



FACULTY OF HEALTH AND OCCUPATIONAL STUDIES
Department of Caring Sciences



NURSING DEPARTMENT,
MEDICINE AND HEALTH COLLEGE

Effects of Horticultural Therapy on the quality of life of the older adults - A descriptive literature review

Gu Shiyong (Jane)

He Jiaying (Candy)

2023

Student thesis, Bachelor degree, 15 credits

Nursing

Degree Thesis in Nursing

Supervisor: Xu Lijan

Examiner: Annakarin Olsson

Abstract

Background: The number of older people around the world is expected to continue to grow, as is the need for their care. With the obvious and historically unprecedented trend of population aging, research on aging and related diseases has received increasing attention. Horticultural Therapy, as a relatively easy to implement intervention that can use interaction with living things to achieve specific therapeutic goals, is very popular in positively improving the quality of life of older adults.

Objective: This descriptive literature review aims to describe the therapeutic effects of horticulture on the quality of life of the older adults.

Methods: By searching PubMed database thirteen scientific articles with a quantitative approach were selected, summarized and a result containing three effects were found.

Results: Through various screening, 13 articles were finally included in this study. We divided our findings on three effects of Horticultural Therapy on the quality of life of older adults into three themes: physiological effects, psychological effects and social effects. The results showed that Horticultural Therapy received almost positive feedback in the three areas.

Conclusion: Horticultural Therapy can improve the quality of life of older people, both physically, psychologically, and socially. Due to the lack of strong evidence to draw definitive conclusions, more research is needed to improve the impact of Horticultural Therapy on the quality of life of older adults.

Keywords: Horticultural Therapy, Older Adults, Quality of Life

Table of contents

1. Introduction	1
1.1 Definition of Horticultural Therapy	1
1.2 Definition of the quality of life and its impact on older adults.....	2
1.3 The nurse’s role	2
1.4 Health Promotion Model	2
1.5 Previous reviews.....	3
1.6 Problem description.....	3
1.7 Aim and research questions.....	4
2. Method.....	4
2.1 Design.....	4
2.2 Search strategy.....	4
2.3 Selection criteria.....	6
2.4 Selection process and outcome of potential articles.....	7
2.5 Data analysis.....	7
2.6 Ethical considerations.....	8
3. Results	8
3.1 Characteristics of Included Studies	8
3.2 Effects of Horticultural Therapy on quality of life in studies.....	9
3.2.1 Physiological effects.....	9
3.2.2 Psychological effects	10
3.2.3 Social effects.....	11
4. Discussion.....	12
4.1 Summary of main results.....	12
4.2 Results discussion.....	13
4.3 Clinical implications.....	14
4.4 Suggestions for future research	15
4.5 Strengths	16
4.6 Limitations.....	16
5. Conclusion.....	17
References	18
Appendix	25

1. Introduction

It is predicted that the number of older adults worldwide will continue to increase, expected to rise to 488 million by 2030 (Prince et al., 2013). With the obvious aging of the population and an unprecedented trend in history, the research on aging and related diseases received more and more attention. Studies have shown that physical health, self-care ability and cognitive function of the older adults tend to decline with the increase of age, there is a need to pay comprehensive attention to their health, taking care of their emotional and mental health as well as physical functioning (Bartzokis, 2004; Manini & Pahor, 2009; Beard & Bloom, 2015; None, 2016). And healthy aging is reflected in their improved quality of life (Beekman et al., 1997; Wiggins et al., 2004). Therefore, it is necessary to take comprehensive care of the health of older people by taking care of their physical function and psychosocial health. This may require the use of nonpharmacological interventions such Horticultural Therapy (HT). As a relatively easy intervention measure, HT could use the interaction with living creatures to achieve a specific treatment goal. It was very welcomed in actively improving the quality of life of the older adults (Nicholas et al., 2019).

1.1 Definition of Horticultural Therapy

Among natural therapies, HT is easy to implement and very popular in terms of positively improving the health of the older adults (Kamioka et al., 2014). HT is an intervention (Haller et al., 2006). It applies plant and gardening activities to achieve specific therapeutic goals, which can help individuals learn new skills, adapt to the loss of function, and experience a feeling of hope and culture (American HT as Society, 2013). HT emphasizes the mechanisms of interaction, action, and response. HT engages participants in this process through plant media from the natural environment, resonating among participants (Chen & Huang, 2005; Relf & Diane, 2005). Contact and connection with nature has generally been shown to restore attention (Berman et al., 2008), reduce stress (Van et al., 2011), promote pleasant mood and enhance mental health (Zelenski et al., 2014).

1.2 Definition of the quality of life and its impact on older adults

The World Health Organization (WHO, 1998) has defined QoL as “individuals’ perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns.” QoL is a subjective evaluation, which is related to an individual’s cultural, social, and environmental context, and encompasses four different domains: physical, psychological, social, and environmental (WHO, 1998). And quality of life is often considered a key component of healthy old age (Otero et al. 2010) and is defined as an emotional evaluation of life satisfaction (Diener et al., 1985). Specifically, older adults with higher life satisfaction have a reduced risk of chronic disease and mortality (Koivumaa et al., 2000; Strine et al., 2008), and improved mental and physical health (Ed Ward et al., 2006). Therefore, it is necessary to find effective ways to improve the quality of life of ordinary older adults. In this article, the quality of life of the older adults will be mainly included three aspects: physical, psychological, and social.

1.3 The nurse’s role

With the increase and variety of the older adult population, it was necessary to better understand and promote health (Wang & Macmillan, 2013). As an indispensable member of health promotion, nurses play an important role in improving the quality of life of the older adults.

Older adults are prone to physical and cognitive decline (Bartzokis, 2004; Manini & Pahor, 2009). Studies have also shown a high prevalence of depression (Weyerer et al., 2008) and social isolation (Nicholson, 2012) among older adults, affecting their well-being and health (Cohen, 2000; Sorkinet et al., 2002; Tomaka et al., 2006; Golden et al., 2009; Tomaka et al., 2006). Nurses can promote the psychosocial, physical health, and cognitive abilities of older adults through regular HT interventions to improve the quality of life of older adults.

1.4 Health Promotion Model

The organizing framework for the study was Pender’s (1996) Health Promotion Model (HPM). Health Promotion Model is a theoretical perspective to explore the factors and relationships that promote health behaviors, thereby improving health and quality of life

(Srof & Velsor-Friedrich, 2006). The older adults are prone to physical function decline. Therefore, it is necessary to promote the health of the older adults, which can effectively prevent diseases, especially maintain function and improve the quality of life. Pender strives to develop a model that guides the entire nursing society to motivate individuals to engage in health promoting behaviors that lead to overall health through individual level interactions and biophysical processes (Pender et al., 2011). Health Promotion Model provides important guidance for nursing professionals as they focus on patients' health promotion strategies and research aimed at predicting health promotion behaviors. Health Promotion Model divides the determinants of health behavior into three specific proposition groups: (a) individual characteristics and experience; (b) behavior specific cognition and influence; (c) situational / interpersonal impact. Context and interpersonal influence are social and environmental factors that affect healthy behavior (Srof & Velsor-Friedrich, 2006). This study proceed from the situation, carries on the horticultural treatment intervention to the older adults to promote their health, and finally achieves the purpose of improving their quality of life.

1.5 Previous reviews

The previous review, also designed to study the effects of HT on older adults, could be improved. Wang et al. (2022) found that HT improved patients' quality of life, physiological function, mood and immunity, and reduced blood pressure and BMI. Nicholas et al. (2019) was evaluated using the physical therapy Evidence Database Scale and found that it significantly improved quality of life, anxiety, depression, social relationships, physical impact, and cognitive impact. However, due to the lack or non-significance of the intergroup results, more rigorous randomized controlled trials and intergroup effects studies are needed. Yeo et al. (2020) using the Effective Public Health Practice Project (EPHPP) tool found that indoor gardening and gardening programs were effective for cognition, mental health, social outcomes, and life satisfaction. To further elucidate these mechanisms, higher quality research and improved reporting standards are needed.

