50.7%) (van den Beuken-van Everdingen et al., 2016). A systematic review in 2015 reported that an average of 21%–29% of people with chronic pain have opioid misuse, such as not taking opioids as prescribed and being at increased risk for overdose (Vowles et al., 2015). Opioid-related adverse events, including fatal overdose, are a serious public health crisis, with 128 deaths per day in 2018 (National Institute on Drug Abuse, 2020). With increased recognition of chronic pain as a serious health problem, the World Health Organization adopted the latest version of the International Classification of Diseases that includes the addition of chronic pain (International Association for the Study of Pain, 2019).

Pain management is challenging and complex, especially among clients with cancer who are likely to receive multiple antineoplastic interventions, such as chemotherapy, hormonal therapy, radiation, stem cell transplantation, and surgeries, that can potentially result in a range of pain syndromes (Gallagher et al., 2017). A meta-analysis of 122 studies showed that 39.3% of patients reported pain after curative treatment, 55% reported pain during cancer treatment, 66.4% reported pain during advanced stages of cancer, and 38% of all individuals with cancer reported moderate to severe levels of pain (van den Beuken-van Everdingen et al., 2016). The American Society of Clinical Oncology Clinical Practice Guideline recommends a comprehensive treatment approach for individuals with cancer and chronic pain, including nonpharmacologic interventions; however, there is no consensus on what types of therapies to recommend (Paice et al., 2016).

Occupational therapy is an integral part of the interdisciplinary team to help address chronic pain and the opioid misuse epidemic. A recent comprehensive review of occupational therapy practice in addressing chronic pain highlighted participation-oriented intervention, modifying environments, managing activities, and improving coping strategies to support active engagement in life despite physical impairments (Lagueux et al., 2018). In October, 2018, The Substance Use-Disorder Prevention that Promotes Opioid Recovery and Treatment (SUPPORT) for Patients and Communities Act, which includes occupational therapy as a nonpharmacological pain management treatment, was signed into law (American Occupational Therapy Association, 2018). Further, a recent cohort study involving 181 patients who completed curative treatments, such as surgery and chemotherapy for different types of cancer, demonstrated a positive effect on occupational performance and satisfaction, thus, supporting the role of occupational therapy in cancer rehabilitation (Rijpkema et al., 2020).

Horticulture, the art and science of growing plants, has been used as an occupation-based modality since the early days of the profession to improve physical, mental, and spiritual well-being (Soga et al., 2017). Occupational therapists currently use gardening-related activities as meaningful and purposeful interventions in a variety of settings, including adult rehabilitation, skilled nursing facilities, and schools (Wagenfeld & Atchison, 2014). A systematic review analyzing the benefits of horticulture therapy in the scope of occupational therapy practice supported horticultural therapy for people with mental health conditions to improve various client factors, including quality of life (QOL), social behavior, and cognitive functioning (Cipriani et al., 2017).

The American Horticultural Therapy Association defines therapeutic horticulture as “the process through which participants enhance their well-being through active or passive involvement in plant and

plant-related activities” (2017, p. 2). In the past few decades, a link between natural environments and wellness has been explained by two theories. The Stress Reduction Theory proposes that the restorative influence of natural environments can provoke positive emotions and decrease negative thoughts and emotions, ultimately producing positive changes in physiological activities and higher levels of positive feelings (Ulrich et al., 1991). The Attention Restoration Theory focuses on the potential of natural environments to conserve and restore cognitive resources, such as direct attention, by willfully suppressing distraction and overuse while allowing other neurocognitive mechanisms to function more effectively (Kaplan, 1995).

Increasing evidence supports the use of therapeutic horticulture for producing a wide range of positive outcomes, including reduced depressive symptoms, anxiety and stress, and increased mindfulness and QOL (Bail et al., 2018; Detweiler, 2015; Soga et al., 2017). Improvement in physical health and successful reintegration into the community through gardening became evident in metaethnography analyzing four qualifying studies out of 214 initially identified studies from 2003 to 2010 (York & Wiseman, 2012). More research is showing the therapeutic benefits of natural environments, especially for those with cancer. For example, Cimprich and Ronis (2003) demonstrated the benefits of a natural restorative environment intervention that consisted of home-based nature activities 120 min per week for women with newly diagnosed breast cancer to decrease attentional fatigue and restore capacity to direct attention.

