NATIONAL PARKS

DESIGN GUIDELINES FOR THERAPEUTIC GARDENS IN SINGAPORE

WORKING COMMITTEE:

Andrew Foke
Angelia Sia
Cheong Li Min
Damian Tang
Isis Lim
Kay Pungkothai
Lilian Kwok
Maxel Ng
Ng Cheow Kheng
Shi Biying
Soh Weijing
Tham Xin Kai
Voon Tin Keat
Yeo Meng Tong

ADVISORS:

Prof Kua Ee Heok, MBBS, MD, FRC, PBM (National University Health System)
Elizabeth R.M. Diehl, RLA, HTM (University of Florida)

© National Parks Board. 2017

ISBN: 978-981-11-3632-0

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic or mechanical including photocopying, recording or any storage and retrieval system, without prior written permission of the copyright owners.

DESIGN GUIDELINES FOR THERAPEUTIC GARDENS IN SINGAPORE

The Therapeutic Garden @ HortPark is the prototype for the network of therapeutic gardens in Singapore. Developed based on best practices and evidence-based design principles relating to therapy for improving mental well-being, it provides respite for visitors of all ages and incorporates design elements and user-friendly features to meet the needs of the elderly, including those with conditions such as dementia. Since its launch in May 2016, there has been a growing interest to incorporate such therapeutic environments outside of park settings.

This guide puts together the basic characteristics of therapeutic gardens and aims to be a useful resource for the design of future therapeutic landscapes in Singapore, particularly for the elderly and people with dementia.

FOREWORD

The practice of creating green spaces that promote well-being dates back to ancient times, where people sought to arrange their surroundings in ways that would enhance their quality of life. There are a number of schools of thought on landscape aesthetics. These include the Prospect-Refuge Theory (Appleton, 1975), the Savanna Hypothesis (Orians & Heerwagen, 1986 and 1992) as well the more recent Biophilia Hypothesis (Wilson, 1984 and 1993) – which have served as an inspiration to many design practitioners worldwide. These designers have applied this understanding of humans' innate attraction to nature to biophilic design principles defined for the built environment.

Taking this concept a step further, natural environments can be specifically designed to bring about optimal restorative benefits for users. Therapeutic gardens fulfill this purpose. They are often intended to meet the needs of a specific population, through a multi-disciplinary collaborative design process helmed by a team of professionals.

In our recent research study with the National University Health System, we found that elderly participants who took part in a horticultural therapy programme experienced improvements in several aspects of their mental health. There were also improvements in a number of biological markers, suggesting that the participants' interaction with nature reaped biological benefits, such as reducing inflammation and depression. The outcomes are both positive and promising, and we have since launched the first Therapeutic Garden @ HortPark in May 2016.

We are heartened by the interest and support of our working associates, including colleagues from the healthcare sector, in our initiative on therapeutic gardens. In this publication, we share best design practices on therapeutic gardens for Singapore. It introduces design guidelines that incorporate principles from the Attention Restoration Theory (Kaplan & Kaplan, 1989) and Stress Reduction Theory (Ulrich, 1991), to restore users' ability to pay attention and experience a more rapid relief from stress. We invite you along in our endeavour to nurture the connection between people and nature – creating a healthier population as a result.

Kenneth Er
Chief Executive Officer
National Parks Board

References

1. Appleton, J. (1975). *The Experience of Landscape*. London: Wiley.
2. Kaplan R. and Kaplan S. (1989). *The Experience of Nature: A Psychological Perspective*. New York: Cambridge University Press.
3. Orians, G. H. (1986). An ecological and evolutionary approach to landscape aesthetics. In E.C. Penning-Rowsell and D. Lowenthal (Eds), *Landscape Meanings and Values*. Allen & Unwin, pp. 3–25.
4. Orians, G. H. and Heerwagen, J. H. (1992). Evolved responses to landscapes. In J.H. Barlow, L. Cosmides and J. Tooby (Eds), *The Adapted Mind: Evolutionary Psychology and the Generation of Culture*. Oxford University Press, pp. 555–580.
5. Wilson, E. O. (1984). *Biophilia*. Cambridge: Harvard University Press.
6. Wilson, E. O. (1993). Biophilia and the conservation ethic. In S. R. Kellert and E. O. Wilson (Eds.), *The Biophilia Hypothesis*. Island Press, pp. 31–41.
7. Ulrich, R.S., et al. Stress recovery during exposure to natural and urban environments. *Journal of Environmental Psychology*, 11(3), pp. 201–230.