1.6 Problem description

As people aging, the function of various organs in the body is declining, which can affect the normal quality of life, such as the eye muscles become weaker with aging and

the eye's ability to focus begins to decline. Therefore, it is important to find effective ways to improve the quality of life of the older adults. HT is a suitable treatment for improving the quality of life of the older adults, because exposure to nature can relax the mood, reduce stress, and improve physical function. And the addition of nursing staff, can play a role in guiding and helping the older adults more scientific HT. However, there is a lack of a comprehensive and reviews of the impact of HT on the quality of life of the older adults. In addition, the published systematic reviews have a limited range of interventions. Therefore, this review aims to identify and evaluate the impact of HT on the quality of life of the older adults on a broader scope.

1.7 Aim and research questions

The aim is to describe the effects of HT on quality of life in older adults.

The research question is what effect HT has on the quality of life of older adults.

2. Method

2.1 Design

This was a "Descriptive literature review"(Polit and Beck, 2017).

2.2 Search strategy

Authors searched PubMed database with some limitations, see table 1. The search terms that were used are "HT, Older Adults and Quality of Life", one by one and in different combinations with each other. When combining search terms, the Boolean term AND was used (Polit and Beck, 2017). Indexed search terms were fetched from MeSH headings. In the preliminary search (see table 1), 39 articles were selected.

Table 1.

Database	Limits and search date	Search terms	Number of hits	Potential articles (excluding doubles)
Medline through PubMed	10 years, English, Full text, 2022-07-4	“Horticultural Therapy”(MeSH)	69	
Medline through PubMed	10 years, English, Full text, 2022-07-4	“Older Adults”(MeSH)	1,171692	
Medline through Pubmed	10 years, English, Full text, 2022-07-4	"Quality of Life"(Mesh)	129958	
Medline through Pubmed	10 years, English, Full text, 2022-07-4	"Horticultural Therapy"(Mesh) AND "Older Adults" (Mesh)	28	28
Medline through Pubmed	10 years, English, Full text, 2022-07-4	"Horticultural Therapy"(Mesh) AND "Quality of Life"(Mesh)	21	10
Medline through Pubmed	10 years, English, Full text, 2022-07-4	"Older Adults"(Mesh) AND "Quality of Life"(Mesh)	45,864	
Medline through Pubmed	10 years, English, Full text, 2022-07-4	"Horticultural Therapy"(Mesh) AND "Older Adults" (Mesh) AND "Quality of Life"(Mesh)	12	1
				Total: 39

2.3 Selection criteria

Eligibility criteria were defined using the PICOS (Mark et al., 1995; Fig.1) method as follows; Population: adults over 60 years of age; Intervention: Any form of real or simulated HT; Control group/comparison group: non-natural intervention/no intervention control group; Outcome: any quality of life related; Study Design: For any quantitative design, a hybrid approach can be used if quantitative aspects can be separated (Yeo et al., 2020).

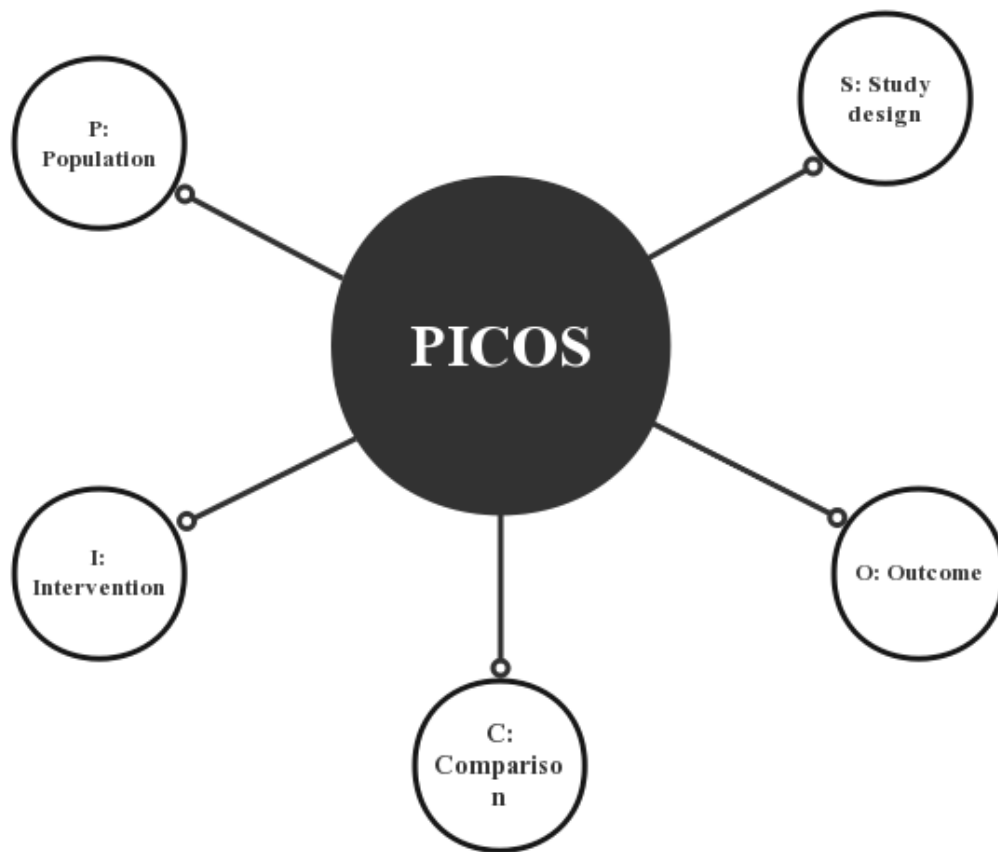


Figure 1. PICOS

2.4 Selection process and outcome of potential articles

A total of 39 potentially relevant studies were identified in PubMed (Wang et al., 2022). After scanning the title, deleted articles on irrelevant topics and protocol, a total of 17 articles. After browsing the abstract, one articles in which the reviews and research subjects were inconsistent were excluded. Finally, 13 eligible articles were included by scanning through the full text to exclude articles with incomplete and missing search terms (Fig.2).

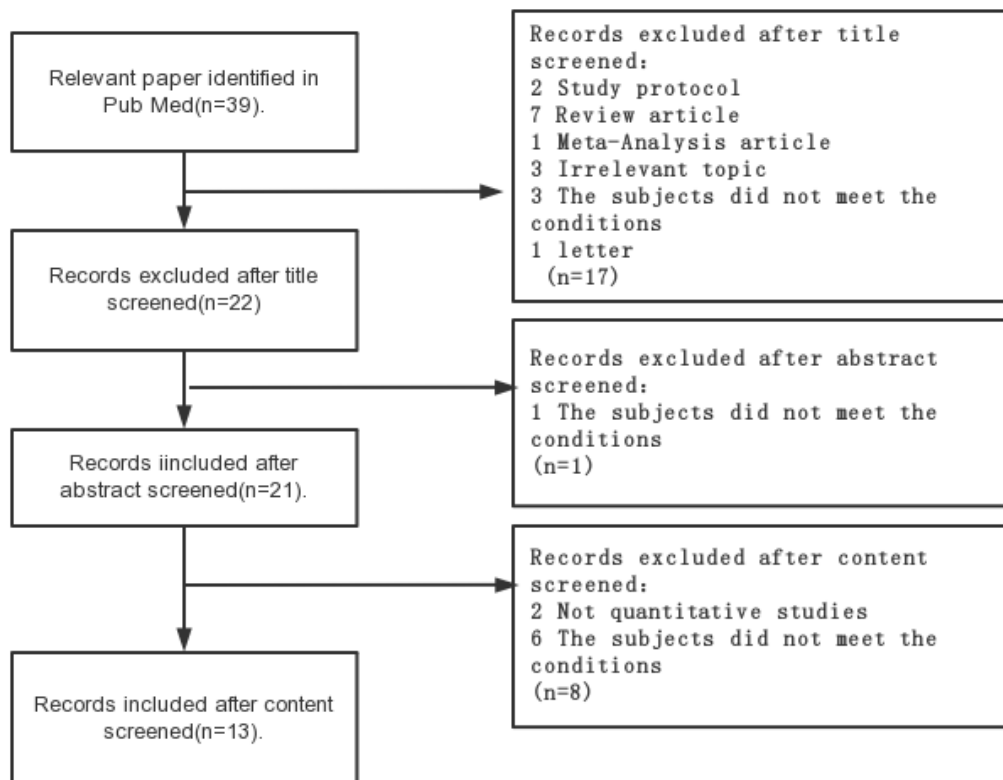


Figure 2. Selection process of potential articles

2.5 Data analysis

According to Polit and Beck (2017), matrix form is conducive to directly supporting the subject analysis of retrieved evidence (Polit and Beck, 2017). All articles in the results are in the form of data consolidation and data analysis. The authors read all the essays