Despite increasing evidence of the positive impact of horticulture, few experimental studies exist that test the clinical effectiveness of horticulture (Relf, 2006), and many contain methodological shortcomings (Kamioka et al., 2014). A systematic review and qualitative metasynthesis on cancer patients’ nature experiences revealed that no studies have focused on the effect of horticulture on pain (Blaschke, 2017). Although there are a few promising studies using horticulture as a modality to treat chronic musculoskeletal pain (Verra et al., 2012), there is a lack of evidence for using horticulture for chronic pain with the cancer population. The need for more research targeting people with cancer living with chronic pain using an occupational therapy perspective is apparent. Engagement in therapeutic horticulture as an occupation-based intervention presents a possible opportunity in current health care where effective use of nonpharmacologic chronic pain management is considered one of the top priorities (Paice et al., 2016). This study investigated the effectiveness of a therapeutic horticulture program on perception of pain, QOL, and functional fitness for women with a history of cancer living with chronic pain.

Method

Research Design

This pilot study used a mixed methods experimental design embedding qualitative data collection after program participation to expand understanding of the experimental results (Creswell & Creswell, 2018). Qualitative data were collected independently of the experiment to augment the outcomes of the experiment (Creswell & Creswell, 2018). The study was approved by the Loma Linda University Institutional Review Board and registered as a clinical trial (ClinicalTrials.gov identifier: NCT03951922). Each participant signed an informed consent form after receiving detailed information about the study and having the opportunity to ask questions.

Participants

Purposive and snowball sampling (DePoy & Gitlin, 2016) were used to recruit participants through a local cancer support organization and a local community hospital in Southern California. Informational flyers, verbal recruitment at hospital events, and email invitations to the members of the cancer support organization were used to recruit participants. Inclusion criteria were: (a) 18–64 years of age, (b) a history of cancer diagnosis, (c) presence of pain for 3 months or longer, (d) an interest in horticulture, (e) the ability to tolerate 1 hr of physical activity, (f) the ability to provide own transportation, and (g) the ability to communicate in English. Exclusion criteria were pregnancy and uncontrolled seizure disorder. Nine participants were eligible after the screening, and seven participants completed the 6-week therapeutic horticulture program. Two people dropped out at the initial phase of the program because of worsening side effects from their cancer treatments and fear of increased pain.

Instruments

A 16-item demographic questionnaire was developed for this study to collect baseline characteristics of the participants (see Table 1). Information such as gender, education, type of cancer, time of cancer diagnosis, history of pain, and pain management intervention were collected to understand the overall participant characteristics, histories of cancer, and pain management techniques.

Table 1

Selected Characteristics of Participants at Baseline (N = 7)

Participant Characteristics		Frequency (%)
Age	40–49	2 (28.6)
	50–59	4 (57.1)
	60–64	1 (14.3)
Gender	Female	7 (100)
	Other gender	0 (0)
Marital status	Single	2 (28.6)
	Married	5 (71.4)
Disability insurance (DI)	Receiving DI	3 (42.9)
	Not receiving DI	4 (57.1)
Education	High school or college	4 (57.1)
	Graduate school	3 (42.9)
Ethnicity	White	5 (71.4)
	Non-White	2 (28.6)
Type of primary cancer	Breast cancer	5 (71.4)
	Non-breast cancer	2 (28.6)
Year after cancer diagnosis	0–3 years	3 (42.9)
	3+ years	4 (57.1)
Number of cancer treatments	0–2	4 (57.1)
	≥ 3	3 (42.9)
Start of pain symptoms	Before cancer diagnosis	2 (28.6)
	After cancer diagnosis	5 (71.4)
Pain location	General pain	2 (28.6)
	Localized	5 (71.4)
Pain duration	Up to 12 months	4 (57.1)
	≥ 13 months	3 (42.9)

Number of pharmacological pain treatments	0–3	4 (57.1)
	≥ 4	3 (42.9)
Number of nonpharmacological pain treatments	0–3	3 (42.9)
	≥ 4	4 (57.1)
Prior horticulture at home	None	2 (28.6)
	Some gardening	5 (71.4)
Prior exercise at home	Walking	5 (71.4)
	Walking/other exercises	2 (28.6)
Frequency of home exercise	1–3 times/week	2 (28.6)
	≥ 4 times/week	5 (71.4)

Note. Values are presented as frequency (percentage).

