

THE IMPACT OF HORTICULTURAL THERAPY VIA SENSORY EXPERIMENT ON
POST-TRAUMATIC STRESS DISORDER PATIENTS TO EXPLORE THE EFFECTS ON
THEIR EMOTIONS, INTERPERSONAL RELATIONSHIPS, AND PROFESSIONAL
ACHIEVEMENTS

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ABSTRACT

Post-traumatic stress disorder (PTSD) symptoms can start at any time or during different situations after a traumatic event. However, few studies discuss the non-medical treatments in sensory treatments on how PTSD affects the emotions and life of patients. This study aims to explore how horticultural therapy and other sensory experiments impact PTSD patients. This research addresses how PTSD groups receive the benefits from experiencing the micro-horticultural therapy designed package — Two weeks of the sensory experiment conducted in PTSD group within the Michigan population. Participants answered questionnaires, including background questionnaire, response questionnaire, and DASS 21 questionnaire, as methods to track the healing improvement in their health conditions, career development, and interpersonal relationships. In addition, participants' self-reflection was explored after the experiment. Results demonstrated horticultural therapy's effect on the five senses and its impact on mental health. This research will positively propose Horticultural Therapy as a universal treatment for the PTSD population struggling with mental health and provide a future guideline for healthcare facilities.

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TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION.....	1
CHAPTER 2: LITERATURE REVIEW.....	5
CHAPTER 3: METHODOLOGY.....	14
CHAPTER 4: RESULTS.....	24
CHAPTER 5: DISCUSSION AND CONCLUSIONS.....	39
REFERENCES.....	42
APPENDIX A: QUESTIONNAIRES.....	46
APPENDIX B: RECRUITING POSTER.....	51
APPENDIX C: CONSENT FORM.....	52

CHAPTER 1: INTRODUCTION

Post-traumatic stress disorder (PTSD) issues have been a long-term concern worldwide, from war to accidents to unequal treatment. PTSD is a lifetime mental health reaction to traumatic events. It can happen at any time and any place, which would cause patients to struggle in their daily life. PTSD is generally classified into four types: intrusive memories, avoidance, negative changes in thinking and mood, and changes in physical and emotional reactions. Ford et al. (2015) mentioned that traumatic events can be divided into physical and mental traumas, such as bodily illnesses and pressure from expectations; and the causes of PTSD could be linked to a lack of connection with intimate relationships, pressure from social expectations, and stereotypes. Roh et al. (2018) described that East Asian countries, such as Japan and South Korea found an increased rate of suicides. To continue, the rapid social and economic changes increased competitive pressures with reduced support from the narrow family structure and fewer community ties, leading to the outcome of suicide trend (Roh et al., 2018). Mental health has always been a sensitive topic and they often are mistreated; therefore, understanding the cause and effect of PTSD can help to direct a path for better solutions. The gap in studies addresses the limitation of individual needs, such as transportation and weather conditions in current mental health treatments and programs. The purpose of this research aims to understand the benefits of horticultural therapy via a sensory experiment package to provide a non-medical treatment by improving social interactions, and healthy environments for PTSD patients.

In Western cultures, the dominant ethnic group in society as well as political, economic, social, and educational is the White population. Most of the media show successful people in business who are primarily White men; however, few discussed how PTSD appeared in the White community because of wars, fanaticism, inflation, or insecurities with immigration status

(Anglin et al., 2021). From the social expectations and personal reputation influence, people tend to hide their issues instead of finding support and solutions. Koenen et al. (2003) using a national clinic-based sample found that non-Whites were less likely to seek treatment for PTSD than Whites. Informed to the analysis of relevant literature, different ethnic groups' backgrounds such as Whites, African Americans, Hispanics, and Asians had specific cultural influences to shape their society's characters related to the causes of developing PTSD and how they address this issue (Koenen et al., 2003).

Most of the treatments addressing PTSD patients use medicines that have more immediate results and are covered by health insurance. Schrader and Ross (2021) described that the medicines, such as fluoxetine, venlafaxine, and paroxetine showed positive impacts in the treatment of PTSD symptoms. However, most of the treatments are delivered personally by therapists. Even if the trauma-focused therapies showed improvement, PTSD patients could be limited in trauma-focused therapy, which requires using manualized treatment, or by cost and insurance coverage. Moreover, Burg et al. (2017) found that medication and psychotherapy are conflicting by showing a lower PTSD-associated high blood pressure risk, but also showing higher individual risk as a major effect for those receiving treatment. The effect of treatment on PTSD-associated high blood pressure risk was not examined randomly in a clinical trial; therefore it was unable to determine receiving evidence-based treatment for PTSD (Burg et al., 2017). Based on the analysis of relevant studies, medical treatment for PTSD symptoms has potential risks and conflicts due to individual health condition needs.

Reflected on the challenge of medical treatment for PTSD symptoms, alternative treatments, such as non-medical treatments, are often not covered by health insurance. An example of non-medical treatment according to Howarth et al. (2020), is gardening which

improves the health and well-being of people in terms of health and social needs. Ohly et al. (2016) concluded that well-being has been impacted by enjoyment and feelings of achievement, satisfaction, and pride from nurturing the plants, seeing them grow, and harvesting the crops in gardening. Additionally, Howarth et al. (2020) mentioned that gardening leads to social prescription and guides health strategy and decision-making to socially prescribed, non-medical interventions involving gardening. But the way people prefer gardening also differs. For example, Herbs are popularly used as a medical nutrient in Asian food and provide a concept of a natural way for their treatments. People tend to think taking medicine seems like a sick behavior, so a non-medical treatment will benefit PTSD groups who do not want to be treated as patients. Howarth et al. (2020) described the influence of the question ‘What makes people healthy?’ rather than, ‘How do we treat disease?’ It is important for the prevention of PTSD symptoms in potential PTSD patients who can be caregivers or patients’ family members.

1.1 The Purpose of the Study

Since Covid-19 changed the lifestyle from in-person to virtual, people had fewer opportunities to go outside, especially PTSD patients who have a lack of healthy social environment and never address the lockdown before. Therefore, it is important to explore different options for the mental health of PTSD patients. The purpose of this research is to promote a healthy treatment and self-care concept in PTSD groups to reduce future issues such as suicide, violence, and social anxiety. This study aims to examine the impact of horticultural therapy and sensory experiment on adults with PTSD.

1.2 Significance of the Study

The significance of the study is to promote the benefits of a sensory experiment, such as reducing anxiety and negative emotions within a short period and low-cost materials as well as

improving PTSD patients' quality of life. The micro-horticultural therapy designed package meets individual needs and solves the barrier of distance and weather issues. The self-report questionnaires aim to patients' interpersonal relationships, professional achievement, and preferred senses in the improvement of their well-being.

1.3 Overview of the Following Chapters

Chapter Two, the literature review, consist of the cause and effects and the benefits of non-medical treatments in PTSD groups. Chapter Three will discuss the experiment methodology, which is designed based on the natural elements by understanding the concept of horticultural therapy via human senses exploring. Participants experienced interactions with nature through their five senses and self-responded in questionnaires. In Chapter Four, the results will be analyzed from questionnaires. The DASS 21 data is classified into three categories: Depression level, Anxiety level, and Stress level. The background and response questionnaires will be reflected in living environments, professional achievements, and interpersonal relationship improvements. The outcome from DASS 21 will be compared with the response questionnaire and provide a guideline for education and healthcare in future studies.

CHAPTER 2: LITERATURE REVIEW

This chapter presents a review of the selected peer-reviewed literature that discusses the effects of horticultural therapy on people's health and the benefits of the sensory experiment on well-being. Both sections in 2.1 and 2.2 explain the historical backgrounds and recent examination to prove the impacts of the natural elements. Moreover, sections 2.3 and 2.4 discuss the pressure of being different from others, such as unequal treatment by gender and race.

Roberts et al. (2011) found that perceived discrimination, racial verbal assault, and racial stereotypes have been linked to PTSD symptoms and account for the higher risk of PTSD among African Americans, while in higher socio-economic classes, the risk of developing PTSD is reduced. Furthermore, the educational achievements and the income status of certain ethnic groups can be the factors to explain these ethnicities' respective risks of developing PTSD.

Few educational programs have been developed to explore sensory practice in horticulture therapy and focus on improving the quality of life and preserving the local environment. For example, Ferrini (2003) pointed out that during the period of World War II, the patients who had physical and psychic traumas had positive results from interaction with plants. It was recommended to use horticulture therapy for veterans, low-income families, or homeless people to avoid the cost of medicine and build self-esteem through the activities of gardening.

In short, pre-existing anxiety and depression may be linked to a higher potential risk of PTSD. Harris et al. (2005) pointed out that epidemiologic research results show the Asian American population reporting lower numbers of PTSD symptoms than Whites and African Americans. Mental illnesses can develop from ethnic discrimination which causes a lack of opportunities and unbalanced sources of arrangement to the outcome of unfair social standards. After decades, ethnic discrimination became a sensitive topic and transformed into judging

educational level and financial level influenced by capitalism. It is often seen in urban areas that have diverse ethnic groups and competitive lifestyles with a lack of green spaces.

2.1 The Effects of Horticultural Therapy on People's Health

Ferrini (2003) found dating back to the year 1300, an Irish monastery used growing plants as a therapy method, and it was until the end of 1700, that American psychiatrists started exploring the benefits of gardening to help patients with mental health issues. Davis (1995) defined horticultural therapy as “A medical discipline that uses plants, the activity of gardening, and the innate affinity that we feel toward nature as a professional means in programs of therapy and rehabilitation” (p.121). The concept of human-nature interaction means that green environments can engage the brain activities without working on it; meanwhile training and calming it. Moreover, it gives the impact of refreshing thoughts and recovering the whole body system.

According to Ferrini (2003), socio-horticulture, which relates between horticulture and human beings in both individuals and groups, applies the improvement in the quality of life and preserves the local environment. It could be a flexible setting at home, in public, or private spaces. Therefore, the flexibility of the horticultural structures suits various conditions and needs. Based on the flexibility of horticultural therapy, Ikei et al. (2014) examined 85 senior high school students in Japan on the changing views between 3 dracaena plants and a cardboard box by tracking their heartbeat rate. The result showed that increasing plant view improved physical relaxation by controlling the balance of parasympathetic nervous activity and sympathetic nervous activity triggering the calming effects associated with mental health (Ikei et al., 2014).

Stephanie (2015) described subjective well-being as referring to the evaluation of the quality of life, including emotions, fulfillment, and life satisfaction. Stephanie (2015) found both

households and gardens can be natt which is a verdant garden or cultivated field, connotes prosperity and health circumscribed by both qualitative and quantitative dimensions. People use micro-gardening to provide well-being at both household and city levels; the performances constitute socio-material realities (Stephanie, 2015). The micro-gardening affects personal experiences and benefits the surroundings with opportunities for well-being practices.

Additionally, Shiva (1989) pointed out that local Indian women have used natural herbs for healing purposes for 3,000 years which have been approved by Western countries. Reflecting on the relevant literature, natural elements have significant impacts on well-being as well as the environment for community connection.