carefully. And these essays are divided into three parts according to physical, psychological and social effects. The primary research information in the literature is organized into two matrices, one containing authors, study design, source of participants, sample characteristics, interventions, comparators and frequency, and the other containing aims and results. The results of the paper will be read and carefully processed to determine the effects of HT on quality of life in older adults. The results of potential articles were extracted for classification, and finally determined the division of the results of this study. Different types of results were collected and analyzed, integrated description, which has specific significance for nursing work.

2.6 Ethical considerations

This review objectively quoted and analyzed the viewpoints of the found papers, and there is no tampering with the original author's viewpoints or plagiarism (Polit and Beck, 2017). All published papers included in this review have received ethical approval (Polit and Beck, 2017).

3. Results

3.1 Characteristics of Included Studies

A total of 13 studies were included in this review, and the characteristics of each study are shown in Table 1. Sample sizes for the randomized control studies (RCT) varied widely, ranging from 10 to 150, and the review's overall sample size was 736 participants. All included studies were published within the last 10 years and were conducted in China (n = 7), Singapore (n = 3), South Korea (n = 2), and Italy (n = 1). The sources of research objects include nursing home (n = 4), community (n = 4), long-term care facilities (n = 2), adult day-care services (n = 1), and University Senior Citizens Learning Camp (n = 1) and elderly mental health centers (n = 1). The all participants ranged in age from 60 to 93 and did not have gender limitation.

The interventions were divided into indoor gardening activities, which included designing gardens, tabletop gardening, 3D virtual reality, making handmade gardening products, cooking greens, drinking tea, tasting, and sniffing herbs, and outdoor gardening activities, which included planting greens, cleaning and maintaining gardens, and walking in parks. And the researchers actively encouraged participants to

participate. Ten studies used a control or control group (including before and after the same group of subjects and after different groups of subjects received different interventions), and the remaining three studies were single-group designs. The intervention duration in all studies ranged from one week to twenty-four weeks. A range of quality of life manifestations such as function, physiology, cognition, behavior, emotion, social health, well-being outcomes were captured through questionnaires, researcher/caregiver observations (e.g. home visits), indirect objective measures (e.g. physiological outcomes), and self-assessment scales (e.g. cognitive assessments).

3.2 Effects of Horticultural Therapy on quality of life in studies

Effect of Horticultural Therapy		Articles
Physiological effects		
	Functional and Physical effects.	Lin et al., 2020; Ng et al., 2018; Wong et al., 2020; Ng et al., 2021; Yao et al., 2016; Han et al., 2018; Shen et al., 2022
	Physiological index change	Tu et al., 2020
Psychological effects		
	Satisfaction with Life and happiness	Lin et al., 2020; Bassi et al., 2018; Shen et al., 2022; Yao et al., 2017; Bassi et al., 2018
	Mental health status	Shen et al., 2022; Jueng et al., 2022; Ng et al., 2018
	Loneliness, depression and anxiety	Lin et al., 2020; Chen & Ji, 2015; Chu et al., 2019; Chen & Ji, 2015; Tu et al., 2020; Ng et al., 2018
Social effects		
	Social relations	Ng et al., 2018; Bassi et al., 2018; Yao et al., 2017

3.2.1 Physiological effects

Functional and Physical effects. Seven studies have shown that gardening therapy is beneficial to health status (Lin et al., 2020), improvement of inflammation (Ng et al., 2018; Wong et al., 2020; Ng et al., 2021) loan immune aging (Wong et al., 2020), lowering the risk of mental disease (Ng et al., 2018), activities of daily living (Yao et al., 2016) and physical functional ability (Han et al., 2018). One experimental 2-group pretest-posttest study (Han et al., 2018) and one quasi-experimental study (Lin et al., 2020) claimed that HT treatment improves health status. Additionally, three randomized controlled trials have reported that HT treatment can prevent or reduce inflammation in

the older adults (Ng et al., 2018; Wong et al., 2020; Ng et al., 2021). Among them, Shen et al. (2022) and Wong et al. (2020) mentioned that the small sample size of the study would lead to unreliable results. Yao et al. (2016) could not provide outdoor horticultural activities involving the use of gardens or gardens because of the limited space at the study sites.

Physiological index change. Two studies investigated the physiological effects of HT on older adults, using various measures such as blood and saliva samples. Tu et al. (2020) showed significant improvement in sleep quality after 6 weeks of HT activity. Besides, Tu et al. (2020) investigated the indicators that gardening treatment can alter indices of physiological stress, such as heart rate variability (HRV), pulse rate, blood pressure, salivary amylase activity (SAA). However, there were no significant changes in blood pressure and standard deviation of the normal-to-normal (SDNN) which were used to assess the impact of participation in long-term gardening. Therefore, it cannot give an immediate indication of the outcome.

3.2.2 Psychological effects

Satisfaction with Life and happiness. Two non-equivalent group designs (Lin et al., 2020; Bassi et al., 2018) and two pretest-posttest designs (Shen et al., 2022; Yao et al., 2017) investigated the effects of HT on life satisfaction and well-being in older adults. Outcome measures included Satisfaction with Life Scale (Shen et al., 2022; Yao et al., 2017), Happiness and Life Satisfaction (Shen et al., 2022), meaning in life questionnaire (was adapted from the Purpose in Life survey compiled by Frankl; Lin et al., 2020), Chinese Happiness Inventory (CHI) short version and ESM (Experience Sampling Method) forms (Bassi et al., 2018). All these studies reported significant improvements in these scores after HT. However, these experiments almost all have limitations such as unreliable service samples, small sample size and short experiment duration.

Mental health status. One study used Warwick -- Edinburgh Mental Well-Being Scale (Shen et al., 2022), and the second study used the Chinese version of Antonovsky's short 13-item SOC scale (Jueng et al., 2022), Another study used the Ryff's Scales of Psychological Well-Being (Ng et al., 2018) to investigate the effect of HT on mental health status in older adults. The results of the three studies showed that the mental health status of the elderly was significantly improved, but it does not rule out the

possibility that the results could be affected by other positive effects of the subjects, nor can it be ruled out that the subjects subconsciously anticipated the good results of the experiment and led to the idealization of the results.