There were three objective outcome measures used in this study: The Brief Pain Inventory short form (BPI-SF), the 36-Item Short Form Survey (SF-36), and the Functional Fitness Test (FFT). The BPI-SF is a 5-min, self-report pain assessment tool that captures the sensory intensity of pain and the degree to which pain interferes with different areas of daily functions (Younger et al., 2009). The BPI-SF demonstrates high validity and reliability as an assessment tool for measuring pain intensity across four categories: worst, least, on average, and present. The BPI-SF also measures pain interference across seven categories: general activity, mood, walking ability, work, relationships, sleep, and enjoyment of life (Cleeland, 2009).

The SF-36 is a self-administered questionnaire containing 36 questions to assess health perception and QOL, including eight health components: physical functioning, social functioning, bodily pain, role limitations because of physical health problems, role limitations because of emotional problems, emotional well-being, energy or fatigue, and general health perceptions (Brazier et al., 1992). The SF-36 requires less than 10 min to complete and has high internal consistency (Cronbach- α above 0.85 for seven categories), test-retest reliability (91%–98% confidence interval), and construct validity (Brazier et al., 1992).

The FFT is a practical tool comprised of six tests to measure functional mobility, upper and lower body strength, aerobic endurance, agility and dynamic balance, and upper and lower body flexibility. The FFT demonstrates high intraclass reliability ($.80 < R < .98$) and content validity for all subtests (Rikli & Jones, 1999). The FFT, formally called the Senior Fitness Test, has a recommended age range of 60–94 years that does not apply to our inclusion criteria (18–64 years of age). However, we chose the FFT because this test was designed to evaluate fitness in a range of independent living adults to identify evolving weakness, and it has been used previously to assess physical activity among cancer survivors (Rikli & Jones, 2012).

Interview and Focus Group Discussions

The participants were able to choose whether they preferred to do an individual or focus group discussion. Eight guiding questions were developed by the research team based on a review of current literature. Questions were open-ended in order to understand the participants' perceptions of the horticultural experience and to facilitate spontaneous discussions about their overall experiences, the impact of pain, what was learned through the experiences, and what part of the program could be improved.

Horticulture Program

The participants engaged in a 6-week therapeutic horticulture program two times a week for 1-hr each session. The program was led by the first author, and an average of two to three adult student volunteers were present to assist with the horticultural activities and monitor the participants for safety in the large field. The study site for the therapeutic horticulture was a 4.9-acre educational farm located east of downtown Los Angeles. The average temperature of the farm was 78 degrees and mostly sunny in the early summer season. Each session had specific themes and objectives based on the dynamics of horticultural therapy theory that aimed to facilitate healing of the body, emotion, and spirit by engaging in passive and active horticultural activities emphasizing social interaction and the nurturing of plants (Relf, 2006). This model was combined with the ecology of human performance model focusing on the unique context (Dunn et al., 1994) of individuals living with cancer and chronic pain. Specific therapeutic horticulture activities using the restorative influence of nature that involves creating a shift toward a more positive emotional and physiological state based on the Stress Reduction Theory (Ulrich et al., 1991) were used to facilitate the achievement of the objectives (see Table 2).