The concept of human-environment design and horticulture therapy share the similarity of impact on mental health. Yao and Chen (2017) demonstrated the effect of horticulture therapy in Southern Taiwan. The authors pointed out that the interaction of gardening activities supports elder adults' creativity, self-confidence, self-esteem, cognitive function, and quality of life by learning the cycle of life in plants. Moreover, healthcare staff who have been involved in therapeutic gardening activities reported an improvement in their emotions as well. Therefore, horticulture therapy has a beneficial impact on the surroundings, not only for patients (Yao & Chen, 2017). Due to the healing power of horticultural therapy in patients and non-patients, it can be used as a preventive method for all populations.

2.2 The Benefits of the Sensory Experiment in Well-being

Sensory exploring practice often appears in horticultural therapy. The five senses have a strong connection with brain activities. McGreevy and Boland (2020) described that sensory-based treatment has significant impacts on the symptoms of PTSD; it has been announced by healthcare researchers encouraging a helpful exploration in trauma treatment. Moreover,

sensory-based therapy involves an individual's sensory system to help adults with PTSD adapt to their physical environments. Holland et al. (2018) studied how sensory-based program development, such as sensory rooms and customized sensory packages helps to reconcile overactive senses and emotions. Moreover, Brown and Dun (2002) suggested several programs including cooking, art-making, and yoga which used the concept of sensory treatment for mental health improvement.

Recently, in the rapid development of technology, Reger et al. (2019) pointed out that multi-sensory virtual reality (VR) was designed as a method to treat emotional processing in PTSD symptoms. Technically, VR systems present relevant VR interventions during exposure to the memory, such as traumatic events in sensory activities, which should increase emotional engagement and reduce the possibility of inadequate activation. Reger et al. (2019) showed the efficiency of VR for the treatment of PTSD in veterans, as well as survivors of terrorist attack events. Furthermore, Sekula et al. (2022) suggested using VR as a tool in the psychedelic experience, such as escaping from familiar reality and changing self-experience through sensory perception. In short, VR's evidenced capacity has provided relaxation, and reduced anxiety and external irritation; VR also promotes a peaceful mindset, enhances therapeutic alliance, and encourages self-efficacy. However, the cost of VR is not affordable for low-income patients and this technical program requires a budget to develop to be easily accessible.

Many possible treatment interventions involving the senses have been studied and practiced. Champagne (2011) explained how sensory progress impacts adults with PTSD in their work engagement and provides examples including aromatherapy and sensorimotor activities; furthermore, professional therapists need to be aware of the survival mechanisms and help PTSD patients ensure a sense of security and quality of life. Nickel et al. (2021) described that some

strong evidence interventions evaluated include neurofeedback therapy, emerging interventions, art, and music therapies supporting the sensory interventions in several rehabilitative recoveries to aid individuals who have experienced interpersonal trauma.

Overall, these studies provide applicable data on the effectiveness of sensory interventions. The sensory experiences elements, such as plants, natural sounds, landscapes, and cooking are economically friendly to service in PTSD groups. Although these interventions are well-studied and useful to patients, it is important to consider diverse backgrounds including their demographic conditions (i.e. insurance coverage, finances, etc.) and accessibility (i.e. travel, weather, etc.) for future program development.

2.3 Nature and cultural relationships in Ethnic Societies' Perspectives on PTSD

There are many types of environmental designs related to culture and nature in well-being such as Feng shui, which is one of the most popular principles worldwide based on wind and water. According to Bonaiuto et al. (2010), Feng shui is the design of placement in natural energy movement focusing on the interaction between human behaviors and social environment based on the philosophy of wind and water which are universal and dynamic energy. However, the limitation of Feng shui has the lack of science-based evidence and the challenge of testing efficiency, and is commonly used as a guideline in environmental psychology. On the other hand, Wilson (2005) described that Native spirituality helps connect people and the Earth, and explained the sweat lodge, which is the symbol of Mother Earth's womb and provides spiritual and healing benefits to resolve social and health issues. In short, human beliefs in connection with nature discovered the healing impact on mental health.

In the United States, different ethnic groups created their communities continuing their motherland cultures and the past and present generations seem challenged with similar injustice

issues in ethnic identities and belonging which can be one of the causes of developing PTSD symptoms. In Asian communities, Shih (2013) demonstrated that Taiwanese people tend to satisfy others' expectations and social norms to achieve higher goals; therefore autonomy support and psychological control could lead to different goals and personality dispositions. Moreover, Huang & Chen (2015) pointed out that spiritual involvement has an interpersonal connection and sense of security for individual needs, and the outcome shows a decrease in depressed mood and increasing the purpose of life. Furthermore, Son et al. (2008) demonstrated social support in interpersonal relationships is relevant to mental health comparing the similarities and differences between Taiwan and the United States. In short, cultural beliefs and expectations can be factors in developing PTSD symptoms.

The United States was founded by immigrants. the second large population in the United States is the Latino community (Welsh, 2013; Phinney, 1996; Betancourt & Lopez, 1993) explained that Latinos' cultural norms and the meaning of ethnic identity can be variables to explain why specific Latino subgroups have been placed at a higher risk for the potential development of PTSD. Moreover, Crenshaw (1991) deliberated about women of color and LGBTQ groups enduring violence from society and political systems because of cultural influence. The purpose of Crenshaw's study is to “takes a great deal of energy and arouses intense anxiety, and the most one could expect is that we will dare to speak against internal exclusions and marginalization, that we might call attention to how the identity of “The group” has been centered on the intersectional identities of a few (p.1299)”.

It is important for non-medicine and non-human-involved treatment to address LGBTQ groups. Bell (2010) explained that nature does not show discrimination against LGBTQ groups like human society does. In his concept, nature tends to be neutral and less biased which is suited

for people who have social anxiety or are antisocial. The natural environment has a larger capacity than human society.

2.4 Cause and Effect in Developing PTSD

There are several ways to develop symptoms of PTSD, such as accidents, wars, inequality, and verbal and physical violence. It can happen at any age and anywhere. The human brain has a self-protection system to avoid dangerous situations, avoid repeated trauma and painful feelings. PTSD patients are overwhelmed by traumatic events by their brains sending repeated trauma signals. Roberts et al. (2011) concluded that the White population has higher exposure to traumatic events experienced by a close friend or relative, witnessing an unexpected death that was common, and carrying a higher risk for developing PTSD. Moreover, experiencing war-related events and child abuse leads to higher risks. African Americans and Hispanics had a higher risk of facing domestic violence as children, African Americans had a higher risk of conflict, and Asians had a higher risk of being a civilian in a war zone than Whites.

Williams (2021) described based on reliable data from the Diagnostic and Statistical Manual of Mental Disorders in discrete events such as being in combat or sexual assault, that experiencing racism can have psychological effects on people of color causing PTSD. Racial trauma can be severe causing mental and emotional injury because of the long-term continued traumatic effect of racism. Researchers examined race-related stressors and traumatic events, and their findings were able to predict PTSD symptoms in Latino and African American adults.

In African American communities, Washington (2021) pointed out that “Racial battle fatigue” and “Post-traumatic slave syndrome” are terms coined in the 2000s. They support the idea of racism being a form of trauma. The Strong Black Woman trope is one form of historical racism that originates in slavery and continues today and impacts African American women from

generation to generation. The historical trauma has been carried through generations and developed into characteristics such as insecurity and sensitivity from the relationships between different ethnic groups.

Asnaani and Hall-Clark (2017) explained that the primary challenge of treatment-seeking in PTSD patients is the fear of stigma and found that Latinos may be willing to report exposure to large-scale traumas rather than individual or personal events. Similarly to Asian American culture, they focus on self-ability to exercise self-control to handle negative internal mental conditions rather than expressing their feelings. The majority of the impact on individuals seeking treatment for PTSD fearful of being branded is found within the military, among HIV-positive patients, and among sexual minority populations in a large number of ethnic minorities.

Moreover, Acker (2006) mentioned that the Equal Employment Opportunity Commission is trying to reduce discrimination in workplaces however, hidden inequality cases seem to have increased, but no one knows for sure how many female workers have been treated unfairly in the past. The unequal treatment in a working environment can lead to developing PTSD symptoms. From my perspective, sexually hierarchical job positions are based on the stereotype of physical strength from men derived from cultural practices. When women work as men, they may not receive the same respect as men do. The social expectation of gender roles causes pressure and discrimination, and it is one of social violence for people who endure this situation for long-term periods.

The cause-and-effect relationship in PTSD has appeared in unjust environments from ethnic cultures, gender, fears, and high social expectations. As new generations become more sensitive, they have a higher risk of developing PTSD symptoms such as depression, anxiety, and stress, especially in urban areas that have multiple cultures with tense lifestyles. Urban

residents often lack green spaces and natural environments which could create potential pressure on physical and mental health.

Overall, the literature reviews addressed the impact of horticultural therapy, the influences of sensory among brain activities and emotions, and interpersonal relationships with cultural influences. The unseen factors in human-human relationships and human-nature relationships play a significant role in mental health. It is hard to define and notice in small details which could affect larger issues in the long-term period. Understanding the background causing PTSD symptoms can help to narrow the direction of finding the root of issues; examining the impact of horticultural therapy (sensory experiment) can provide a better solution for PTSD patients as well as benefit others.

CHAPTER 3: METHODOLOGY

In this chapter, the research methods used in this study will be described. Section 3.1 will examine the site background. Sections 3.2 and 3.3 will explain the process of the sensory experiment and the development of questionnaires. Section 3.4 will discuss the research question that addresses the impact of micro-horticultural therapy designed package via sensory experiment on mental health improvement.

This study used an experimental research design to compare the pre-and post-outcomes by using three types of questionnaires which were the Background questionnaire; Response questionnaire; and the Depression, Anxiety Stress Scale 21(DASS21) questionnaire over two weeks.

During the study, the DASS21 questionnaire was applied at the beginning, middle, and end phases to compare the outcomes within the different periods. The Background questionnaire focused on mental and physical health including self-relaxing and learning modes. The Response questionnaire included the preferred sensory experience permitted to compare the changes after sensory experiences based on the result of DASS21 questionnaires. The participants were all experiencing PTSD symptoms analyzing individuals based on their depression, anxiety, and stress levels.

3.1 Site background

Michigan State is famous for auto and agricultural development located in the Great Lakes region and close to Canada. According to World Population Review (2022), Michigan is the 11th largest state in the United States by area. The largest city is the Motor City, Detroit, and other large cities in Michigan including Grand Rapids, Warren, Sterling Heights, Lansing, Ann

Arbor, and Flint. Most of the participants attending the sensory experience reside in the Lansing area where State Capital and Michigan State University are located.

The majority population in Michigan is White Caucasian with ancestry including German, Belgian, British, Polish, and Irish while Western Michigan has the highest concentration of Dutch residents compared to other states. African Americans are most of the population in Detroit and Flint. Meanwhile, Southeast Michigan has a large population of Arab people. The highest rate of bachelor's degrees is in the Asian population (World Population Review, 2022). From National Alliance on Mental Illness Michigan (2022), shows anywhere between two to nine percent of the population has had some degree of PTSD with most cases found among inner-city youths and people who come from third-world countries. Based on Lansing (2022) data, the racial rate in the Lansing area is 51.4% White, 22.5% African American, 13.7% Hispanic, and 4.2% Asian in the 2020 census.