Loneliness, depression and anxiety. The UCLA Loneliness Scale version 3 was the common tool used to measure loneliness symptoms and three studies which were chosen to use this scale (Lin et al., 2020; Chen & Ji, 2015; Chu et al., 2019). Except for one study, which had a negative loneliness score and thus increased, the other two trials showed a decrease in scores. Three studies used the Geriatric Depression Scale (GDS-15) (Lin et al., 2020; Chen & Ji, 2015; Chu et al., 2019). The GDS-SF consists of 15 items requiring “yes” (1) or “no” (0) answers. Higher scores indicate higher levels of depression. A score above 5 is suggestive of depression (Chen & Ji, 2015). Another study used Profile of Mood States (POMS) and Total Mood Disturbance (TMD) to assess depression levels in older adults. And a high TMD score indicates a poor mental state, while a low TMD score indicates a good mental state (Tu et al., 2020). Except for one study, which had a negative loneliness score and thus increased the result score, the other three trials showed a decrease in scores. The Zung Self-Rating Anxiety Scale (SAS) (Ng et al., 2018), Profile of Mood States (POMS) and Total Mood Disturbance (TMD) (Tu et al., 2020) was used to assess the effect of HT on anxiety levels in older adults by the researchers. Ng and his colleagues found little difference in the amount of change in anxiety levels between the experimental and control groups. However, in the other study, anxiety dropped in all four groups.

3.2.3 Social effects

Social relations. Two non-equivalent group designs (Ng et al., 2018; Bassi et al., 2018) and one pretest-posttest designs (Yao et al., 2017) investigated the effects of HT on social relations in older adults using a variety of scales, such as Friendship Scale (Ng et al., 2018), Interpersonal Intimacy Scale (IIS) (Yao et al., 2017) and ESM (Experience Sampling Method) forms (Bassi et al., 2018). All three showed significant improvements in these scores after HTy. Ng et al. (2018) Showed significant improvement in HT participants' positive relationships with others. Yao et al. (2017) investigated that gardening therapy can increase interpersonal intimacy. Bassi et al.

(2018) suggested that there was a significant increase in sociability in older adults after HT.

4. Discussion

The focus of this descriptive literature review is to assess and summarize the effects of HT on quality of life in older adults. Although there were some limitations in the study, this study provides more promising evidence that HT can be used as a recommended intervention to improve the quality of life of older adults from a physical, psychological, and social perspective.

4.1 Summary of main results

Thirteen studies eligible for this review showed that HT can improve health status, enrich activities of daily living, increase life satisfaction, expand social relationships, and enhance social competence in the older adults. The duration of HT ranges from 20 minutes to 120 minutes per week, with each treatment lasting from 1 to 24 weeks, but it is not known what is best recommended. First, the literature selected suggests that HT has a positive effect on improving the health status of older adults. It has been shown to improve inflammation, reduce the risk of mental illness, improve sleep quality, and so on. Secondly, mental health also plays an important role in the quality of life of the older adults, especially in the emotional aspects. Happiness and other positive emotions can improve people's life satisfaction, and reducing loneliness, anxiety, depression and other negative emotions can also improve the mental state of the older adults. In addition to the degree of physical and mental health, social relations are also a very important part of people living in society. Having good social skills and relationships can reduce people's worries, irritability, impatience, etc., and exchange for positive and mild emotions. In today's era of network development, making more beneficial friends can also promote information exchange and sharing. The evidence from the included studies is certainly relevant to the main issues in this review, but it is not sufficient to address all the issues as there is not enough relevant RCTS. Different interventions in the control group, different duration of treatment, or different scales used in the same

test may lead to different results. The respective purposes and results of the 13 literatures selected will be presented in Table 4.

4.2 Results discussion

The findings of this review suggest that HT appears to be a beneficial intervention for general health in older adults. Health Promotion Model helps health-care professionals develop appropriate behavioral interventions, and its application can enable older adults to participate in and adhere to gardening activities. Health Promotion Model guides nursing communities to motivate older adults to participate in horticultural activities, improve their physical health through interaction with nature and plants, and thus improve their quality of life. Health Promotion Model provides important guidance for the practice of long-term nursing professionals and the design of horticultural activities. However, the evidence on the use of HT can still be considered at the exploratory stage, as only a few studies are available for review due to a lack of focus on horticulture. A thorough understanding of the benefits of gardening has yet to be determined, and only preliminary studies have been conducted on many potential outcomes. While the evidence to date is somewhat limited in terms of generality, for less rigorous (but appropriate to the current state of research) methodological design, the evidence provides an interesting basis for further research. HT seems to offer new opportunities for a variety of outcomes in a variety of disciplines, while specific activities may be modified to meet the interests and needs of different older age groups. The activities in HT can be used to promote healthy aging in the older adults. When these activities are designed to meet and challenge participants' current level of functional ability, the physical and mental benefits are obvious. HT activities can be as simple as a walk in the park or as complex as designing a garden, making handmade gardening products, or growing vegetables. From the limited experiments, it was found that a variety of gardening activities resulted in a variety of improvements for subjects.

Some studies five years ago have found a positive impact of HT on the quality of life of older adults. Two studies in China have shown that HT can help reduce loneliness and depression in the older adults, and increase activities of daily living, happiness, meaning of life, and interpersonal intimacy (Chen & Ji, 2015; Yao & Chen, 2017). In the last five

years, many studies have confirmed this and found more. A 6-week study showed that HT treatment improved sleep quality (Shen et al., 2022). Two of the studies we included showed that participants who engaged in moderate levels of HT were able to halt the deterioration of hippocampal function in the brain and subsequently improve memory and cognitive function (Park et al., 2019; Ng et al., 2018). In addition, some researchers found that the secretion of interleukin 6 (IL-6: 6th INTERNATIONAL CONGRESS OF IMMUNOLOGY, 1986) was positively correlated with the inflammatory response, and HT significantly reduced the level of IL-6 in the subjects before and after the experiment, that is, HT alleviated the inflammation in the older adults (Park et al., 2019; Wong et al., 2021; Ng et al., 2021). However, some case report studies report that gardening may be associated with health risks: Hall et al. (2018) also stated that while their HT findings were very positive, some fewer positive aspects have been noted, such as sunburn, dehydration, potential distress, etc (Hall et al., 2018). Although fatal cases are rare, the health of participants, especially those with allergies, should be always monitored throughout the treatment. All in all, the benefits of HT outweigh the risks, and these findings add to growing evidence that regular exposure to horticultural activities can improve quality of life.

4.3 Clinical implications

Since almost all horticultural interventions are conducted in communities, nursing homes and other long-term care facilities, the results of this review could be used to guide the practice of long-term care professionals and the design of horticultural activities, especially those that meet the needs of healthy older adults and older adults with functional or cognitive limitations.

Exposure to nature can help reduce the risk of stress and depression, strengthen social connections, and provide direct and indirect health benefits through physical activity in natural environments. Compared with outdoor gardening, indoor gardening can reduce lower limb activities and breathe fresh air, but it can also promote cognitive function and mental health through touch, smell, taste and vision in the process of interaction with plants by simply using plants to do manual work, arranging flowers and drinking tea. Therefore, long-term nursing institutions can promote the physical and mental

health of the older adults by combining indoor and outdoor gardening activities. Indoor gardening activities can be arranged in case of bad weather, physical exhaustion or mobility inconvenience of the older adults, which can also induce psychological relaxation to a certain extent. Even according to different populations and different needs, we can tailor personalized horticulture.

The authors believe that this study is meaningful. In the face of the continuous growth of the global older adults' population, as a nurse, the probability and number of contacts with elderly patients will be large in the future. For the older adults, the quality of life in their later years greatly affects their happiness level of life, and nursing staff have the responsibility to help the older adults improve their living standard. HT, as an effective means of clinical convalescence, is developing gradually and can obviously improve the quality of life of the older adults. Perhaps, in the future, HT will also become a preferred treatment for the older adults. With the further study of HT, it will have a profound impact on nursing and clinical nursing work.

4.4 Suggestions for future research

One suggestion for future research is to report not only the benefits of HT in older adults, but also adverse reactions or unpleasant outcomes, which are not mentioned in many studies. Besides, future research could also build on existing research and replicate it with different populations, such as depressed, dementia and frail older adults. At present, there are only a few studies on the impact of HT on the older adults. As these are prominent areas of geriatric care, more research should be conducted to investigate the effects of HT on the risk and frequency of falls in older adults.