Table 2
Therapeutic Horticulture Program Outlines

	Activity	Objectives	Practice Framework
Week 1	<ul style="list-style-type: none"> • Introduction to the therapeutic horticulture program • Horticulture site tour • Organic farming intro • Plant identification game 	<ul style="list-style-type: none"> • Become familiar with the farm environment • Get to know each other • Share interest in and experience of horticulture 	<ul style="list-style-type: none"> • EHP: Understanding the context of the client • DHT: Explore people-plant interaction for positive impact on health
Week 2	<ul style="list-style-type: none"> • Teach basic horticultural skills • Teach proper ergonomics • Education on pain management • Introduction to adaptive equipment and environmental modification ideas 	Physical <ul style="list-style-type: none"> • Review the physical fitness aspect of horticulture • Review proper use of core muscles and how to lift while protecting your back 	<ul style="list-style-type: none"> • EHP: Emphasize visual, auditory, tactile, and olfactory stimulus of horticulture • DHT: Explore positive influence of the therapeutic horticulture on physical fitness
Week 3	<ul style="list-style-type: none"> • Introduction to soil basics • Homemade organic fertilizer • Explore various composting ideas (i.e., worm, food) • Intro to local farmer's market • Participate in transplanting 	Social <ul style="list-style-type: none"> • Share coping strategies for managing chronic pain • Share community resources 	<ul style="list-style-type: none"> • EHP: Explore interaction between an individual and local community • DHT: Facilitate stronger bonding between the participants and community
Week 4	<ul style="list-style-type: none"> • Teach diaphragmatic breathing technique to focus on managing emotions • Participate in pruning and fruit bagging 	Psychological <ul style="list-style-type: none"> • Share strategies related to self-management of stress • Meditation on the farm 	<ul style="list-style-type: none"> • EHP: Potential of natural environment in stress management • DHT: Positive effect of nature in reducing stress
Week 5	<ul style="list-style-type: none"> • Introduction to various ideas on home gardening • Participate in decorative planting and flower arrangement activity at table 	Spiritual <ul style="list-style-type: none"> • Share the idea of mindfulness • Share impact of spirituality in cancer survivorship 	<ul style="list-style-type: none"> • EHP: Explore spiritual context of survivorship • DHT: Explore meaning of life through horticulture
Week 6	<ul style="list-style-type: none"> • Explore healthy diet (i.e., increased fruits and vegetables) through therapeutic horticulture • Explore ways to continue horticulture at home 	Wholeness <ul style="list-style-type: none"> • Share hopes for future • Share experience in the program • Share what's next after the program completion 	<ul style="list-style-type: none"> • EHP: Explore the importance of context to improve QOL • DHT: Appreciate living through interacting with plants

Note. EHP = Ecology of Human Performance. DHT = Dynamics of Horticultural Therapy.

Data Collection

All seven of the participants completed the pre and post program assessments, including the demographic questionnaire, the BPI-SF, and the SF-36. Seven of the participants completed the pre-FFT and six of the participants completed the post-FFT because one participant sustained a back injury unrelated to the program. For this participant, mid-intervention FFT scores were used for analysis. Four of the participants completed a repeat FFT as a mid-intervention assessment at the sixth session. At the completion of the program, four of the participants completed a semi-structured interview individually and three of the participants joined a focus group discussion using guided questions.

Data Analysis

Mean \pm Standard Deviation (*SD*) scores were computed for quantitative variables and frequency (percentage) for categorical variables. Wilcoxon paired signed rank tests were used to compare pre and post variables in both groups. Data were analyzed using SPSS Statistics Software version 25.0. All analyses were performed at an alpha level of .05.

Focus group discussions and interviews were audiotaped and transcribed verbatim. Transcriptions were coded in Dedoose, a web-based application to facilitate organization and analysis of qualitative data (Lieber et al., 2016). The research team identified patterns in the codes leading to categories using code co-occurrence, concept mapping, and application to reach final themes (Creswell & Creswell, 2018). In ensuring internal validity, we implemented peer debriefing, the first author spent a prolonged time in the field to gain an in-depth understanding of the context, and an audit trail was kept to ensure trustworthiness of study methods and procedures (Creswell & Creswell, 2018). We also kept in-depth field notes after each session and used these in conjunction with the generation of descriptions and themes. We checked transcripts multiple times to ensure accuracy, and intercoder agreement was sought among the investigators to achieve increased qualitative reliability (Creswell & Creswell, 2018). We compared quantitative and qualitative data side by side to generate a comprehensive understanding of the data.

Results

Quantitative Results

The baseline characteristics of the participants are shown in Table 1. All seven of the participants were female and had a mean age of 51.3 years (*SD* = 5.99). Five of the participants had a diagnosis of breast cancer and two had non-breast cancer diagnoses including non-Hodgkin's Lymphoma and Leiomyosarcoma. The participants were an average of 3.7 years post initial diagnoses. Three of the participants received three or more types of cancer treatments, including chemotherapy, radiation, and surgery. At the time of the program, 6 out of the 7 participants were taking oral antineoplastic medications. Five of the participants reported that pain started after their cancer diagnosis in localized areas, such as neuropathic pain in hands and feet, aching pain in the lower back, and post breast surgery pain. Two of the participants reported general body pain. All but one participant had tried pharmacologic pain management strategies, including opioids, NSAIDs, and muscle relaxants, and 42.9% (*n* = 3) had tried more than four different medications to manage pain. All of the participants had tried at least one nonpharmacologic pain management intervention, such as physical therapy and acupuncture, and 57.1% (*n* = 4) of the participants attempted more than four different nonpharmacologic interventions. The average participation rate for the 6-week therapeutic horticulture program was 63%, ranging from 4–11 sessions out of the 12 sessions offered.