According to Neighborhood Scout (2022), Lansing city crime rate is 47.22 per 1,000 residents and only safer than 4 % of other U.S. cities. Both property crime and violent crime are higher than the national average. Reflecting on crime rate data, the diversity of population from residents, immigrants, and foreigners (college students/tourists/employees) requires different needs, seemingly Lansing or in general Michigan's political system is not ready to deal with the needs of different ethnic groups.

3.2 Participants recruiting and examining progress

The participants were people with PTSD symptoms who went through two weeks of sensory experience and three questionnaires. The participants were selected based on purposive sampling to focus in-depth on relative PTSD symptoms in a small group. We reached out to school faculties to help to spread out the digital recruiting poster as well as printed out flyers and

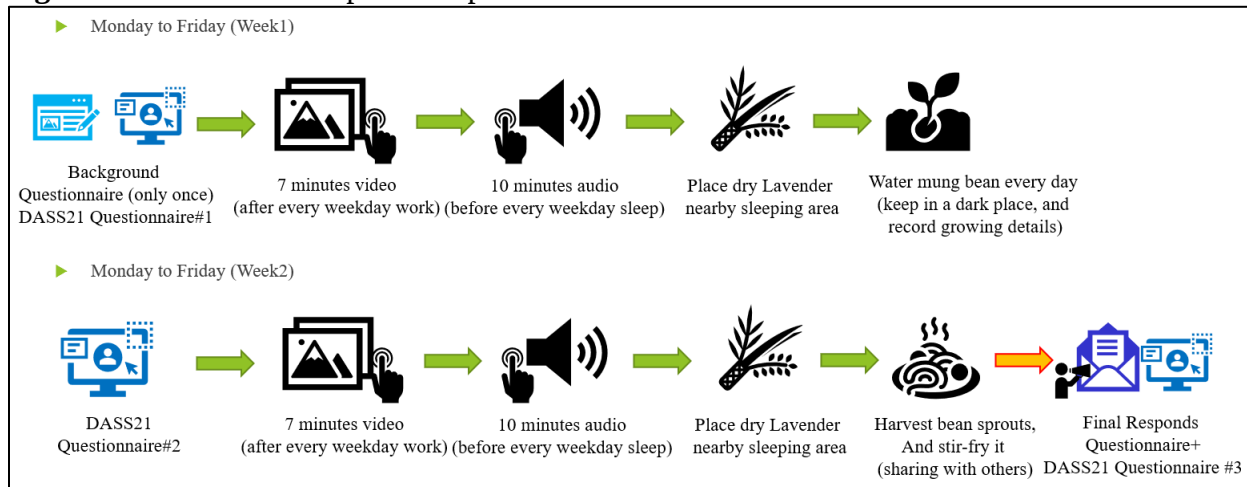
posted them in commercial areas around the cities of East Lansing, Lansing, Okemos, and Sterling Heights. There were a total of 23 volunteer participants and 11 dropped out during the experiment, 12 completed the whole process. The focus group had been tracked via YouTube Studio by clicking their requested landscape videos daily and providing mung beans to grow by themselves for recording the circle of life process.

They were asked to fill out background questionnaires as well as the Depression, Anxiety, Stress Scale 21 (DASS21) questionnaire before starting the sensory experience. At the beginning of the second week, participants filled out the second DASS21 questionnaire as they completed the second sensory experience, they filled out another DASS21 and response questionnaire. The participants took the DASS21 a total of three times during different periods of sensory experiences. The dynamic of the outcomes in all three DASS21 questionnaires analyzed three category levels: Depression, Anxiety, and Stress.

3.3 Data Collection Procedures

The questionnaires were developed into quantitative and qualitative responses in parallel. The survey source from literature and online data designs for PTSD participants was divided by their depression level, anxiety level, stress level, professional achievements, and interpersonal relationships. The Background questionnaire was designed to approach age, gender, school crime experiences in and out of class, types of learning, and relaxation. The sensory experience was developed to include all five senses: visual, auditory, smell, touch, and taste.

Figure 1. illustrates the experiment procedures



The sensory experiments were conducted as follows:

Step 1.

- 1.1 The participants completed a background questionnaire and the first DASS 21 questionnaire.
- 1.2 Took parts in the sensory experience and repeated it daily.

Step 2.

- 2.1 The participants completed the second DASS 21 questionnaire at the beginning of the second week.
- 2.2 Took parts in the sensory experience and repeat it daily.
- 2.3 Completed a response questionnaire and the third DASS21 questionnaire at the end of the sensory experience.

The sensory experience was conducted for two weeks except for weekends for a total of ten days. Everyday Participant was asked to follow the steps below:

1. Click a link to watch about 7 minutes of natural landscape video after work.
2. Listen to 10 minutes of natural sounds before going to sleep.
3. Provide a dry lavender bag to place nearby the sleeping area to support sleeping quality.
4. Provided participants with mung bean sprouts and recorded the growing process.

5. Harvesting, cooking, and eating the bean sprouts would complete the sensory experience.

The purpose of the visual part is based on the theory of biophilic design, using visual senses combined with natural landscape videos to perform eye relaxation exercises. The auditory part provides a brain relaxation treatment for the sounds of insects and birds and the sound of wind and water. The sense of smell is aimed at aromatherapy and meets the needs through the effects of herbs. For example, lavender improves sleep quality. The touch and taste sections come together to provide a small feeling of achievement and a sense of being needed by taking care of mung beans. The combination of sensory experience and questionnaires with a credible psychological measure scale (DASS21) allowed an understanding of the impacts of horticultural therapy on PTSD patients.

All the questionnaires used online Google form format presenting and collecting. Participants received the questionnaire links and filled them out digitally. We downloaded the spreadsheets and used Excel tools to visualize the data. Moreover, this research had been approved by Institutional Review Boards (IRB) for the protection of human subjects.

3.4 Instruments and Measurement

The DASS 21 is a short questionnaire developed from DASS, and it is a self-report based on 21 questions to measure a range of symptoms that are common in PTSD patients. Each item in DASS 21 scaled from 0 (did not apply to me at all over the last week) to 3 (applied to me very much or most of the time over the past week). There are seven items in each subscale of depression(D), anxiety(A), and stress(S), and the result in each summed score is multiplied by two.

The DASS 21 questionnaire data were collected three times during the sensory experiment and classified into three categories: Depression level, Anxiety level, and Stress level.

The DASS 21 Questionnaire has seven questions for each symptom level. Question numbers 3, 5, 10, 13, 16, 17, and 21 are counted in depression level; questions numbers 2, 4, 7, 9, 15, 19, and 20 are counted in anxiety level; question numbers 1, 6, 8, 11, 12, 14, and 18 are counted in stress level as shown in Figure 2. The severity ratings in the Depression level are: Normal 0-4, Mild 5-6, Moderate 7-10, Severe 11-13, and Extremely Severe 14+. The severity ratings in the Anxiety level are: Normal 0-3, Mild 4-5, Moderate 6-7, Severe 8-9, and Extremely Severe 10+. The severity ratings in Stress level are: Normal 0-7, Mild 8-9, Moderate 10-12, Severe 13-16, and Extremely Severe 17+.

Figure 2. DASS 21 Evaluation Form

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement.
The rating scale is as follows:

0 Did not apply to me at all - NEVER
1 Applied to me to some degree, or some of the time - SOMETIMES
2 Applied to me to a considerable degree, or a good part of time - OFTEN
3 Applied to me very much, or most of the time - ALMOST ALWAYS

					FOR OFFICE USE			
		N	S	O	AA	D	A	S
1	I found it hard to wind down	0	1	2	3			
2	I was aware of dryness of my mouth	0	1	2	3			
3	I couldn't seem to experience any positive feeling at all	0	1	2	3			
4	I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3			
5	I found it difficult to work up the initiative to do things	0	1	2	3			
6	I tended to over-react to situations	0	1	2	3			
7	I experienced trembling (eg, in the hands)	0	1	2	3			
8	I felt that I was using a lot of nervous energy	0	1	2	3			
9	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3			
10	I felt that I had nothing to look forward to	0	1	2	3			
11	I found myself getting agitated	0	1	2	3			
12	I found it difficult to relax	0	1	2	3			
13	I felt down-hearted and blue	0	1	2	3			
14	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3			
15	I felt I was close to panic	0	1	2	3			
16	I was unable to become enthusiastic about anything	0	1	2	3			
17	I felt I wasn't worth much as a person	0	1	2	3			
18	I felt that I was rather touchy	0	1	2	3			
19	I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat)	0	1	2	3			
20	I felt scared without any good reason	0	1	2	3			
21	I felt that life was meaningless	0	1	2	3			
TOTALS								

The design of DASS 21 is not a diagnosis tool, it is suggested to take between two to four weeks the same as a medical treatment would be to assess improvements after this period. DASS has certainly contributed to identifying general symptoms, offering individual change at each level that helps clinicians to pay attention to specific diagnoses. The functions of DASS 21 in depression, anxiety, and stress have not only to measure the level of symptoms but also to measure patients' responses after treatment.

The Response Questionnaire was reflected in section II. Sensory experience/Background questionnaire comparison section with seven items. The result in the highest professional achievements was reflective of their living environment which was either Urban near industrial with air pollution, Urban near commercial districts with noise and busy traffic, Suburban agricultural land-use surrounding, Suburban parks and residential land-use surrounding, and Mountain side around the natural environment. In the Response Questionnaire section II, the participants responded to the changes in their learning types and their relationships with others. In this section, results will compare the data showing the majority and the most effective sense used to improve their body and mental health as a guideline for clinicians to focus on.

3.5 Data Analysis

Data analysis is based on questionnaires which are DASS 21, a Background questionnaire, and a Response questionnaire. The DASS 21 is classified into depression level, anxiety level, and stress level; and it was conducted three times at different times concerns. The collected data were examined by the Kruskal Wallis test in all 21 questions to see the differences before and after the sensory experiment, and the One sample t-test was to see the difference between the total score of mean value at the beginning and the end of the sensory experiment as well as examined extra three times in depression, anxiety, and stress levels. The total score of

mean value from question numbers 3, 5, 10, 13, 16, 17, and 21 were presented in depression level. The total score of mean value from question numbers 2, 4, 7, 9, 15, 19, and 20 was presented in anxiety level. The total score of mean value from question numbers 1, 6, 8, 11, 12, 14, and 18 was presented in stress level.

The Background questionnaire and Response questionnaire are comprehensive questionnaires including seven items of reflection from the sensory experiment. The reflection questions are classified into the change of learning modes and the change of interpersonal relationships as well as responding to the individual preference of sensory as an efficient receiver in their well-being improvement. All the data collected is from 12 participants' self-responses, and all participants were experiencing two weeks of the sensory experiment.

3.6 Research Question

Based on the expectation of the Sensory experience and questionnaires development in interpersonal relationships, the hypothesis perspective in effectively targeting problems addressed the individual career, as well as the surrounding environments. Some PTSD patients have difficulties attending group therapy or find it hard to trust psychologists; therefore, the research question addresses how the micro-horticultural therapy designed package (sensory experiment) in this research provides benefits, such as negative emotion reduction, improvement of professional achievements and interpersonal relationships for adults with PTSD. The design of this two weeks sensory experience program supports individual experience in private. The process is flexible, enabling participation from any place they feel comfortable. The materials for sensory experience are low-cost which is beneficial for low-income and no health insurance coverage patients.