Gardening activities can be indoor or outdoor gardening. It can be as simple as admiring flowers and drinking tea, or as complex as designing or growing a vegetable garden. Different types of horticultural activities have different degrees and kinds of effects on the results. Right now, the interventions studied are a mix of different types of gardening. Therefore, another key area of future research is to subdivide the impact of different types of gardening activities on the older adults.

4.5 Strengths

This review comprehensively evaluated the impact of HT on the quality of life (WHO, 1998) of the older adults. The documents selected by the authors are all published in recent years, and the timeliness is better reflected; Moreover, the subjects in the literature are from different countries and regions, and the experimental environment is also different, so the experimental results will be more universal. The authors used a relatively scientific and reasonable method in the selection of articles, and expressed it with a mind map, so that the reader can see briefly. In addition to sorting out the data objectively, the authors also put forward some suggestions for the development and application of HT in the future.

4.6 Limitations

The authors try to comprehensively review the literature and synthesize the sparse evidence that gardening is beneficial to the older adults. It is worth noting that, like all scientific research methods, this literature review also has its limitations. First of all, this study adopts qualitative description for the research results of the selected literatures without meta-analysis (Glas, 1976), which makes the research results of this paper less intuitive and clear to readers. Secondly, because the subject is multidisciplinary, the database that may be retrieved may not be comprehensive. It is likely that other studies, whether published or unpublished, have not been identified by these search engines, and there is a gap between the retrieval data and the published data. Therefore, some eligible studies may be conducted and published during this period, and the impact of these studies on the research results of this review is immeasurable. Thirdly, the authors will acquiesce that HT has a positive impact on the quality of life of the older adults, so it may be easy to ignore the negative significance of HT to the older adults. In addition, considering that this review is written and published in English, studies in other languages may not be included in the analysis.

5. Conclusion

HT can improve the quality of life of older people, including physical, psychological, and social aspects. With the emergence of an aging population, the care needs of the elderly are also increasing. Their physical function and cognitive abilities also decline with age, so HT is widely used in the environment in which older people live. Thus, the results of this review can be used to guide the practice of long-term care professionals and the design of community, nursing homes and long-term care facilities. Limited to HT improving the quality of life in older adults, the study lacked the disadvantages of HT. This study is limited by the absence of stronger evidence to draw firm conclusions about the effects of HT on the physical, mental, and social domains of older adults, even though the evidence for the various effects of HT on older adults looks promising.

References

Articles marked with * is in the result

6th INTERNATIONAL CONGRESS OF IMMUNOLOGY. (1986). *Clinical & Experimental Immunology*, 63(1), 260.

American Horticultural Therapy Association. (2013). *Horticultural Therapy*. Retrieved from <http://ahta.org/>

Bartzokis, G. . (2004). Age-related myelin breakdown: a developmental model of cognitive decline and alzheimer's disease. *Neurobiology of Aging*, 25(1), 5-18.

* Bassi, M., Rassiga, C., Fumagalli, N., & Senes, G. (2018). Quality of experience during horticultural activities: An experience sampling pilot study among older adults living in a nursing home. *Geriatric nursing*, 39(4), 457-464.

Beard, J. R. , & Bloom, D. E. . (2015). Towards a comprehensive public health response to population ageing. *Lancet*, 385(9968), 658-661.

Beekman, A. T. F., Penninx, B. W. J. H., Deeg, D. J. H., Ormel, J., Braam, A. W., & van Tilburg, W. (1997). Depression and physical health in later life: Results from the Longitudinal Aging Study Amsterdam (LASA). *Journal of Affective Disorders*, 46(3), 219–231.

Berman, M. G., Jonides, J., & Kaplan, S. (2008). The Cognitive Benefits of Interacting with Nature. *Psychological Science*, 19(12), 1207–1212.

* Chu, H. Y., Chen, M. F., Tsai, C. C., Chan, H. S., & Wu, T. L. (2019). Efficacy of a horticultural activity program for reducing depression and loneliness in older residents of nursing homes in Taiwan. *Geriatric nursing*, 40(4), 386-391.

Chen, H. M. , & Huang, Y. L. . (2005). The theory and application of Horticultural Therapy. *Journal of the Chinese Society for Horticultural Science*.

Cohen, & D. Gene. (2000). Loneliness in later life. *American Journal of Geriatric Psychiatry Official Journal of the American Association for Geriatric Psychiatry*, 8(4), 273-275.

Development of the World Health Organization WHOQOL-BREF Quality of Life Assessment. (1998). *Psychological Medicine*, 28(3), 551–558.

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The Satisfaction With Life Scale. *Journal of Personality Assessment*, 49(1), 71.

Ed Ward, M. A. , Konopack, J. F. , Motl, R. W. , Morris, K. S. , Doerksen, S. E. , & Rosengren, K. R. . (2006). Physical activity and quality of life in older adults: influence of health status and self-efficacy. *Annals of Behavioral Medicine* (1), 99-103.

GLASS, G. V. (1976). Primary, Secondary, and Meta-Analysis of Research¹. *Educational Researcher*, 5(10), 3–8.

Haller, R. L., & Kramer, C. L. (2006). *Horticultural Therapy methods: making connections in health care, human service, and community programs*. Haworth Press.

Hall, J. (1), Mitchell, G. (2), Webber, C. (3), & Johnson, K. (4). (2018). Effect of Horticultural Therapy on wellbeing among dementia day care programme participants: A mixed-methods study (Innovative Practice). *Dementia*, 17(5), 611-620–620.

* Han, A. R., Park, S. A., & Ahn, B. E. (2018). Reduced stress and improved physical functional ability in elderly with mental health problems following a Horticultural Therapy program. *Complementary therapies in medicine*, 38, 19-23.

Jeannette, Golden, Ronán, M., Conroy, & Irene, et al. (2009). Loneliness, social support networks, mood and wellbeing in community-dwelling elderly. *International Journal of Geriatric Psychiatry*.

Joe, Tomaka, Sharon, Thompson, Rebecca, & Palacios. (2006). The relation of social isolation, loneliness, and social support to disease outcomes among the elderly. *Journal of Aging & Health*.

* Jueng, R. N., & Chen, I. J. (2022). The Effects of Horticultural Therapy on Sense of Coherence among Residents of Long-Term Care Facilities: A Quasi Experimental Design. *International journal of environmental research and public health*, 19(9), 5412.

Kamioka, H., Tsutani, K., Yamada, M., Park, H., Okuizumi, H., Honda, T., Okada, S., Park, S.-J., Kitayuguchi, J., Abe, T., Handa, S., & Mutoh, Y. (2014). Effectiveness of Horticultural Therapy: A systematic review of randomized controlled trials. *COMPLEMENTARY THERAPIES IN MEDICINE*, 22(5), 930–943.

Koivumaa-Honkanen, H. , Honkanen, R. , H Viinamäki, K Heikkilä, Kaprio, J. , & Koskenvuo, M. . (2000). Self-reported life satisfaction and 20-year mortality in healthy finnish adults. *American journal of epidemiology*, 152(10), 983-91.

* Lin, T. , Huang, C. , Hsu, H. , Liao, J. , Cheng, V. , & Wang, S. , et al. (2020). Effects of a combination of three-dimensional virtual reality and hands-on Horticultural Therapy on institutionalized older adults' physical and mental health: quasi-experimental design. *Journal of medical Internet research*, 22(11), e19002.

Manini, T. M. , & Pahor, M. . (2009). Physical activity and maintaining physical function in older adults. *BRITISH JOURNAL OF SPORTS MEDICINE*, 43(1), 28-31.

Mark C. Wilson, Jim Nishikawa, W. Scott Richardson, & Robert Hayward. (1995). The well-built clinical question: a key to evidence-based decisions. *ACP Journal Club*, 123, A12.

* Ng, K. , Sia, A. , Ng, M. , Tan, C. , Chan, H. , & Tan, C. , et al. (2018). Effects of Horticultural Therapy on asian older adults: a randomized controlled trial. *International journal of environmental research and public health*, 15(8).