The results of three quantitative measures are shown in Table 3. The results indicate statistically significant improvements in SF-36 vitality scale scores (energy or fatigue) after the completion of the therapeutic horticulture program, $p = 0.018$, $p < .05$ (see Table 3). Marginally significant improvements were seen in three areas: (a) role limitations because of emotional health $p = 0.066$, $p < .10$; (b) emotional well-being $p = 0.061$, $p < .10$; and (c) social functioning $p = 0.056$, $p < .10$. Post program raw scores were improved on all seven variables of QOL with an average increase in scores by 16.5 ($SD = 13.24$), with the exception of role limitations because of physical health, which had no change in the mean score.

There were no statistically significant differences in pain intensity and pain interference scores from pre to post program participation. However, the mean raw scores decreased by 1.39 in pain intensity and 1.7 in pain interference showing a positive trend toward decreased reports of pain and functional interference during program participation.

The FFT scores showed statistically significant improvements after program completion in the areas of lower body flexibility $p = 0.043$, $p < .05$ and agility and dynamic balance $p = 0.043$, $p < .05$. Although not statistically significant, all six areas of physical fitness mean scores were improved after program completion.

Table 3*Outcome Measures Before and After Therapeutic Horticulture Program (N = 7)*

Measures	Pre	Post	Change	Trend	<i>P</i> value ^a
BPI-SF: Pain severity	4.39 ± 1.77 (1.75–6)	3.00 ± 2.19 (.00– 6.25)	- 1.39	Improved	0.204
BPI-SF: Pain interference	5.39 ± 2.69 (1.43–10.00)	3.69 ± 3.09 (.00– 7.71)	- 1.7	Improved	0.237
SF-36: Physical functioning	60.71 ± 27.15 (20–95)	67.86 ± 23.95 (30–100)	7.15	Improved	0.352
SF-36: Role limitations because of physical health	14.29 ± 19.67 (0–50)	14.29 ± 28.35 (0–75)	0	No change	1
SF-36: Role limitations because of emotional health	4.76 ± 12.60 (0– 33.33)	47.62 ± 50.40 (0–100)	+ 42.86	Improved	0.066**
SF-36: Energy and fatigue (Vitality)	35 ± 14.72 (20– 60)	53.57 ± 14.64 (30–75)	+ 18.57	Improved	0.018*
SF-36: Emotional well-being	54.86 ± 24.19 (20–96)	71.43 ± 7.81 (60–80)	+ 16.57	Improved	0.061**
SF-36: Social functioning	39.29 ± 13.36 (25–50)	58.93 ± 27.68 (12.5–87.5)	+ 19.64	Improved	0.056**
SF-36: Pain	43.57 ± 18.13 (22.5–67.5)	50.71 ± 20.90 (20–77.5)	+ 7.14	Improved	0.462
SF-36: General health	41.43 ± 24.10 (10–85)	45.00 ± 25.69 (20–90)	+ 3.57	Improved	0.238
FFT: Chair sit-stand (Lower body strength)	14.71 ± 4.96 (8– 23)	15.86 ± 3.58 (11–21)	+ 1.15 (times)	Improved	0.206
FFT: Arm curl (Upper body strength)	20.86 ± 5.08 (11–26)	22.00 ± 3.74 (15–26)	+ 1.14 (times)	Improved	0.491

FFT: 2 min step (Aerobic endurance)	57.86 ± 14.58 (45–87)	64.43 ± 8.81 (50–76)	+ 6.57 (times)	Improved	0.173
FFT: Chair sit and reach (Lower body flexibility)	-2.86 ± 11.96 (- 21–11)	5.14 ± 11.25 (-9– 18)	+ 3.15 (inch)	Improved	0.043*
FFT: Up and go (Agility/dynamic balance)	7.12 ± 2.02 (5.40–11.08)	5.88 ± 1.35 (4.36–8.38)	- 1.24 (sec)	Improved	0.043*
FFT: Back stretch (Upper body flexibility)	-2.94 ± 8.59 (- 17.78–6)	-2.14 ± 10.07 (- 18–6)	+ 0.31 (inch)	Improved	0.345

Note. **p* values are significant at 0.05 level. ***p* values are marginal significant at 0.10 level. ^a*p* values for the null hypothesis that there is no difference between pre and post.