It is important to examine the impacts of sensory experience, especially in some ethnic cultures treating PTSD patients as a stigma for their family and community. Therefore, prevention and intervention of mental health needs to focus on multiple risks and protective factors in behavioral health, social environment, and ecological system (Hsieh e al., 2019). Participants can interact with natural elements such as natural landscape videos, dry lavenders, and planting mung beans, being also able to share their harvested bean sprouts with others for social interaction and body nutrition improvements via sensory experiment.

CHAPTER 4: RESULTS

A background questionnaire was used as a baseline to understand participants' behavior pattern and their living environment. The questionnaire included general information about the participants such as age, symptoms, types of the living environment, and personal exercise time. 12 participants were selected for this study. Most of the cases were aged 18-25, with normal health during the last 12 months. In addition, seven cases had been told that they have Post Traumatic Stress Disorder (Anxiety, stress, panic attack). Some of the cases lived in residential and agricultural areas, but the highest percentage of them lived in urban areas. Besides, participants were asked about the average time spent outdoors, and 7 out of 12 participants spend less than one hour per day in an outdoor environment while the others spend more than this in Figure 7.

The purpose of understanding participants' behavior patterns, health conditions, and surrounding neighborhoods is to group the majority of adults with PTSD in the relationship between their outdoor activities and the types of environments. As Figure 3 illustrates, more than half of the participants are aged 18-25, and half of them responded with normal health conditions in the past 12 months as Figure 4 shows.

Figure 3. Participants Ages

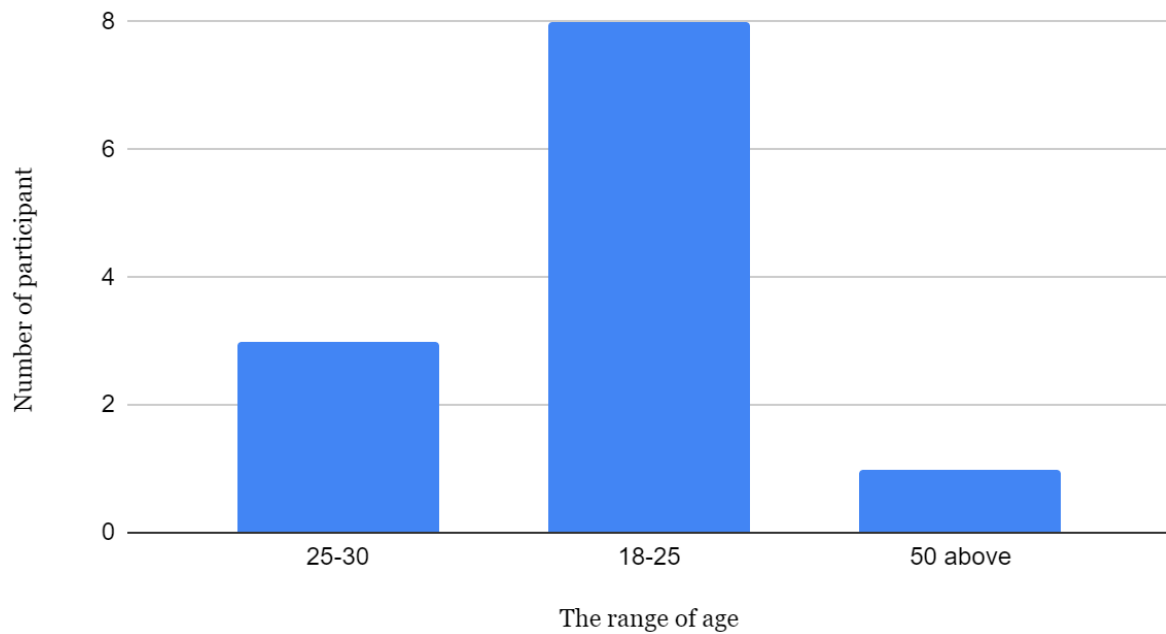


Figure 4. Participants' Health Conditions in the past 12 months

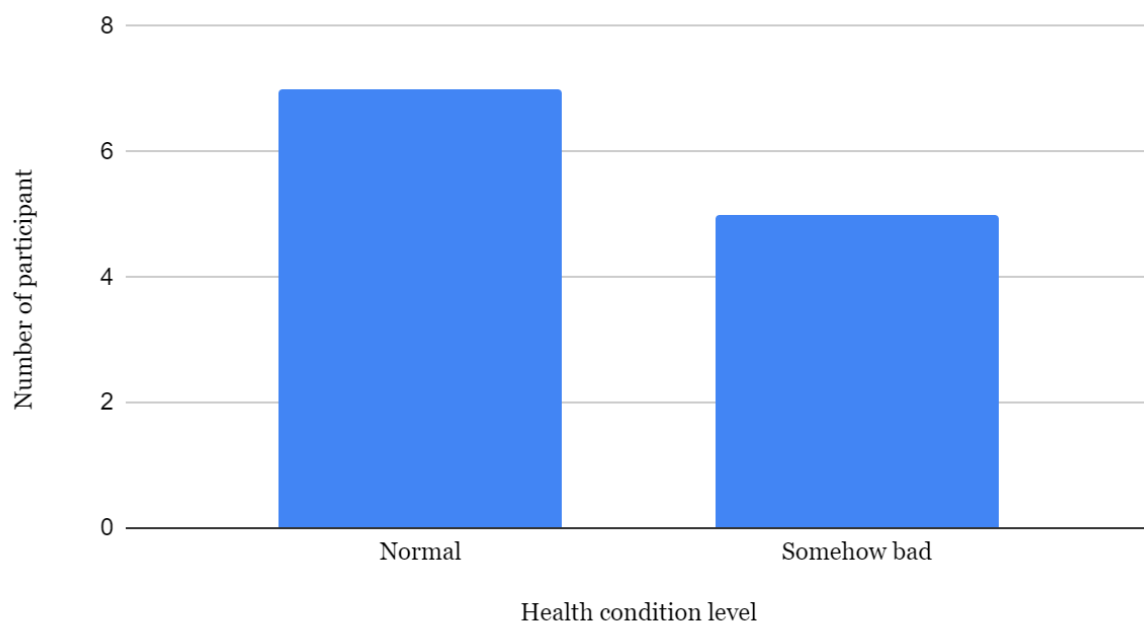
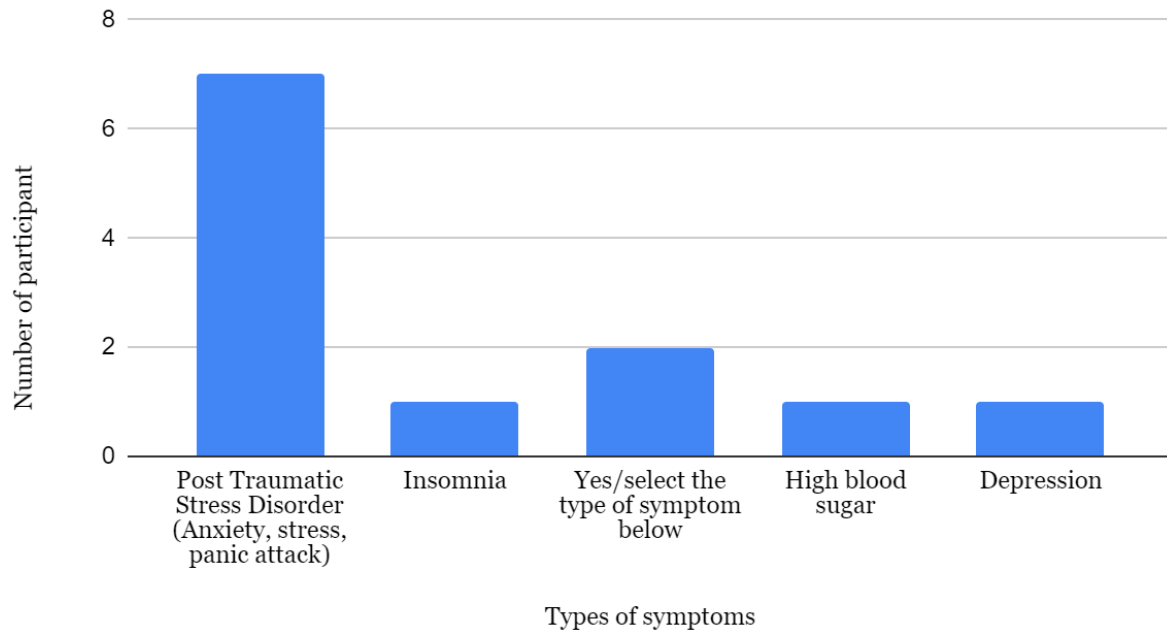


Figure 5 shows the number of participants who had health symptoms. 7 participants had Post Traumatic Stress Disorder which was the highest number of reported symptoms. On the

other hand, there was a fluctuation in the number of responses about the remaining symptoms, but only 2 or fewer were the number responses for each symptom.

Figure 5. Participants' Health Symptoms



Besides, the participants were asked about their surrounding living environments. The results are clarified in Figure 6 that 7 out of 12 participants mentioned that they were living in a commercial district with a noisy and busy traffic area. Then, 4 and 1 participants reported that they were living in suburban areas with residential land use and agricultural land use respectively.