* Ng, T. K. S., Gan, D. R., Mahendran, R., Kua, E. H., & Ho, R. C. (2021). Social connectedness as a mediator for Horticultural Therapy's biological effect on community-dwelling older adults: Secondary analyses of a randomized controlled trial. *Social Science & Medicine*, 284, 114191.

Nicholas, S. O. , Giang, A. T. , & Yap, P. . (2019). The effectiveness of Horticultural Therapy on older adults: a systematic review. *Journal of the American Medical Directors Association*, 20(10).

Nicholson, N. R. . (2012). A review of social isolation: an important but underassessed condition in older adults. *j prim prev*, 33(2-3), 137-152.

None. (2016). Promoting successful aging: population health management for older adults. *Gerontologist(Suppl_3)*, Suppl_3.

Otero-Rodríguez, A., León-Muñoz, L. M., Balboa-Castillo, T., Banegas, J. R., Rodríguez-Artalejo, F., & Guallar-Castillón, P. (2010). Change in Health-Related Quality of Life as a Predictor of Mortality in the Older Adults. *Quality of Life Research*, 19(1), 15–23.

* Park, S.-A. (1), Lee, A.-Y. (1), Park, H.-G. (2), & Lee, W.-L. (3). (2019). Benefits of gardening activities for cognitive function according to measurement of brain nerve growth factor levels. *International Journal of Environmental Research and Public Health*, 16(5).

Pender, N. J. (1996). *Health promotion in nursing practice*. Stanford, CT: Appleton and Lange.

Pender, N.J., Murdaugh, C. and Parsons, M.A. (2011) *Health Promotion in Nursing Practice*. 6th Edition, Pearson, Boston.

Polit, D. F., & Beck, C. T. (2017). *Nursing research : generating and assessing evidence for nursing practice* (9.ed.). Wolters Kluwer Health/Lippincott Williams & Wilkins.

Prince, M., Prina, M., & Guerchet, M. (2013). *Journey of Caring: an analysis of long-term care for Dementia*.

Relf, & Diane, P. . (2005). The therapeutic values of plants. *Pediatric Rehabilitation*, 8(3), 235-237.

* Shen, J. L., Hung, B. L., & Fang, S. H. (2022). Horticulture therapy affected the mental status, sleep quality, and salivary markers of mucosal immunity in an elderly population. *Scientific Reports*, 12(1), 1-7.

Sorkin, D. , Rook, K. S. , & Lu, J. L. . (2002). Loneliness, lack of emotional support, lack of companionship, and the likelihood of having a heart condition in an elderly sample. *Annals of Behavioral Medicine*(4), 290-298.

Srof, B. J. , & Velsor-Friedrich, B. . (2006). Health promotion in adolescents: a review of pender's health promotion model. *Nursing Science Quarterly*, 19(4), 366-373.

Strine, T. W. , Chapman, D. P. , Balluz, L. S. , Moriarty, D. G. , & Mokdad, A. H. . (2008). The associations between life satisfaction and health-related quality of life, chronic illness, and health behaviors among u.s. community-dwelling adults. *Journal of Community Health*, 33(1), 40-50.

* Tu, P. C., Cheng, W. C., Hou, P. C., & Chang, Y. S. (2020). Effects of types of horticultural activity on the physical and mental state of elderly individuals. *International Journal of Environmental Research and Public Health*, 17(14), 5225.

Van Den Berg, A. E., & Custers, M. H. G. (2011). Gardening promotes neuroendocrine and affective restoration from stress. *Journal of Health Psychology*, 16(1), 3–11.

Wang, D. , & Macmillan, T. . (2013). The benefits of gardening for older adults: a systematic review of the literature. *Activities Adaptation & Aging*, 37(2), 153-181.

Wang, Z. , Zhang, Y. , Lu, S. , Tan, L. , Guo, W. , & Lown, M. , et al. (2022). Horticultural Therapy for general health in the older adults: a systematic review and meta-analysis. *PLOS ONE*, 17.

Weyerer, S. , Eifflaender-Gorfer, S. , K?Hler, L. , Jessen, F. , Maier, W. , & Fuchs, A. , et al. (2008). Prevalence and risk factors for depression in non-demented primary care attenders aged 75 years and older. *Journal of Affective Disorders*, 111(2-3), 153-163.

WIGGINS, R. D., HIGGS, P. F. D., HYDE, M., & BLANE, D. B. (2004). Quality of life in the third age: key predictors of the CASP-19 measure.

* Wong, G. C. L., Ng, T. K. S., Lee, J. L., Lim, P. Y., Chua, S. K. J., Tan, C., ... & Larbi, A. (2021). Horticultural Therapy reduces biomarkers of immunosenescence and inflammaging in community-dwelling older adults: A feasibility pilot randomized controlled trial. *The Journals of Gerontology: Series A*, 76(2), 307-317.

World Health Organization. (1998). *The World Health Organization Quality of Life Assessment (WHOQOL): Development and psychometric properties*". *Social Science and Medicine*, 46(12), 1569-1585.

* Yao, Y. F., & Chen, K. M. (2017). Effects of horticulture therapy on nursing home older adults in southern Taiwan. *Quality of Life Research*, 26, 1007-1014.

Yeo, N. L., Elliott, L. R., Bethel, A., White, M. P., Dean, S. G., & Garside, R. (2020). Indoor nature interventions for health and wellbeing of older adults in residential settings: A systematic review. *The gerontologist*, 60(3), e184-e199.

* Yuh-Min Chen & Jeng-Yi Ji. (2015). Effects of Horticultural Therapy on psychosocial health in older nursing home residents: a preliminary study. *The Journal of Nursing Research*, 23(3), 167-171.

Zelenski, J. M., & Nisbet, E. K. (2014). Happiness and Feeling Connected: The Distinct Role of Nature Relatedness. *ENVIRONMENT AND BEHAVIOR*, 46(1), 3–23.

Appendix

Table 1

Author(s)	Study Design (possibly approach)	Source of Participants	Sample characteristics	intervention(s)	Comparators/controls	Frequency/duration
Ah-Reum Han et al., Publication: 2018 Country: Korea	Pre- and post-test design with experimental and control groups.	Elderly mental health centres	Number:28 Age: The average participant age was 80.1 ± 2.9 years in the Horticultural Therapy group and 77.4 ± 5.9 years in the control group. Participants were divided into Horticultural Therapy group (n = 14) and control group (n = 14)	Rural gardening activities	Plant cultivation activities	1×1.5 hours per week for 10 weeks
Glenn Choon Lim Wong et al.,	An experimental research design	Community	Number:48 Age: between 60	Indoor and outdoor gardening	indoor horticulture,park visits and outdoor	1×1 hour per week for first 3 months and 1×1 hour per

Publication: 2020 Country: Singapore			and 85 years old Participants were divided into Horticultural Therapy group (n = 22) and waitlist group (n = 24)	activity	gardening	month for second 3 months
Hui-Ying Chu et al., Publication: 2018 Country: China	An experimental research design	Nursing home	Number:150 Age: over 65 years old Participants were divided into experimental group (n = 75) and control group (n = 75)	Indoor gardening activities	Plant related crafts and planting	1×1.5-2 hours per week for 8 weeks
Jui-Ling Shen et al., Publication: 2022 Country: China	An experimental research design	Community (6/24) and adult day-care services (18/24)	Number:24 Age: 70–93	Indoor gardening crafts and outdoor gardening activities	Before and after gardening activities	1×1 hour per week for 6 weeks
Kheng Siang Ted Ng et al.,	An experimental research design	Community	Number : 59	Indoor and outdoor gardening	from indoor gardening, growing, and harvesting	1×1 hour per week for first 3 months and 1×1 hour per