CONTENT

Part 1: Introduction, Theories and Research

Introduction 7
Attention Restoration Theory 9
Stress Reduction Theory 11
Research Study in Singapore 13
Case Study: Therapeutic Garden @ HortPark 15

Part 2: Design Guidelines

Overall design considerations 29
Framework for designing therapeutic gardens 31
Planning 32
Site selection 33
Layout 34
Garden structures 35
Amenities 37
Visual communication and signage 45
Planting and composition 53
Examples of plants for use in therapeutic gardens 55

Part 3: Programming

Types of social and therapeutic horticulture programmes 71
Social Horticulture Programme (SHP) 73
Therapeutic Horticulture Programme (THP) 77
Horticultural Therapy Programme (HTP) 81

Annex A:
Schedule design of SHP 83

Annex A1:
SHP activity plan design – example of activity 1 85

Annex A2:
SHP activity plan design – example of activity 7 87

Annex B:
Schedule design of THP 89

Annex B1:
THP session plan design – example of session 2 93

Annex B2:
THP individual session design – example of session 8 95

Annex C:
Schedule design of HTP 97

Annex C1:
HTP session plan design – example of session 4 101

Annex C2:
HTP individual session design – example of session 5 103

Annex D:
Further reading 105

PART 1

INTRODUCTION, THEORIES & RESEARCH

INTRODUCTION

What are Therapeutic Gardens?

Therapeutic gardens are outdoor gardens specifically designed based on evidence to meet the physical, psychological and social needs of the people using the gardens.

Human Connection to Nature

The body of research literature demonstrating the wide range of benefits arising from human interactions with nature is extensive and growing. Green space provides an attractive venue for physical activity, and contributes to physical health as a result. Through bio-physiological mechanisms, it also enhances our mental well-being.

One particularly beneficial activity is horticultural therapy. It is defined as the use of prescribed nature-related activities to aid recovery from mental or physical ailments. Study findings have shown benefits such as the reduction of chronic pain, improvement in attention, lessening of stress, and reduction of falls. Similarly, therapeutic gardens, located within built environments and designed specifically for a target group of patients, are now increasingly being recognised as an important aid in healthcare. They support and enhance the impact of horticultural therapy for users. In view of these benefits, the design of healthcare facilities and policies globally has begun to incorporate access to therapeutic gardens.

Understanding Benefits at Population Level

A number of theories have been presented to explain the widespread attraction to and appreciation of natural environments, the Biophilia Hypothesis being a significant one.

Biophilia[1] was first defined by Erich Fromm as "the passionate love of life and all that is alive" in his book *The Anatomy of Human Destructiveness* (1973). The term was later used by American biologist Edward O. Wilson in his work *Biophilia* (1984), which proposed that the tendency of humans to focus on and to affiliate with nature and other life-forms has, in part, a genetic basis.

Overall, the concept of biophilia implies that we hold a biological need for connection with nature on physical, mental, and social levels. Hence, integrating natural environments into our urban setting will affect our personal well-being, productivity, and societal relationships in a positive way.

Understanding Benefits at Individual Level

Complementing population level theories are "restoration and recovery" theories (described in the following sections) that explain the psycho-physiological mechanisms through which natural environments manifest their physical and mental benefits on individuals.