Figure 6. Participants' Living Neighborhoods

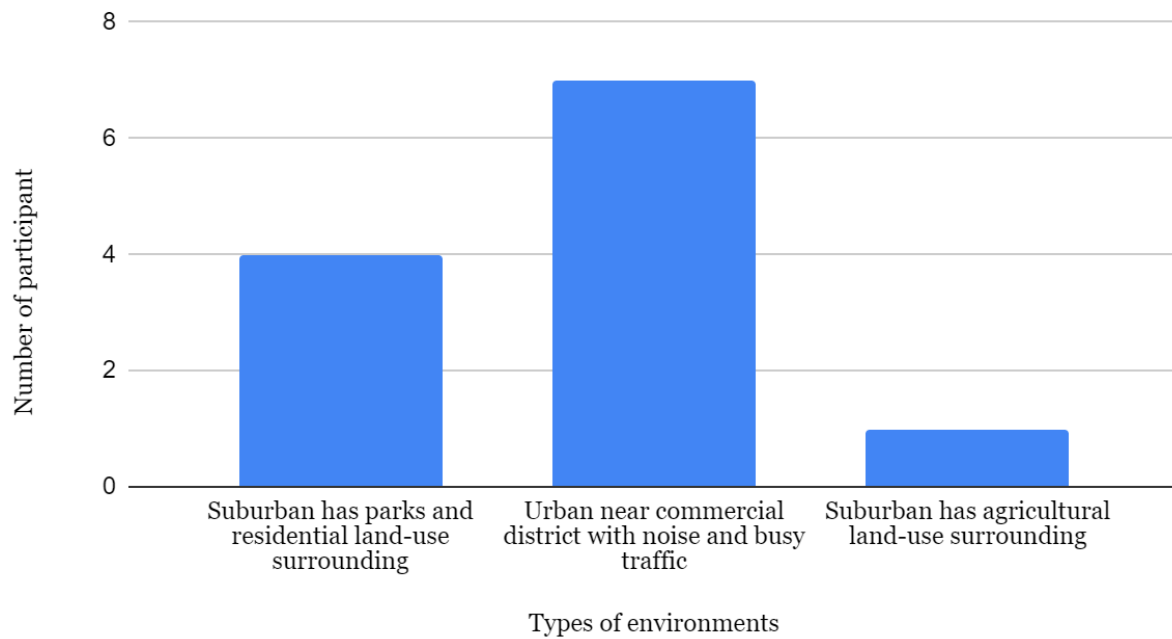
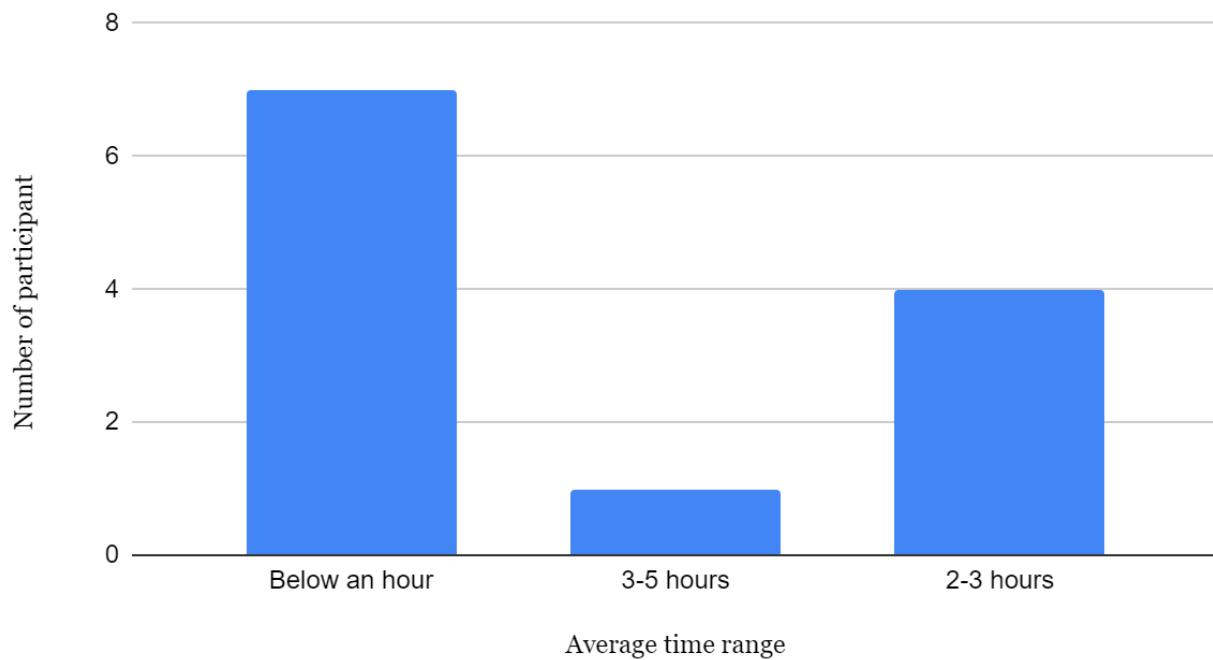


Figure 7. Daily Time Spent Outdoors by Participants



Finally, Figure 7 illustrates the number of participants reporting the average spent time in outdoor environments. Seven participants spend less than one hour per day which was the

highest number of participants among other answers. Only one participant reported that he spends 3-5 hours while four of them spend 2-3 hours outdoors per day. The demographic of participants helps to see the relationships between the health and environmental conditions that more than half of participants lack green space living in an urban area was found to less than an hour spent time outdoors daily.

4.1 Responses in Three Different Stages of the DASS 21 Questionnaire

Data analysis is essential for achieving the intended outcomes of any study. The first section of this chapter provides a descriptive analysis of the total score of stress, anxiety, and depression for all of the participants in each stage of implementing the experiment. Kruskal-Wallis and T-test were used to compare means to find out if there are differences in the psychological response each time the experiment was implemented. The second section of this chapter introduces a description of the demographic information of the participants while the last section represents the description of the sensory of participants during the experiment. Based on the self-response from 12 participants, the results have been calculated as the mean of the whole questions for each section of the survey in anxiety, stress, and depression levels. Next, the collected data were calculated as the total number of answers for the whole participants for each section.

Figure 8 shows the total score of stress, anxiety, and depression for all of the participants in each stage of collecting the data. All the participants had normal anxiety score rates; the stress and depression had declined to moderate score rates in the third stage after the sensory experiment. It can be inferred from Figure 8 that there was a decrease in all responses. Overall, the total score of stress was the highest in all stages while depression and anxiety were lower. In stage one, the total score of stress and depression was 16 for each while the total score of anxiety

was the highest which was equal to 18. In stage two, there was a gradual decrease in all of the total response scores but with small differences. For example, the total score for stress was 13 meanwhile the total scores for anxiety and depression were 10 and 11 respectively.

Figure 8. DASS21 Total Values in Three Stages

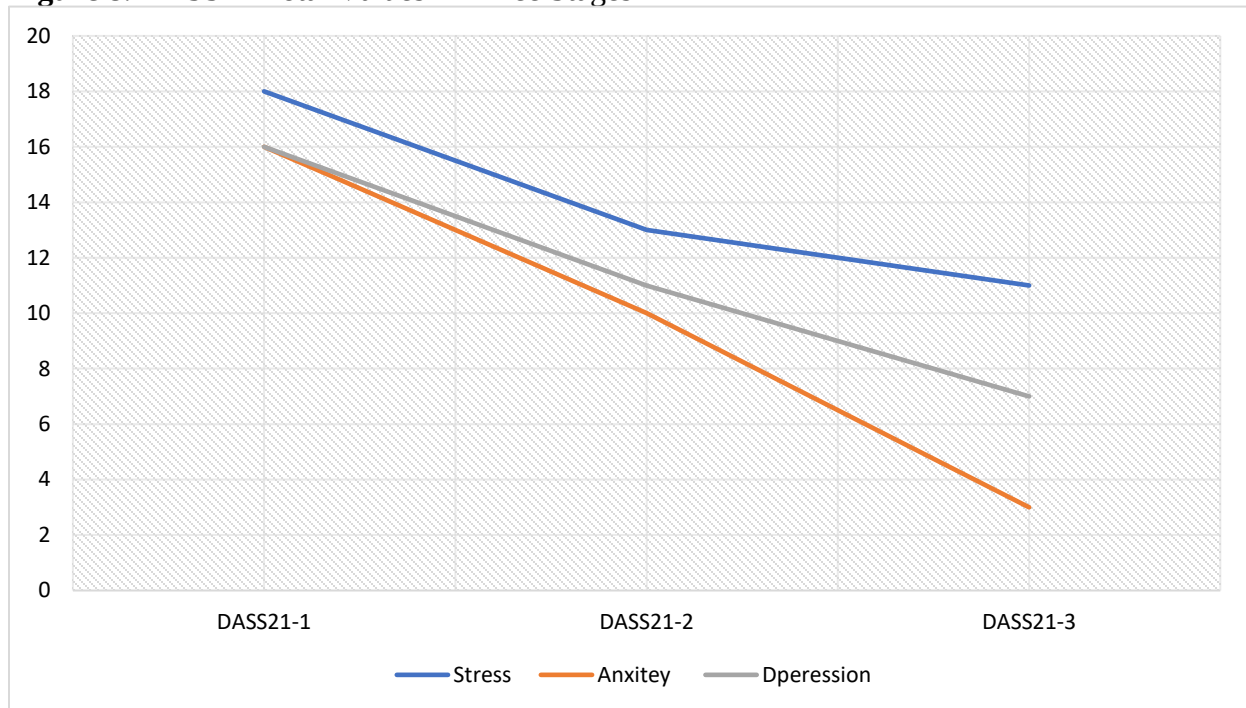


Figure 9 clarifies the score rating standard for each response. Therefore, based on Figure 8, the participants had moderate stress in stage one while they became normal in stage three. The average overall score of anxiety in the first stage was eight for whole participants which means that most of them had severe anxiety while they had normal anxiety in stage three. The participants had mild depression levels in stage one while they normally stress in stage three.

Figure 9. DASS 21 Score Ratings Standard

	Depression	Anxiety	Stress
Normal	0 - 4	0 - 3	0 - 7
Mild	5 - 6	4 - 5	8 - 9
Moderate	7 - 10	6 - 7	10 - 12
Severe	11 - 13	8 - 9	13 - 16
Extremely Severe	14 +	10 +	17 +

Then the Kruskal-Wallis one-way ANOVA test was used. It is a non-parametric test. This statistical method is to test the null hypothesis also called the H statistic. The hypotheses of the test are H_0 = population medians are equal, and H_1 = population medians are not equal. The result determines the significant difference between groups.

In this study, this test was used to determine which one of the participant's answers in DASS form have differences between the experiments. The results of the test are presented in Table 1. Among the anxiety questions, the result indicated that awareness of dryness of the mouth (Q2) has a significant difference during the experiment, $\chi^2(2) = 10.732$, $p = 0.005$. In addition, the result indicated that experienced trembling in hands has a significant difference, $\chi^2(2) = 6.202$, $p = 0.045$. the participants' response of "Feeling scared without any good reason" (Q20) has a difference between the experiments, $\chi^2(2) = 6.313$, $p = 0.043$. Among all stress questions, the response of participants about this question "I felt that I was using a lot of nervous energy" (Q8) was different between the experiments, $\chi^2(2) = 5.936$, $p = 0.051$. In terms of depression, the results indicate that the participants' question about "I found it difficult to work up the initiative to do things" (Q5) was different after implementing each experiment, $\chi^2(2) = 10.076$, $p = 0.006$. Also, the results from the table about the answer to the question (Q16) "I was unable to become enthusiastic about anything" show that there was a difference between the experiments; $\chi^2(2) = 7.738$, $p = 0.021$. Lastly, it was found that there was a difference in the

response of the participants about the question “I felt that life was meaningless” (Q21), $\chi^2(2) = 6.229$, $p = 0.044$

Table 1. Analysis of Variance

Test Statistics ^{a,b}			
Question numbers	Kruskal-Wallis H	DF	Asymp. Sig.
1	1.819	2	0.403
2	10.732	2	0.005
3	3.173	2	0.205
4	1.549	2	0.461
5	10.076	2	0.006
6	1.604	2	0.448
7	6.202	2	0.045
8	5.936	2	0.051
9	1.860	2	0.395
10	3.559	2	0.169
11	0.409	2	0.815
12	3.380	2	0.184
13	1.678	2	0.432
14	1.143	2	0.565
15	5.432	2	0.066
16	7.738	2	0.021
17	3.377	2	0.185
18	4.591	2	0.101
19	5.567	2	0.062
20	6.313	2	0.043
21	6.229	2	0.044

a. Kruskal Wallis Test b. Grouping Variable: Time

A T-test is a type of statistical test in parametric analysis. The test is used to compare the means of two groups. The test was implemented four times; the mean of the DASS-21 total score, the mean of the stress questions, the mean of the anxiety questions, and the mean of the depression questions. One-sample t-test was conducted to determine if the mean of the DASS-21 total score at the end of the experiment was significantly different from the mean value of the DASS-21 total score at the beginning. The mean value at the beginning of the experiment was 17. The results showed that the sample mean score of DASS-21 after the experiment ($M=7$,

SD=4) was significantly less than the test value $t(2) = -4.330$, $p = 0.049$ (Tables 2 and 3 show the results of the test).