Publication: 2018			Age: between 61 and 77 years old	activity	plants to guided walks in the various parks	month for second 3 months
Country: Singapore			Participants were divided into intervention group (n = 29) and control group (n = 30)			
Marta Bassi et al.,	a crossover study	Nursing home	Number: 13 (group 1: n=6, group 2: n=7)	Indoor horticultural and occupational activities	to join a first cycle of horticultural activities and a second cycle of occupational activities	1×1 hour per week for 6 weeks
Publication: 2018	with a baseline measure		Age: over 65 years old		to join a first cycle of occupational activities and a second cycle of horticultural activities	
Country: Italy			Participants were divided into group 1 (n=6) and group 2 (n=7)			

Pei-Chun Tu et al., Publication: 2020 Country: China	An experimental research design	University Senior Citizens Learning Camp	Number:27 Age: 60 to 76 years (average years 67.9 ± 4.5)	Indoor gardening activities	Before and after gardening activities	2×1 hour per week for 2 weeks
Ruo-Nan Jueng & I-Ju Chen, publication: 2022 Country: China long-term care facilities	A quasi-experimental research design	long-term care facilities	Number:86 Age: 65 years or above Participants were divided into experimental group (n = 49) and control group (n = 37)	Indoor planting	Indoor desktop planting and decorative plants	1×40 min per week for 12 weeks
Sin-Ae Park et al., Publication: 2019 Country: Korea	An experimental research design	Community	Number:41 Age : over 65 years	Low to medium intensity gardening activities	Before and after gardening activities	1×20 min for one week

<p>Ted Kheng Siang Ng et al., Publication: 2021 Country: Singapore</p>	<p>An experimental research design</p>	<p>Community</p>	<p>Number: 59 (Horticultural Therapy intervention arm: n = 29, waitlist control arm: n = 30) Age: 60–85 years Participants were divided into Horticultural Therapy intervention arm (n = 29) and waitlist control arm (n = 30)</p>	<p>Outdoor garden activities</p>	<p>the cultivation of vegetables and the plant- related material application nature receive, packs, and gardens visits</p>	<p>1×1 hour per week for first 3 months and 1×1 hour per month for second 3 months</p>
--	--	------------------	--	----------------------------------	--	--

Tsung-Yi Lin et al., Publication: 2020 Country: China	a quasi-experimental design	long-term care facilities	Number:106 Age: over 65 years old Participants were divided into experimental group (n = 59) and control group (n = 47)	3D Virtual and Hands-on Horticultural Therapy	Three-dimensional virtual reality and Hands-on Horticultural Therapy	2×1 hour per week for 9 weeks
Ya-Fang Yao & Kuei-Min Chen, Publication: 2016 Country: China	A quasi-experimental study	Nursing home	Number:85 Age: aged 65 or older Participants were divided into experimental group (n = 41) and control group (n = 44)	Indoor gardening therapy	plant cultivation and plant-related material application	1×1 hour per week for 8 weeks
Yuh-Min Chen& Jeng-Yi Ji Publication: 2014 Country: China	A combined quantitative and qualitative design	Nursing home	Number:10 Age: aged 65 years or older	Indoor gardening project	Before and after gardening activities	1×1.5 hours per week for 10 weeks

Table 4

Author Year	Aim	Result
Bassi et al. 2018	Aim of this pilot study was to contribute to extant literature through the investigation of the quality of experience associated with horticultural versus occupational activities.	<p>For all the experiential variables in group 1, the coefficients for baseline activities were significant and negative: concentration ($t(118) = -2.60, p = .011$), happiness ($t(118) = -2.44, p = .017$), sociability ($t(119) = -2.31, p = .022$), involvement ($t(119) = -4.52, p < .001$), challenges ($t(119) = -3.01, p = .004$), stakes ($t(116) = -5.05, p < .001$), and self-satisfaction ($t(119) = -3.31, p = .002$).</p> <p>Results thus showed that, globally, for group 1 the quality of experience was significantly more positive in all its components during horticultural activities than at baseline. Concerning occupational activities, significant negative coefficients were observed for challenges ($t(119) = -2.13, p = .035$) and stakes ($t(116) = -2.55, p = .012$), and a nearly significant negative coefficient for self-satisfaction ($t(119) = -1.91, p = .058$), underlying a decrease in these variables compared to horticultural activities.</p> <p>For multilevel models of group 2, the experiential variables were the dependent variable, the dummies baseline activities and horticultural activities were the predictors, and occupational activities were the reference category. Significant negative coefficients of baseline activities were obtained for concentration ($t(207) = -4.45, p < .001$), sociability ($t(206) = -2.74, p = .007$), and involvement ($t(206) = -3.78, p < .001$), showing an increase in these variables during occupational activities. In addition, significant positive coefficients of horticultural activities were</p>

- observed for challenges ($t(207) = 3.11, p = .003$), stakes ($t(207) = 2.17, p = .031$), and self-satisfaction ($t(206) = 2.87, p = .005$), underscoring an increase in these variables compared to occupational activities.
- Chen & Ji 2015 This preliminary study examined the effect of Horticultural Therapy on psychosocial health in older nursing home residents.
- Depression: The score for depression decreased from 8.1 (SD = 3.28) at T0 to 5.2 (SD = 2.94) at T1 and 3.6 (SD = 2.76) at T2 ($p < .001$). At the end of this program, the mean score for depression fell below the cutoff value of 5.
- Loneliness: The score for loneliness decreased from 42.9 (SD = 9.26) at T0 to 34.2 (SD = 7.54) at T1 and 35.9 (SD = 6.08) at T2 ($p < .001$).
- Choon et al. 2020 We aimed to examine the effects of Horticultural Therapy on immunosenescence.
- Horticultural Therapy is associated with increased numbers of naïve CD8+ T cells and fewer CTLA4-expressing terminally differentiated effector CD4+ and CD8+ memory T cells re-expressing CD45RA (TEMRA).
- Furthermore, IL-6 levels were reduced during Horticultural Therapy, and the frequencies of naïve and TEMRA CD8+ T cells were found to be associated with IL-6 levels.
- Following a 6-month Horticultural Therapy intervention program, Horticultural Therapy was associated with reduced T cell exhaustion and inflammation in community-dwelling older adults.
- (This study did not specify the specific experimental data.)
- Chu et al. 2018 This study evaluated a horticultural activity program for reducing depression and loneliness in older residents of nursing homes in Taiwan.
- Depression: The mean score for depression in the experimental group significantly decreased from 7.31 at T0 to 2.71 at T1 ($p < .001$). The mean score for depression in the control group significantly increased from 5.44 at T0 to 8.08 at T1 ($p < .001$).
- Loneliness: The mean score for loneliness in the experimental group significantly decreased from 50.77 at T0 to 44.27 at T1 ($p < .001$), but the mean score for

Han et al. 2018	This study aimed to determine the effects of a plant cultivation-based Horticultural Therapy program for elderly people with mental health problems.	loneliness in the control group significantly increased from 49.59 at T0 to 52.63 at T1(p < .001). the cortisol levels: In the Horticultural Therapy group, the cortisol levels decreased significantly from an average of 7.56 before and the program to 3.80 after the program (P <0.05). By contrast, no significant difference in cortisol levels was observed in the control group. And a higher level of cortisol correlates with a higher level of stress.
Jueng & Chen 2022	This study aims to examine the effectiveness of Horticultural Therapy on the level of sense of coherence (SOC) among older LTCF residents with relatively normal mental function.	SOC (sense of coherence): ①In the experimental group (n = 49), the mean score of SOC was 50.45 ± 6.07 at baseline and increased to 56.37 ± 7.20 (p < 0.001) after 12-week horticultural intervention. ②In the control group (n = 37), the mean SOC score was 52.97±6.00 at baseline and increased to 53.22 ± 5.96 (p < 0.001) after 12-week.
Lin et al. 2020	This study explored the effects of a combination of 3D virtual reality and Horticultural Therapy on institutionalized older adults' physical and mental health.	mean health status: The score of experimental group for health status increased from 19.19 at T1 to 28.73 at T2. And the score of control group for health status decreased from 23.15 at T1 to 22.70 at T2. mean meaning in life: The score of experimental group for meaning in life increased from 19.15 at T1 to 28.11 at T2. And the score of control group for health status decreased from 29.53 at T1 to 28.81 at T2. mean perceived mattering: The score of experimental group for perceived mattering increased from 9.19 at T1 to 14.22 at T2. And the score of control group for health status decreased from 10.77 at T1 to 10.49 at T2. mean loneliness (reverse scored): The score of experimental group for loneliness increased from 13.86 at T1 to 18.92 at T2. And the score of control group for health status decreased from 17.77 at T1 to 17.21 at T2.