Reference

1. Erich Fromm. (1973). *The Anatomy of Human Destructiveness.* New York: Holt, Rinehart and Winston, p.366.

ATTENTION RESTORATION THEORY

Kaplan and Kaplan explain in the Attention Restoration Theory (ART)[1] that a person has several states of attention including directed attention and effortless attention. Directed attention requires effort and is used when concentrating on specific tasks, such as working on the computer. As the capacity of the brain to focus on a specific stimulus or task is limited, prolonged usage of directed attention causes direct attention fatigue, and results in ineffectiveness and human error.

Restoration from directed attention fatigue can be derived from the use of effortless attention when a person is in a natural environment. Gardens, in particular, provide an opportunity for people to rest since they do not have to exercise directed attention.

ART proposes that exposure to the natural environment encourages more effortless brain function, thereby allowing it to recover and replenish its directed attention capacity.

In S. Kaplan's earlier work, he explains the following landscape characteristics being intuitively meaningful.

A) Coherence

Provide a setting that is orderly and organised into clear areas so that people can easily understand and make sense of a place.

B) Complexity

Provide a rich setting with many opportunities for sensory engagement. For example, a garden can have a clear layout but be rich with trees, shrubs, flowers, places to sit, and paths to wander.

C) Legibility

Create a distinct setting that has one or more memorable components – something that helps someone remember the place and also allows them to navigate easily through the space.

D) Mystery

Scenes high in mystery are characterised by continuity; there is a connection between what is seen and what is anticipated. For example, a view partially obscured by foliage tempts one to follow the path, "just a little farther", thus engaging the visitor and drawing him or her forward.

References

1. Kaplan, R. and Kaplan, S. (1989). *The experience of nature: A psychological perspective.* New York: Cambridge University Press.
2. Kaplan, S. (1979). Perception and landscape: Conceptions and misconceptions. *Proceedings of Our National Landscape: A Conference on Applied Techniques for Analysis and Management of the Visual Resource* (Incline Village, Nevada, April 23-25 1979), pp. 241-248.

STRESS REDUCTION THEORY

Roger Ulrich used the Stress Reduction Theory (1991) to explain emotional and physiological reactions to natural spaces.[1] Being in an unthreatening natural environment or viewing natural elements (such as vegetation) activates a positive affective response, resulting in a decrease in stress in individuals, which involves reduced levels of negatively toned feelings and reductions in elevated physiological conditions (such as heart rate and blood pressure).

Based on the theory, there are four areas of consideration that can guide the design of therapeutic gardens:

A) Sense of control

Enable users to get to and into the garden easily (garden should be visible from a main entry or other gathering/waiting area). The garden should have a variety of different types of spaces for users to choose from.

B) Social support

Locate and configure seating for a variety of opportunities for interaction. Conducive seating will allow users to gather and spend time together, building social connections.

C) Physical movement and exercise

Provide more structured opportunities for exercise as well as interaction with the gardens.

D) Positive natural distraction

Provide as many opportunities to engage with nature as possible. This includes plants, water, and wildlife.

Reference

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

RESEARCH STUDY IN SINGAPORE

Facilitators leading elderly participants from Lee Ah Mooi Old Age Home in a gardening activity at HortPark

Recognising the positive role that greenery plays in improving people's health, the National Parks Board (NParks) and the National University Health System embarked on the first study in ASEAN (Association of South East Asian Nations) countries to evaluate the efficacy of horticultural therapy in promoting mental health and cognitive functioning of our elderly in 2015. This is especially relevant in the context of the proven benefits of horticultural therapy on the elderly population and our rapidly ageing population with increasing numbers of elderly with dementia.

In the study, 69 elderly participants were randomly assigned to receive horticultural therapy in the treatment group, or to be waitlisted in the control group. The horticultural therapy programme for the treatment group comprised outdoor gardening, indoor horticultural activities, and park visits. The sessions took place weekly for 12 weeks, and then monthly for three months.

The mental health of participants in both groups was assessed through self-reports of depressive and anxiety symptomatology, social connectedness, and psychological well-being as well as tests on immunological markers. The participants were examined at three points in time: at the start (to establish a baseline); three months post-intervention (after therapy started); and six months post-intervention.