Table 2. One-Sample Statistics in Total DASS21-3 of the Mean Value

One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
DASS3	3	7.00	4.00	2.30940

Table 3. One-Sample T-test in Total DASS21-3 of the Mean Value

One-Sample Test				
Test Value = 17				
	t	df	Sig. (2-tailed)	Mean Difference
DASS3	-4.330	2	.049	-10.00

In the Stress section, the mean value at the beginning of the experiment was 2. The results showed that the sample mean score of stress after the experiment ($M=1$, $SD=1$) was significantly less than the test value $t(10) = -3.317$, $p = 0.008$ (Tables 4 and 5 illustrate the results).

Table 4. One-Sample Statistics in Stress Score of the Mean Value

One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
stress	11	1.00	1.00	.30151

Table 5. One-Sample T-test in Stress Score of the Mean Value

One-Sample Test				
Test Value = 2				
	t	df	Sig. (2-tailed)	Mean Difference
stress	-3.317	10	.008	-1.00

Finally, in the anxiety section, the mean value at the beginning of the experiment was 1. The results showed that the sample mean score of Anxiety after the experiment ($M=0.2727$,

SD=0.4671) was significantly less than the test value $t(10) = -5.164$, $p < .001$ (Tables 6 and 7 represent the results).

Table 6. One-Sample Statistics in Anxiety Score of the Mean Value

One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
Anxiety	11	.2727	.46710	.14084

Table 7. One-Sample T-test in Anxiety Score of the Mean Value

One-Sample Test				
Test Value = 1				
	t	df	Sig. (2-tailed)	Mean Difference
Anxiety	-5.164	10	.000	-.72727

In the depression section, the mean value of the f at the beginning of the experiment was 2. The results showed that the sample mean score of Anxiety after the experiment ($M=0.6364$, $SD=0.6742$) was significantly less than the test value $t(10) = -6.708$, $p < .001$ (Tables 8 and 9 illustrate the results of the test).

Table 8. One-Sample Statistics in Depression Score of the Mean Value

One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
depression	11	.6364	.67420	.20328

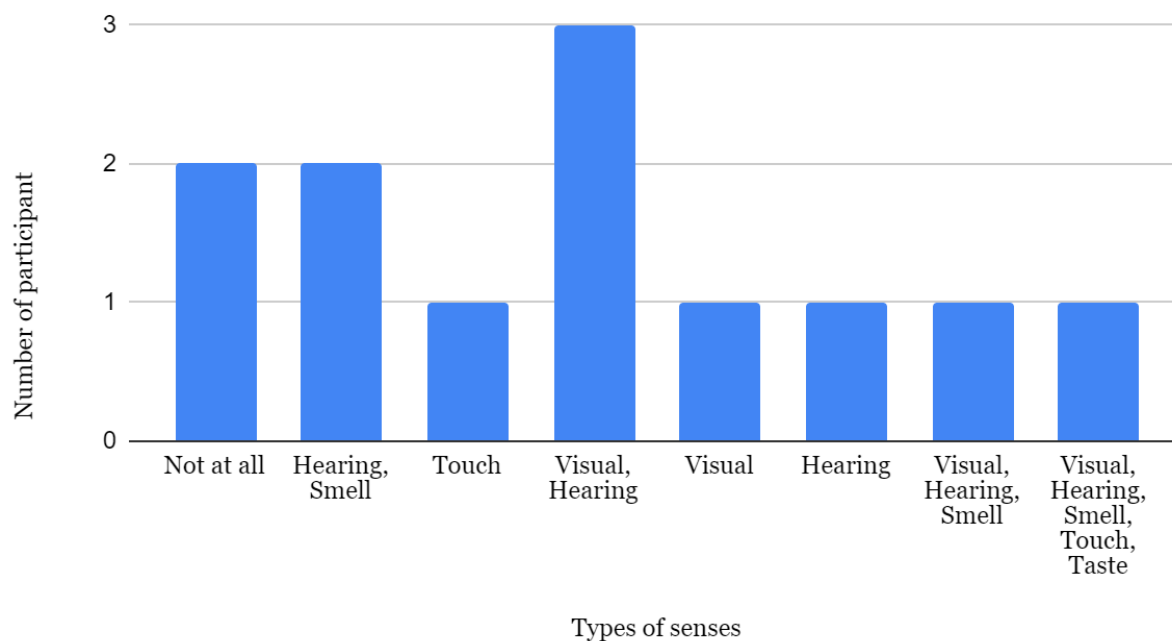
Table 9. One-Sample T-test in Depression Score of the Mean Value

One-Sample Test				
Test Value = 2				
	t	df	Sig. (2-tailed)	Mean Difference
depression	-6.708	10	.000	-1.36364

4.2 Sensory Experience Reflects in Response Questionnaire

The results from the response questionnaire were collected in the section of the sensory experiment reflection and responded to background questionnaires (baseline scenario) on health conditions, professional achievements, and interpersonal relationship improvements in their peers, superiors, and families. The participants completed the two weeks of the sensory experiment and self-report in response questionnaire at the end of the experiment. The relevant questions are asking which sensory found a higher influence on their well-being, and how their professional achievements and interpersonal relationship improved after the sensory experiment. To summarize the response questionnaire, most of the participants found visual and hearing sections experiencing higher improvement in their well-being in Figure 10.

Figure 10. Five Senses Response in Well-being after the Sensory Experiment



4.3 Self-learning Methods Affected by Sensory Experience

The outcomes after the sensory experiment show more than half of the participants have higher achievements in their professional fields and changed their learning modes to self-

management/setting goals for reward or punishment (self-push). The self-learning modes section responds to past professional achievements and learning methods. Based on the results in Figure 12, more than half of the participants responded “yes” to their professional improvement after the sensory experiment. The same number of participants had been changing their learning modes after the sensory experiment. Figure 11 shows the types of learning mode changes. The positive feedback of higher achievement in their professional fields explained that sensory has a strong influence on brain activities which affect their behaviors.

Figure 11. The Type of Self-learning Modes Changing after the Sensory Experiment

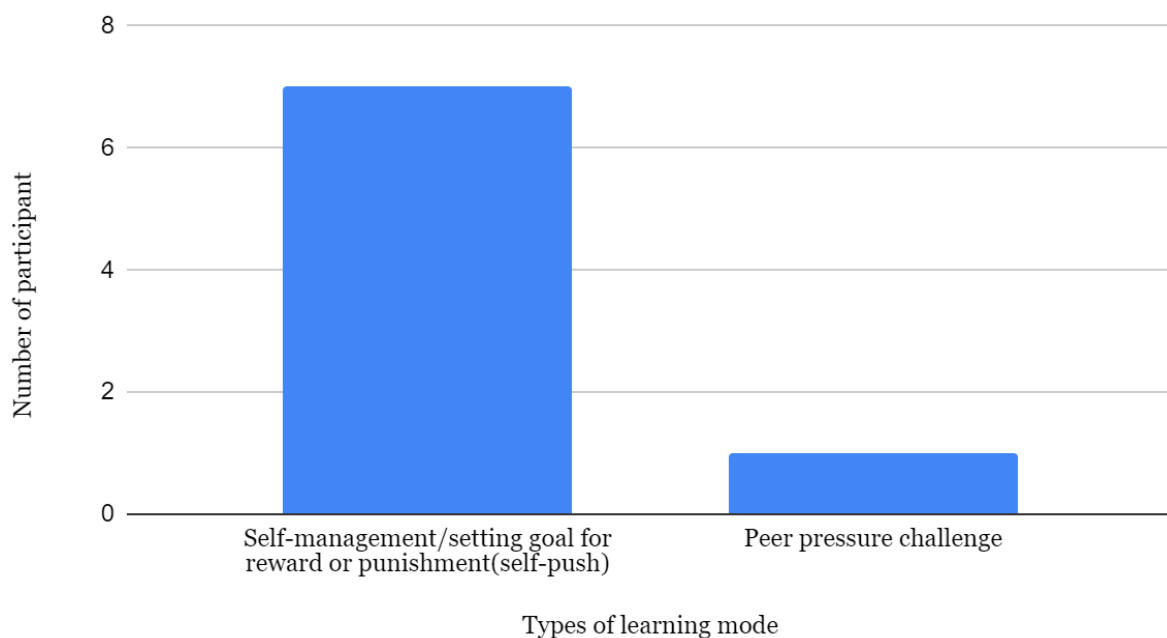
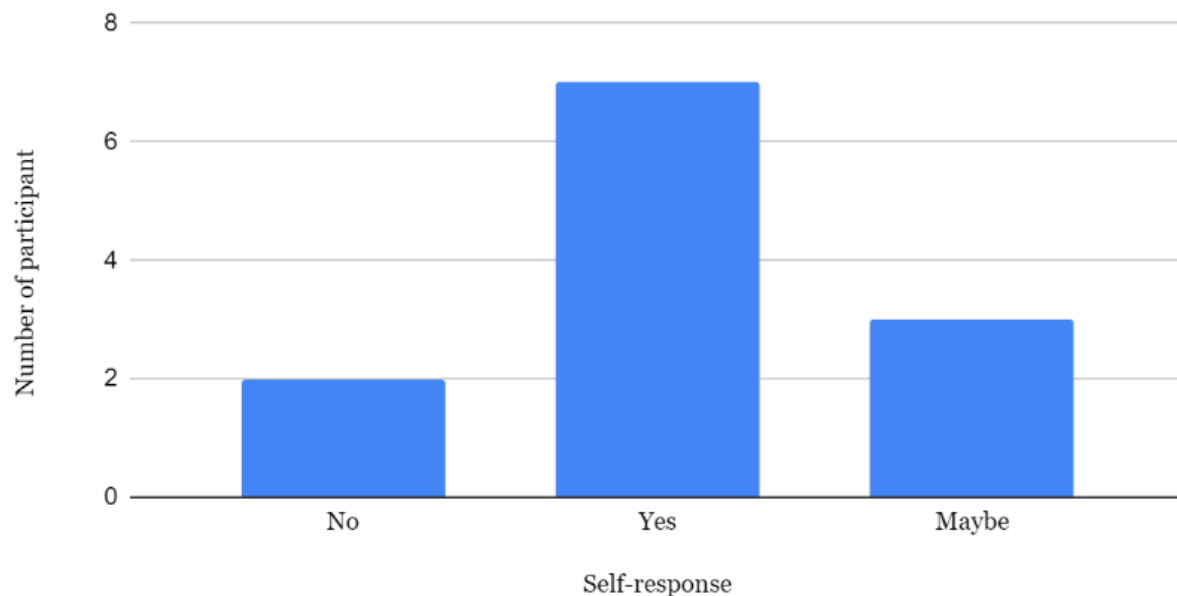


Figure 12. Self-report of Improvement in Professional Fields after the Sensory Experiment



4.4 Interpersonal Relationships Affected by Sensory Experience

Information about the family structure in which the participants lived was included in the questionnaire. The highest number of them grew up in a family with parents and siblings which was equal to 6 out of 12. 4 and 2 participants mentioned that they grew up with single parents and one child respectively. Additionally, many PTSD patients found difficulties in their interpersonal relationships, especially with family members who stay for almost 24/ 7 in their lifetime. In the interpersonal relationships section, three different interpersonal relationships were classified: participant with family relationships; participant with peers, colleagues, and friends relationships; and participant with teachers and bosses' relationships. The results in Figure 14 show half of the participants found improvement in their family relationships, which could reduce potential home violence after the sensory experiment.