Qualitative Results

Three of the participants engaged in the focus group discussion, and four of the participants chose the individual interview. Four themes related to the benefit of the horticulture program emerged from the qualitative data: (a) challenges of cancer survivorship, (b) social connectedness and nature, (c) being in the moment and mindful of self, and (d) experiencing horticultural activities.

Challenges of Cancer Survivorship

Many of the participants voiced specific challenges that inhibit active participation in their meaningful occupations through participation in therapeutic horticulture activities. Dion was suffering from severe hand and foot syndrome from one of her chemotherapy agents, which made it difficult for her to handle gardening tools. Cheryl had chronic back pain and neuropathy from metastatic breast cancer that affected her spine. She described her concern of declining standing balance: “it was a little difficult, especially initially, getting around because of the unevenness to the soil, and so forth. And the bending was a little bit difficult.” Nancy had lymphedema on her right arm, which flared up during the weeding activity: “when I was doing the hoeing ... my lymphedema acted up.”

Other challenges were manifested in psychological and mental states. Gloria shared, “it’s that first step. That’s the hardest one. Try again, you know, put those shoes on and take those shoes off. Put those shoes on, and then finally make it out the door.” This group of women found themselves at a loss after their active treatments were completed and felt the need to find the path to reengage in activities they used to enjoy. The participants voiced their view of cancer survivorship as a lifelong process that required frequent adjustments in life and continuous effort to strive for optimal health and active participation.

Social Connectedness and Nature

The participants identified the positive impact of connectedness to people and nature. Most of the horticultural activities were group-based activities to promote interpersonal connection and the opportunity to share stories of cancer survivorship. Storytelling was never forced; rather, a supportive environment was created for the participants to feel comfortable and empowered to share their life’s journey. Dion shared, “I liked being with other people. You know, different backgrounds and experiences. I think that’s important.” Nancy concurred, “the sisterhood, you know, being there with these lovely ladies, the great kids that you had out there, help me.” The participants expressed that it is difficult to navigate cancer survivorship alone, especially with a chronic pain condition that can impact social participation. Veronica voiced the importance of having a support group when dealing with cancer and pain. She elucidated, “the social aspect of meeting somebody else or talking to somebody ... made the experience more enjoyable than doing the horticulture itself ... that part of the interaction, working, building, like team building, I, I appreciate it that way.”

Participation in therapeutic horticulture enabled the participants to interact with nature and engage in outdoor activities. Gloria expressed she has sheltered herself since her cancer diagnosis and had difficulty going outdoors: “getting out into the garden and outside under the sun. You know, bugs and all (laughter) ... yeah, getting outside again. That was, that was just the biggest thing for me.” Mary shared, “like when we did the exercise on the tree, close to the trees ... I love it.” Veronica saw how vegetables grow strong while weeds cohabit in the field and said: “this field is my body ... the cancer is all those little weeds that you see ... look how many good things that are in there, look at the carrots grow and look at the bell peppers growing.” This group of women expressed positivity in being outdoors with people and close to nature while experiencing the evolving nature of living plants.

Being in the Moment and Mindful of Self

One of the most significant findings based on the frequency of codes was the positive impact of being in the moment and focusing on the task itself. Amanda explained, “so I just felt ... being there ... helped me ... kind of put everything else on hold for an hour and just focus, I think, focusing on ... on what we were doing was kind of meditating.” This community farm is located adjacent to a major freeway in Southern California and you can hear the freeway noise continuously. There was a concern from the research team that the freeway noise would diminish the therapeutic effect of horticulture; however, none of the participants were bothered by the noise, which exemplified the state of intense focus and immersion in the activities. Nancy shared:

Yeah, because when you're focused on what you're doing you don't even hear it. It was for that one hour, we forgot about everything else that was going on, I wasn't caretaking. I wasn't doing housework ... whatever time we were there, it was being mindful that this was about me.