The findings revealed that horticultural therapy improved participants' scores for life satisfaction, memory, and psychological well-being. In particular, this improvement was significant for positive relations (social connectedness and trusting relationships).

Elderly participants from Lee Ah Mooi Old Age Home potting plants as part of a gardening activity at HortPark

Through biomarkers assessment, it was found that the levels of the cytokines, interleukins IL-1β and IL-6, in the horticultural therapy group were significantly reduced compared to those of the control group. IL-1β and IL-6 are pro-inflammatory proteins involved in the activation of inflammatory responses, which lead to both physical and psychological deterioration.

These positive findings support our plan to develop specially designed therapeutic gardens that are infused with nature to stimulate the senses and also incorporate features that facilitate gardening and nature engagement. Inclusive in nature, they cater to users with different capabilities, including the elderly and those with mobility concerns. As gardening offers an enjoyable experience while increasing physical activity levels at the same time, we anticipate therapeutic gardens to become more popular amongst the elderly.

Beyond the elderly, all visitors to therapeutic gardens in our public parks will be able to experience benefits as these gardens are designed to bring about restorative effects to our mental well-being.

CASE STUDY: THERAPEUTIC GARDEN @ HORTPARK

Location
33 Hyderabad Rd, Singapore 119578

Client/Owner	Completion Date	Site Area
National Parks Board	14 May 2016	850 sqm

Landscape Architect
Andrew Foke (National Parks Board)

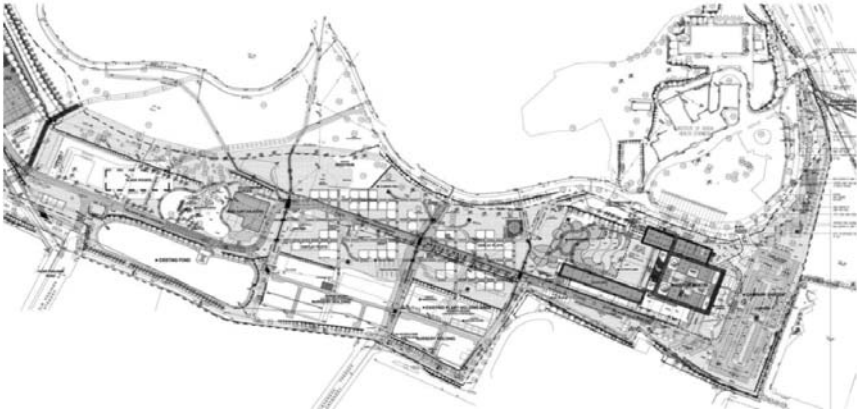
Hardscape Contractor	Landscape Contractor
Landscape Engineering Pte. Ltd.	Tropic Planners & Landscape Pte. Ltd.

Project Summary

The first therapeutic garden in Singapore, this site is distinguished by its exceptional landscape quality and design functionality.

In its Activities Zone, where horticultural activities take place, elements like trees with ample shade, moveable and raised planter beds, wide walkways, and easily accessible water sources help to enhance the gardening experience. These features allow users with different physical abilities to carry out typical gardening tasks like watering, weeding and harvesting without straining or overexerting themselves.

A Restorative Zone complements the Activities Zone: it is a space designed with appropriate rest points like pavilions and benches scattered across the garden, serving as varied vantage points to its intensive and fascinating landscape.



PLANNING

At the start of the project, feedback was obtained from the psychological health department of the National University Health System. The Alzheimer's Disease Association was also consulted as the Therapeutic Garden was intended to benefit the elderly. Their input was considered and incorporated in the design.

SITE SELECTION

A) Vicinity
It is located near a building known as the Hands-on House at HortPark, which has amenities such as toilets, wash areas and drinking fountains.

B) Shade
A site with shady trees was selected. In addition, the project was implemented without removing any existing trees. A shady area provides comfort to participants when programmes are being carried out.