Figure 13. Family Structure has grown up with

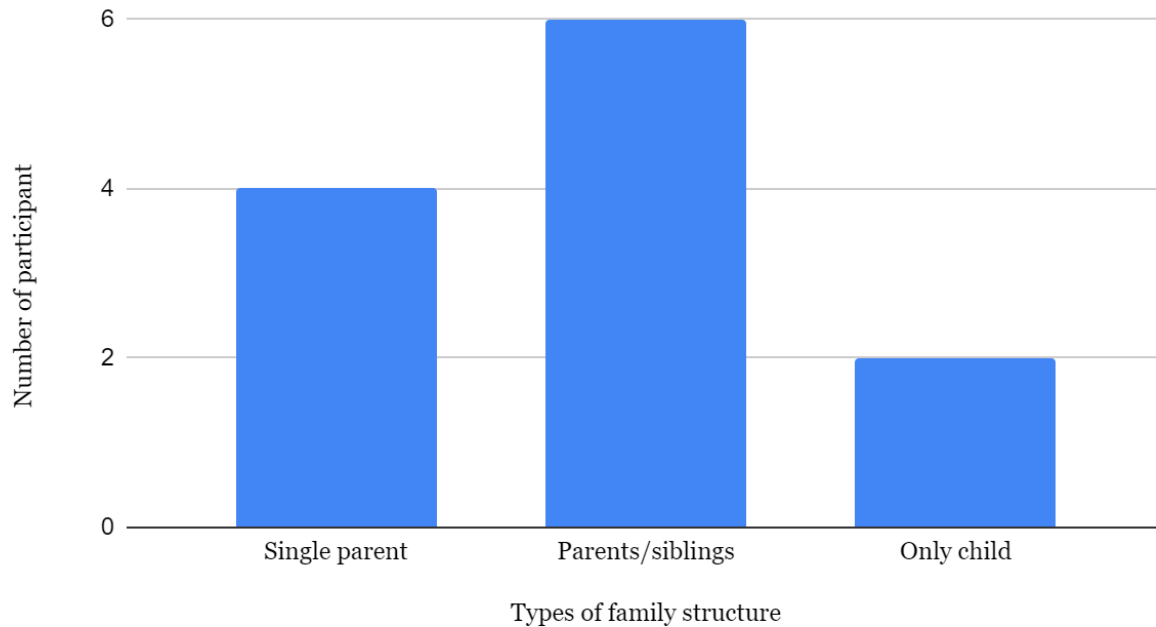
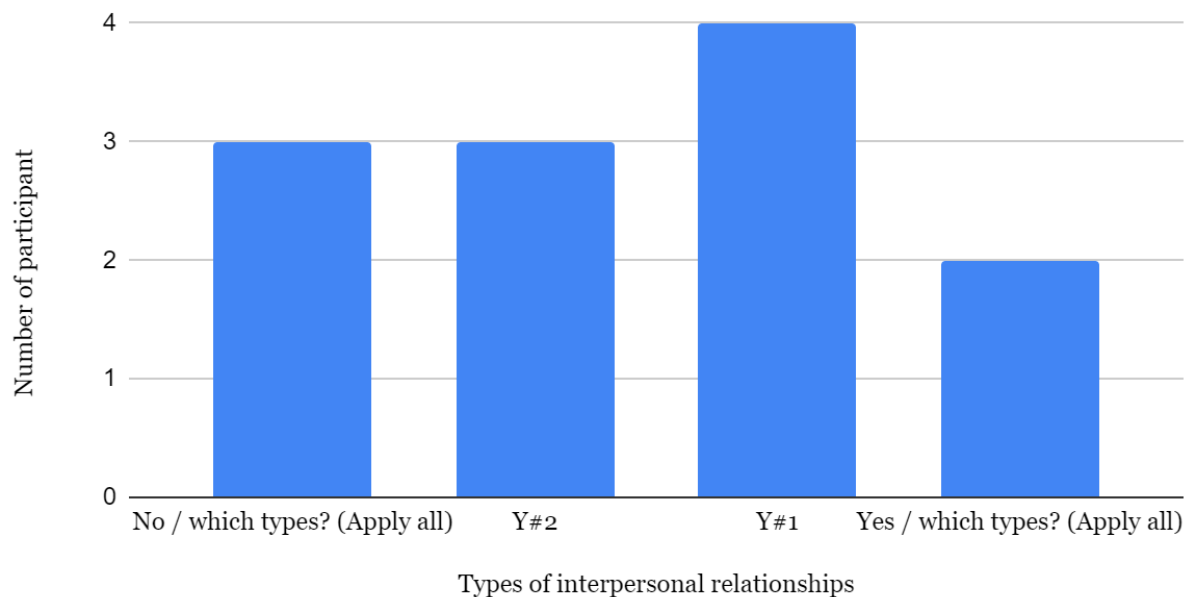


Figure 14. 3 Types of Interpersonal Relationships Improvement after the Sensory Experiment



Overall, the analysis of results demonstrated that the impacts of the sensory experiment (micro-horticultural therapy designed package) provide benefits in reducing anxiety, stress, and depression levels; improving professional achievements; and family relationships within two

weeks. Moreover, the results of the Kruskal Wallis Test and T-test showed that there are differences in the responses of the participants at the beginning and the end of the experiment. Based on the results, non-medical treatment has healing impacts on well-being and provides better quality of life, and prevents potential risks for the PTSD population.

CHAPTER 5: DISCUSSION AND CONCLUSIONS

Some of the current horticultural therapy programs in Michigan address the distance between therapeutic gardens and patients' living places, the transit methods issues, weather conditions, and insurance coverage issues from current health programs. The purpose of this research is to provide a universal treatment, a micro-horticultural therapy designed package (sensory experiment) for PTSD groups. The challenge in veterans' horticultural therapy program found participants hard to continue the program after attending a few times. Stowell et al. (2018) discussed that the attrition rate had 28% drop out due to the meeting twice a week for a total of five weeks, and the participants responded the horticultural projects require them to finish in more time than the actual session hour. Moreover, Murphy et al. (2014) explained that the activities, such as weeding and bending their knees are found difficult to continue, according to the data from the Centers for Disease Control and Prevention (CDC) evaluated that one in four veterans have arthritis and it is more common in veterans than nonveterans. The therapeutic garden and garden activities have limitations for individual physical needs.

Horticultural therapy is a non-medicine treatment for mental health and often requires long-term participation in the progress; therefore, it is hard to see the impact if participants cannot continue their practice. The micro-horticultural therapy designed package could solve several issues, such as locations and weather conditions as well as customize the package to meet their need flexibly.

The findings of this study in depression, anxiety, and stress levels were found to be lower after the two weeks of the sensory experiment, especially in anxiety levels. Participants also responded with positive improvements in their professional achievements and self-reflects to the visual sense and the sense of hearing had a strong engagement for their physical and mental

health improvement. It is important to generalize which human sense is the most efficient receiver in the sensory experiment. The result shows visual and hearing senses are the most preferred from 12 participants; however, it requires larger numbers of participants in future studies to establish a guideline for future researchers.

In the three types of interpersonal relationships, results show that nine out of twelve participants have improved in their interpersonal relationships, especially with family relationships. More than half of the participants' ages are below 25 years old and live in an urban area near commercial districts with noise and busy traffic. Urban living environments commonly lack green spaces, and from participants' self-response, visual and hearing senses are the most effect on their body and mental health, which means the noise and buildings surrounding them can cause negative impacts on their well-being. The concepts of horticulture therapy do not only approach patients who have PTSD but are also suited for potential users as prevention. Since people who live in urban areas spend much of their time indoors, it is important to promote and build a mental health-friendly environment. Promoting psychological well-being and self-care in our daily life is necessary.

The limitation of this study is the small sample size of participants and the limited area in Michigan may not apply to other different types of countries based on the cultural influence and social structure. The independent variable is the two weeks of the sensory experiment, and the dependent variables are professional achievements, interpersonal relationships, depression levels, anxiety levels, and stress levels.

Future recommended studies would be to have a larger number of participants as well as the inclusion of multiple cities. In addition, several studies found the impact of horticultural therapy in reducing the crime rate. Holmes (2017) discussed that "Offenders who completed

their community service in horticultural or nonhorticultural outdoor environments showed lower rates of recidivism when compared to offenders who completed their community service in non-horticultural indoor environments and those who had no community service” (p.59). The capacity of the natural environment heals criminals to provide quality of life. A future study can address different living environments, crime rates, and other mental illness groups. Also, the potential mental health issues require professional psychologists to be involved, as well as provide guidelines for educators.

Overall, this research used experimental design methods to address the mental health issues in Michigan PTSD participants by understanding family structures, stress release methods, and the response of surrounding environments including the relationships between peers in personal life and professional fields. Counseling services and treatment have limitations due to the ethnic societies’ perspectives and the fear of stigma in being mental health patients. Therefore, non-medical treatment and the design of horticultural therapy have a significant impact and are found easier acceptable for PTSD patients. The concept of horticulture therapy can improve interpersonal skills, reducing attention tiredness, depression, anxiety, and stress. This research provides guidance for future school faculties, government education departments, veteran service programs, and counseling units to provide the service. The sensory experiment package contributes various benefits to the urban human environment both physically and psychologically.

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APPENDIX A: QUESTIONNAIRES

Background questionnaire

Occupation:	Age:	Gender:
ZIP Code:	Education level:	Race:
Family structures (growing up with): ☐ Single parent ☐ Only child ☐ Grandparents ☐ Parents/siblings		
Family genetic disease : ☐ Yes/ Type: _____ ☐ No		
How you feel your health in the past 12 months ☐ Very well ☐ Normal ☐ Somehow bad ☐ Not well		
Have been told any symptoms below: ☐ Yes ☐ No ☐ High blood pressure ☐ Depression ☐ Manic depression ☐ High blood sugar ☐ Post Traumatic Stress Disorder (Anxiety, stress, panic attack) ☐ High blood cholesterol ☐ Insomnia ☐ Low blood pressure ☐ Heart related disease ☐ Low blood sugar ☐ Dyspraxia		
How often have you had memory problems? For example, forget things to place or do something ☐ Very frequently ☐ Sometimes ☐ Never		
What type of environment is around your living place? ☐ Urban near industrial district with air pollution ☐ Urban near commercial district with noise and busy traffic ☐ Suburban has agricultural land use surrounding ☐ Suburban has parks and residential land-use surrounding ☐ Mountain side around nature environment		
How much time do you average spend outdoors per day? ☐ Below an hour ☐ 2-3 hours ☐ 3-5 hours ☐ Above 5 hours		
What average time do you exercise? And it is indoor or outdoor? ☐ Once a week ☐ Indoor gym ☐ Outdoor parks ☐ Twice a week ☐ Indoor home ☐ Outdoor mountain ☐ Above 3 times ☐ Never		
Do you think you prefer outdoor or indoor activities? ☐ Outdoor ☐ Indoor		
Can you describe how living in a nearby park or natural landscape matters for you or you do not care about the neighborhood environment?		