Active participation in therapeutic horticulture helped the participants break away from life's challenges and stressful routines in life and focus on self. Cheryl shared her own interpretation of how being in the moment further created a “channel” to escape endless medical procedures and doctor visits. Veronica added her experience of being in the moment during stretching exercise: “I close my eyes and listen to your voice ... guiding us through the exercise. It made me in the moment. It made me think about my body that way ... I'm just in tune to my body in your voice.” All of the participants expressed that simple range of motion exercises with a focus on deep breathing at the beginning of the session was meaningful to turn off external noise and focus on self.

Experiencing Horticultural Activities

The majority of the participants in this study had a prior interest in horticulture; however, they had limited exposure to actual participation in horticulture. Nancy shared, “this is something I would have never done on my own ... at home, I pick stuff, and I just put it there for the gardeners.” The therapeutic horticulture program introduced the participants to each of the main stages of growing plants. Remembering the zucchini that she had grown, Dion summarized this process as, “what was once just dirt, and rock, is now food. So that's beautiful.” Throughout the program, the participants shared the joy in learning new horticultural skills and techniques.

One of the main goals in the program was to introduce gardening techniques to be integrated into their home and continue the participation in horticulture activities. Amanda rented a section of the local community garden near her residence, where she transplanted the vegetables that she had planted in the farm. Nancy, who had little experience in gardening, stated proudly, “I've planted a few things on my

own without having a gardener do that.” Gloria was excited to show her home garden, consisting of multiple planters and a raised garden bed she shares with her neighbors. All of the participants demonstrated joy in cooking the produce they harvested at the farm and sharing it with their families and friends. Mary, who had the most consistent participation in the program, made tamales with her mother using corn leaves picked at the farm: “I checked recipes on YouTube and because I want to experiment with all the things that you give us ... even my son so picky, and said mom, this is edible (laughter).” The horticulture program transferred to the participants’ home life with gardening and eating with their families.

Finally, the participants provided feedback when asked about the program’s negative aspects and future recommendations. Two participants indicated environmental challenges, such as increased temperature and humidity toward the end of the 6-week program, and suggested to modify hours to avoid heat. Six of the participants expressed the difficulty of the drive to the farm during morning traffic. Six of the participants suggested to include simple warm-up exercises at the beginning of the horticultural therapy consistently.

Discussion

Individuals diagnosed with cancer commonly experience chronic pain and challenges with their physical and psychosocial well-being (Paice et al., 2016). This study aimed to examine the impact of a therapeutic horticulture program for women with cancer and chronic pain. The results of this study parallel previous studies demonstrating the effectiveness of horticultural activities on QOL (Soga et al., 2017; York & Wiseman, 2012). The statistical significance shown on the SF-36 vitality scale suggests a possible positive effect of therapeutic horticulture on generating more energy and reducing cancer-related fatigue. Although the statistical significance was marginal, three of the social and emotional domains of QOL, emotional well-being, role limitation because of emotional health, and social functioning, improved more than the other four domains.

The results on the FFT revealed significant improvements in lower body flexibility and dynamic balance and agility as well as improvements in all the mean raw scores from six categories of physical fitness. This suggests a positive influence of therapeutic horticulture on overall physical fitness, but especially on lower body flexibility and dynamic balance. Evidence suggests that physical activity plays an essential role in cancer survivorship, including the recovery of physical functioning from cancer treatment, improved QOL, decreased cancer-related fatigue, and increased survival rate (Thomas et al., 2014). Evidence has shown that horticultural activities can be equivalent to moderate physical activities and can contribute to one’s health (Soga et al., 2017). Chronic pain may be impacted by a sedentary lifestyle, and the current cancer survivorship guideline recommends at least 150 min of moderate physical activity each week (Thomas et al., 2014). Therapeutic horticulture may be used as an effective occupation-based intervention to increase activity and fitness levels and improve the emotional and psychological health of people who have a history of cancer and are living with chronic pain. Furthermore, although there were no statistically significant results seen in pain severity and interference scores from the BPI-SF, an overall positive trend and improvements in mean scores from both areas suggest possible positive effects of therapeutic horticulture on symptoms of chronic pain.