- mean depression (reverse scored): The score of experimental group for depression increased from 6.67 at T1 to 8.40 at T2. And the score of control group for health status increased from 7.52 at T1 to 7.57 at T2.
- Ng et al. 2018 In this Horticultural Therapy-randomized controlled trial, we aimed to measure the changes in the levels of pro-inflammatory cytokines, interleukin (IL)-6, IL-1 β , soluble glycoprotein 130 (sgp130), chemokines, C-X-C motif chemokine 12 (CXCL12), also known as stromal cell-derived factor 1 alpha (SDF-1 α), C-C motif ligand 5 (CCL-5), also known as regulated on activation, normal T-cell expressed and secreted (RANTES) and BDNF, all of which exert pleiotropic effects on the central nervous system and are key modulators of the immune and nervous system.
- positive relations with others: Relative to baseline, the mean scores of positive relations with others was significantly increased by 2.14 points (95% CI: 0.52 to 3.76) in Horticultural Therapy participants ($p = 0.001$). On the other hand, the change in the control group after 6 months was not significant ($p = 0.31$), with the mean scores reduced by -0.7 points.
- Cognitive Function, Depression, Anxiety and Psychological Well-Being: SAS scores increased in both groups from baseline to 6-months, in the treatment group from 26.00 (4.88) to 36.32 (4.91), ($p < 0.001$), while in the control group from 25.79 (5.07) to 34.21 (3.69), ($p < 0.001$).
- Ng et al. 2021 The aim of this study was to conduct a secondary analysis of a randomized controlled trial investigating the bio-psychosocial effects of Horticultural Therapy.
- IL-6 levels: Improving mental health, including depression, anxiety, and general psychological well-being could regulate IL-6 levels, as it has also been shown to be a biomarker for both depression and anxiety. At baseline, social connectedness was significantly correlated with IL-6 levels ($\beta = -0.12$, 95% CI = -0.21 to -0.03 , $p = 0.008$). Social connectedness at 3-month significantly mediated the effects of Horticultural Therapy on IL-6 levels at 6-month ($\beta = 0.32$, 95% CI = 0.09 to 0.54 , $p = 0.005$; $\beta = -0.25$, 95% CI = -0.45 to -0.05 , $p = 0.016$). Specifically, Horticultural Therapy resulted in a significant increase in social connectedness at 3-month levels at 6-month.

Park et al. 2019	The objective of this study was to determine the effects of gardening activities in senior individuals on brain nerve growth factors related to cognitive function.	Levels of the Brain Nerve Growth Factors: ①BDNF (brain-derived neurotrophic factor): The score for BDNF increased from 53.75±21.49 before intervention to 58.26±23.40 after intervention.
Shen et al. 2020	This study investigated the effects of Horticultural Therapy on the psychological status and mucosal immunity of elderly individuals.	②PDGF (platelet-derived growth factor): The score for PDGF increased from 3477.46±1171.82 before intervention to 3945.80±1372.26 after intervention. Satisfaction with Life Scale (SWLS): After 6 weeks, the score for SWLS increased from 22.38±5.97 before activities to 30.54±5.60 after activities. Warwick–Edinburgh Mental Well-Being Scale (WEMWBS): After 6 weeks, the score for WEMWBS increased from 53.21±13.89 before activities to 65.17±6.25 after activities. Happiness and Life Satisfaction (HLS): After 6 weeks, the score for HLS increased from 5.96±1.57 before activities to 9.21±1.28 after activities. Sleep assessment (PSQI): After 6 weeks, the score for PSQI decreased from 7.92±3.75 before activities to 5.21±3.60 after activities.
Tu et al. 2020	This study aimed to evaluate the effect of types of horticultural activities among elderly individuals in a senior citizen learning camp.	Effect of Grass Doll on Profile of Mood State (POMS): ①depression-dejection: decrease from 15.8 ± 0.8 to 13.5 ± 0.9. ②confusion-bewilderment: decrease from 12.4 ± 0.8 to 10.2 ± 0.7. ③tension-anxiety: decrease from 13.7 ± 1.0 to 11.0 ± 0.8. ④anger-hostility: decrease from 14.8 ± 1.1 to 12.3 ± 0.9. ⑤fatigue-inertia: decrease from 11.3 ± 0.9 to 9.3 ± 0.8. ⑥vigor-activity: increase from 22.3 ± 0.8 to 23.0 ± 1.0 Effect of Kokedama on Profile of Mood State (POMS): ①depression-dejection: decrease from 16.0 ± 1.2 to 13.4 ± 0.9. ②confusion-bewilderment: decrease from 12.0 ± 0.7 to 10.3 ± 0.8. ③tension-anxiety: decrease from 13.3 ± 1.0 to 11.2 ± 0.8.

0.9.. ④anger-hostility: decrease from 14.6 ± 1.1 to 11.8 ± 0.8 . ⑤fatigue-inertia: decrease from 11.0 ± 0.9 to 9.0 ± 0.7 . ⑥vigor-activity: increase from 21.0 ± 0.7 to 24.5 ± 0.7

Effect of Rocky Leaf Prints on Profile of Mood State (POMS): ①depression-dejection: decrease from 16.0 ± 1.1 to 12.6 ± 0.8 . ②confusion-bewilderment: decrease from 11.4 ± 0.7 to 8.7 ± 0.6 . ③tension-anxiety: decrease from 13.2 ± 0.9 to 9.2 ± 0.6 . ④anger-hostility: decrease from 14.7 ± 0.9 to 9.3 ± 0.5 . ⑤fatigue-inertia: decrease from 11.5 ± 0.6 to 7.6 ± 0.5 . ⑥vigor-activity: increase from 21.2 ± 0.5 to 26.4 ± 0.5

Effect of Herb Tasting and Smelling on Profile of Mood State (POMS): ①depression-dejection: decrease from 19.3 ± 1.8 to 12.7 ± 0.8 . ②confusion-bewilderment: decrease from 11.6 ± 0.6 to 8.9 ± 0.6 . ③tension-anxiety: decrease from 12.9 ± 0.6 to 8.6 ± 0.5 . ④anger-hostility: decrease from 14.9 ± 0.8 to 9.6 ± 0.6 . ⑤fatigue-inertia: decrease from 11.2 ± 0.6 to 7.1 ± 0.5 . ⑥vigor-activity: increase from 20.7 ± 0.8 to 26.0 ± 0.5

Yao & Chen
2016
This study aimed to test the effects of horticulture therapy on activities of daily living, happiness, meaning of life, and interpersonal intimacy of nursing home older adults in southern Taiwan.

Activities of daily living (ADL): The score of experimental group for ADL increased from 62.44 before intervention to 70.80 after intervention. And the score of control group for health status decreased from 65.57 before test to 58.79 after test.

Happiness: The score of experimental group for happiness increased from 11.07 before intervention to 14.15 after intervention. And the score of control group for health status decreased from 9.84 before test to 7.86 after test.

Meaning of life: The score of experimental group for meaning of life increased

from 74.49 before intervention to 76.47 after intervention. And the score of control group for health status increased from 73.89 before test to 76.19 after test.

Interpersonal intimacy: The score of experimental group for interpersonal intimacy increased from 44.49 before intervention to 49.24 after intervention. And the score of control group for health status decreased from 46.30 before test to 43.79 after test.