How do you go to school or go to work from home?

- ☐ Family members or friends pick/drop by
- ☐ Own car
- ☐ Motorbike/scooter
- ☐ Biking alone
- ☐ Bus or public transportation ----- ☐ with friends ☐ Alone
- ☐ Walk ----- ☐ with friends ☐ Alone

What type of learning method do you use?

- ☐ Self-management/setting goals for reward or punishment(self-push)
- ☐ Parents and teachers controlling plan
- ☐ Following my feelings to do things and not much care
- ☐ Peer pressure challenge

What type of method are you using for releasing stress?

- ☐ Online media (video game/ social media/ video)
- ☐ Enjoy good foods
- ☐ Sports (balls/ yoga...etc.)
- ☐ Art (music/drawing)
- ☐ Sleep
- ☐ Others : _____

Have you been through violence or seen others in a violent situation? (Including language/physical violence/ inequality treatment)

- ☐ Never
- ☐ Yes, a short description of which type of violence in the situation:

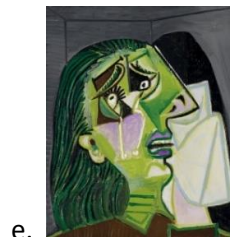
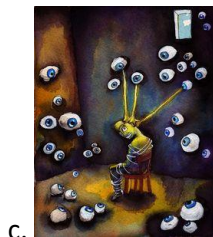
Do you have any chance or experience of spending time with special needs people?

- ☐ Yes ☐ No

If you had experience with special needs people, Circle the number that best describes how you feel pleasant at present. (1 to 5, Lowest to highest)

1 2 3 4 5

Select 3 images (allowed to repeat) that reflect the relationships between #1-you and family #2-You and peers or friends (in and out of school) #3-You and teachers or boss (in and out of school)



#1. ____ #2. ____ #3. ____

Response questionnaire

Occupation:	Age:	Gender:	Date:
ZIP code:	Education level:		Race:
Family structures: ☐ Single parent ☐ Only child ☐ Grandparents ☐ Parents/siblings			
Family genetic disease : ☐ Yes/ Type:_____ ☐ No			
How you feel your health in the past 12 months ☐ Very well ☐ Normal ☐ Somehow bad ☐ Not well			
How do you feel about your health after the experiment? ☐ Same as the past ☐ Very well ☐ Not well			
Do you feel improvement in your academic work and professional job after this experience? ☐ Yes ☐ No			
I. Attention and self-control evaluation section			
1. After the experience, do you follow through on your plans easily? Select the number that best describes how you are doing at present. (0 not at all to 10 extremely well) 0 1 2 3 4 5 6 7 8 9 10 Not at all Extremely well			
2. After the experience, do you keep your mind on what you are doing? Circle the number that best describes how you are doing at present. 0 1 2 3 4 5 6 7 8 9 10 Not at all Extremely well			
3. After the experience, do you keep your mind on what others are saying? Circle the number that best describes how you are doing at present. 0 1 2 3 4 5 6 7 8 9 10 Not at all Extremely well			
4. After the experience, do you control yourself from saying or doing things you did not want to say or do? Circle the number that best describes how you are doing at present. 0 1 2 3 4 5 6 7 8 9 10 Not at all Extremely well			
5. After the experience, would you be patient with others easily? Circle the number that best describes how you are doing at present. 0 1 2 3 4 5 6 7 8 9 10 Not at all Extremely well			
6. Overall self-evaluation, how hard do you find it to concentrate on details? Circle the number that best describes how you are doing at present. 0 1 2 3 4 5 6 7 8 9 10 Not at all Extremely well			
7. Overall self-evaluation, do you find yourself getting easily annoyed or irritated? Circle the number that best describes how you are doing at present. 0 1 2 3 4 5 6 7 8 9 10 Not at all Extremely well			

II. Sensory experience/background questionnaire comparison section	
1. Which senses of experiences do you feel improving on your body and mental health? (Apply all)	☐ Visual ☐ Hearing ☐ Smell ☐ Touch ☐ Taste
2. Would you continue similar experiences in the future and apply them to daily life?	☐ Yes / Type of sensory ☐ Visual ☐ Hearing ☐ Smell ☐ Touch ☐ Taste ☐ No / Why? _____
3. After the experience, did you change the type of learning? ☐ Yes/ Types below ☐ No	☐ Self-management/setting goals for reward or punishment(self-push) ☐ Parents and teachers controlling plan ☐ Following my feelings to do things and not much care ☐ Peer pressure challenge ☐ Others: _____
4. After the experience, have you changed the type of relaxing method you use? ☐ Yes/ Types below ☐ No	☐ Online media (video game/ social media/ video) ☐ Enjoy good foods ☐ Sports (balls/ yoga) ☐ Art (music/drawing) ☐ Sleep ☐ Others : _____
5. After the experience, would you help others while addressing violence? (Including language/physical violence/ inequality treatment)	☐ Yes / How? (Selects the option below) ☐ Secretly report ☐ Stop right away ☐ Provide information for the victim ☐ Others: _____ ☐ No / Why? _____
6. After the experience, would your 3 types of relationships have improved? #1-you and family #2-You and peers or friends (in and out of school/workplace) #3-You and teachers or boss (in and out of school/workplace)	☐ Yes / Which types? (Apply all) ☐ #1 ☐ #2 ☐ #3 ☐ No / Which types? (Apply all) ☐ #1 ☐ #2 ☐ #3
7. Would you recommend a school or the workplace add this sensory experiences program?	☐ Yes ☐ No/Why? _____

DASS₂₁

Name:

Date:

Please read each statement and circle a number 0, 1, 2 or 3 that indicates how much the statement applied to you *over the past week*. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

- 0 Did not apply to me at all
 1 Applied to me to some degree, or some of the time
 2 Applied to me to a considerable degree, or a good part of time
 3 Applied to me very much, or most of the time

1	I found it hard to wind down	0	1	2	3
2	I was aware of dryness of my mouth	0	1	2	3
3	I couldn't seem to experience any positive feeling at all	0	1	2	3
4	I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
5	I found it difficult to work up the initiative to do things	0	1	2	3
6	I tended to over-react to situations	0	1	2	3
7	I experienced trembling (eg, in the hands)	0	1	2	3
8	I felt that I was using a lot of nervous energy	0	1	2	3
9	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
10	I felt that I had nothing to look forward to	0	1	2	3
11	I found myself getting agitated	0	1	2	3
12	I found it difficult to relax	0	1	2	3
13	I felt down-hearted and blue	0	1	2	3
14	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15	I felt I was close to panic	0	1	2	3
16	I was unable to become enthusiastic about anything	0	1	2	3
17	I felt I wasn't worth much as a person	0	1	2	3
18	I felt that I was rather touchy	0	1	2	3
19	I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat)	0	1	2	3
20	I felt scared without any good reason	0	1	2	3
21	I felt that life was meaningless	0	1	2	3

APPENDIX B: RECRUITING POSTER

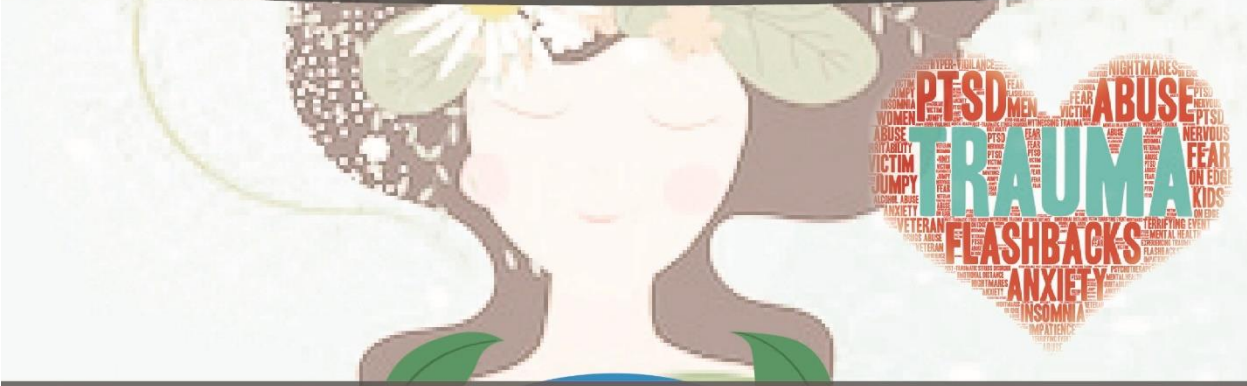
Figure 15. Recruiting poster

Michigan State university / SPDC 

Sensory Experiences Volunteer Recruiting

CALLING FOR VOLUNTEERS

WHO STRUGGLE WITH PTSD SYMPTOMS TO PARTICIPATE IN SENSORY THERAPY



Participant: Adult with PTSD

Registration: email or contact researcher Pengyu Chen and leave your name and contact information

Email: chenpen5@msu.edu / Phone: 517-488-3989

Participants who completed 2 weeks of five sense exploring and questionnaires will provide free materials and earn **\$20 Gift card **



Visual



Auditory



Smell



Taste



Touch

APPENDIX C: CONSENT FORM

Research Participant Information and Consent Form

Points to include:

- In this research, you are being asked to participate in a research study of Sensory Experience for 2 weeks and you will explore your five senses (eyes, ears, smell, taste, and touch). The visual part is based on watching the 7 minutes of natural landscape video daily after work and the potential benefit via eyes exercise would relax your brain activities; the auditory part is based on listening to the 10 minutes of natural sounds daily before sleep to help to distract negative thinking; the smell part is based on aromatherapy and provide a natural dry lavender bag for smelling before sleep to bring calm feeling (if you have an allergy of lavender, please stop participating this study); in taste and touch section, you will plant mung beans and harvest after 2 weeks. The growing mung bean process needs to be recorded (photo preferred). We will also request you to complete 5 questionnaires during the 2 weeks of Sensory experience, there is a Background questionnaire, DASS21, DASS21-2, DASS21-3, and Respond questionnaire.
- In this research, you must be at least 18 years old to participate.
- Participation in this research project is completely voluntary. You have the right to say no. You may change your mind at any time and withdraw. You may choose not to answer specific questions or to stop participating at any time. Whether you choose to participate or not will have no effect on your grade or evaluation and will earn a 20-dollar gift card as compensation.
- This research study of Sensory experience would only cost your time, and all the materials such as videos, mung beans growing kit, dry lavender bag, and online questionnaires will be provided by the researcher, Pengyu Chen. Successful completion of the 2 weeks Sensory experience will receive a \$20 online gift card as a reward.

If you have concerns or questions about this study, such as scientific issues, how to do any part of it, or to report an injury, please contact the researcher Pengyu Chen, 517-488-3989, chenpen5@msu.edu

If you have questions or concerns about your role and rights as a research participant, would like to obtain information or offer input, or would like to register a complaint about this study, you may contact, anonymously if you wish, the Michigan State University's Human Research Protection Program at 517-355-2180, Fax 517-432-4503, or e-mail irb@msu.edu or regular mail at 4000 Collins Rd, Suite 136, Lansing, MI 48910.

Your signature below means that you voluntarily agree to participate in this research study.

Signature

Date