Augmenting the quantitative results, four themes emerged from the participants’ perspectives, highlighting factors that formed their positive experiences while engaging in the therapeutic horticulture program and several challenges that hindered active participation in meaningful activities. Bail et al. (2018) demonstrated the effectiveness of home-based horticulture activities for cancer survivors on

improving QOL, physical activity and functions, and consumption of vegetables. Our study demonstrated a similar trend, although our setting was a group-based program at a large community farm. Nature facilitates physiological relaxation, a reduction in stress, and provides a nurturing context to create caring connections (Blaschke, 2017). The group-based horticultural activities facilitated a natural and supportive environment where the participants felt empowered to optimize their health despite cancer-related difficulties (York & Wiseman, 2012). The participants gained confidence and furthered their interest through participating in the study to grow plants in their home environments.

Participating in therapeutic horticulture provided a unique opportunity for the participants to achieve total immersion in plant-related activities in a naturalistic environment. A sense of peace and a meditative state were achieved through mindfulness activities during the program. The participants were able to focus less on the challenges of everyday life, roles that were burdensome, and to be in the moment with a focus on self. Mindfulness-based programs are intended to increase awareness of moment to moment awareness of breathing, posture, movement, and attention, and are effective in reducing pain intensity, pain-related distress, and psychological distress (Tick et al., 2018). A recent randomized trial of a mindfulness-based stress reduction program for women newly diagnosed with breast cancer demonstrated decreased perceived stress, fatigue, sleep disturbance, and depression and increased functional immune benefits compared to an active control group (Janusek et al., 2019). Similarly, engaging in natural restorative activities, such as gardening, were shown to produce rested attentional capacity and improved mental clarity by clearing the mind and comprehending unresolved thoughts and issues that were caused by newly diagnosed cancer (Cimprich & Ronis, 2003). The positive experiences of the participants may be attributed to increased awareness of self, emotion, and feelings because of the opportunity to engage themselves in therapeutic horticulture in a natural setting.

Individuals diagnosed with cancer experience psychological distress, including depression, anxiety, insomnia, and PTSD (Paice et al., 2016). The qualitative themes demonstrated that nature could be a powerful context for psychological restoration, such as stress reduction and emotional healing (Blaschke, 2017; Relf, 2006). The participants looked forward to coming to the farm, where closer connection to nature is achieved, and being able to observe phases of growing plants throughout program participation. Occupational therapy has a distinct role in promoting a healthy lifestyle and participation in the full range of meaningful occupations at individual and community levels (American Occupational Therapy Association, 2014). The strength of an occupation-based community program like the one implemented in this study is the opportunity for a group of vulnerable people to regain access to an active lifestyle and optimize their health by using a supportive environment and engaging in a meaningful occupation.

Occupational therapists are skilled in integrating context and activity to create a therapeutic space for their clients. Occupation can be an effective therapeutic tool as well as a means to achieve the goals of the intervention (American Occupational Therapy Association, 2014). This pilot study supports the core principle of occupational therapy practice by using the power of occupation to promote health, well-being, and active participation in life.

Limitations and Future Research

There were several limitations to this study. Our small sample size raises the probability of a type II error for the perception of pain outcome, which demonstrated no statistical significance in either pain intensity and interference after program participation. Repeated administration of the FFT measure at mid-intervention may have produced test-retest effects resulting in improved performance during post

FFT. The participants were recruited from only two locations in the community and were all female. Finally, our inclusion criteria included interests in horticultural activities, which may have influenced the study outcomes because of their high internal motivation to learn about horticulture. Future studies should be replicated to include a larger sample size with a more diverse population. Other possible steps in future research include exploration of the long-term effects of therapeutic horticulture on the perception of chronic pain, use of pharmacological interventions for pain following therapeutic horticulture, and targeting other populations, such as children with cancer and people with metastatic cancer.

Conclusion

The study results suggest that participation in therapeutic horticulture is potentially beneficial for improving energy and fatigue (vitality), lower body flexibility, and dynamic balance and agility. An overall positive trend was shown in pain severity and interference, QOL, and comprehensive physical fitness. Based on qualitative data analysis, the positive impact of therapeutic horticulture was facilitated by learning new skills, being mindful of self through immersion in the horticultural activity, social connectedness, and connecting with nature.

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