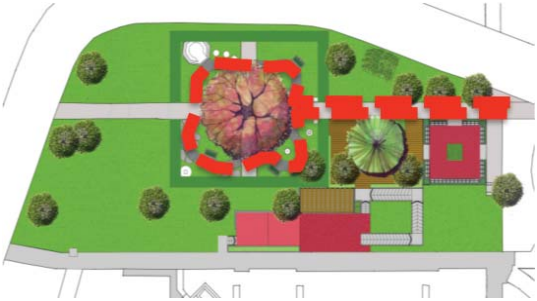
C) Terrain
The site selected has a gentle slope of an approximate gradient of 1:20 running along its length. To create a level space, a timber deck was introduced.

D) Borrowed landscape
The surrounding landscape/scenic view in HortPark enhances the landscape experience in the garden.

LAYOUT

A) Simple, clear layout

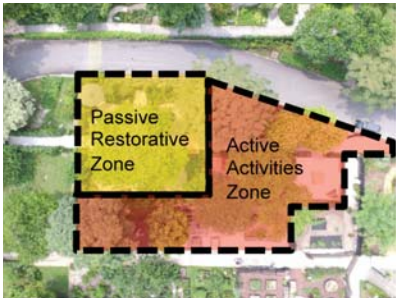
The circulation path adopts a simple looped pattern without confusing dead ends. The area is enclosed with planting beds, providing safety and separation without the use of a fence.



B) Zoning

i. Activities Zone – includes space for group activities such as horticultural therapy and exercise equipment

ii. Restorative Zone – includes space for strolling and seating



The Therapeutic Garden @ HortPark is made up of two zones, the Activities Zone and the Restorative Zone

Entrance to the Restorative Zone

MICROCLIMATE

A) Ambient temperature

With the provision of shade by trees and shelter, the ambient temperature of the site is expected to never exceed 32 degrees Celsius.

B) Air ventilation

The absence of walls and other enclosing structures allows for natural ventilation and wind to pass through the site.

C) Shade and shadow

The mature trees in the site provide shade and contribute towards the comfort of users. Considerations were made to avoid long streaky shadows.

GARDEN STRUCTURES

A) Shelter

An existing gazebo was retained to provide an area for respite and self-contemplation. New benches were built into the shelter to provide seating for up to 15 people. Views of the garden from inside the shelter were carefully curated and maintained to promote calmness and peacefulness.

B) Trellis

A new trellis was built in the activities area to provide shade for users participating in planting activities. Mobile planters were incorporated into the trellis area to ensure that the plants receive enough sunlight. If needed, the mobile planters may be moved aside, to create additional space for group activities.

AMENITIES

A) Benches

Benches are located strategically throughout the garden to make the most of scenic views. These benches were designed with armrests to assist the elderly with getting up. The shape of the bench and its materials are carefully selected to ensure they are safe and easily usable by the elderly.

B) Toilets, drinking fountains and vending machines

Toilets, drinking fountains and vending machines can be found in close proximity to the garden, at the Hands-on House. The access between the garden and these facilities was designed to be barrier free. The Hands-on House also provides shelter in the event of wet weather.

C) Planting racks

Planting racks are provided in the activities area for participants of the programmes to display their completed projects. These racks were designed to be at a height for easy access to anyone in a wheelchair.

D) Work bench

Work benches for the activities were designed to be at a height that is accessible for users on wheelchairs. Materials were selected with safety of the participants and durability in mind.

E) Seats at the Activities Zone

The railings along the timber deck are fitted with seats to optimise space. These seats allow caregivers to rest while activities are going on. Mature trees provide shade for the seating areas.

PROGRAMMING

The Therapeutic Horticulture Programme at HortPark uses plants and plant-related activities to improve the well-being of individuals through active or passive involvement.

The programme aims to:

- provide an enriching experience with nature
- promote social interaction and physical activity
- stimulate the senses through interaction with nature
- enhance physical and mental well-being
- promote interest in plants and gardening

Participants and volunteers enjoying gardening activities from the therapeutic horticulture programme

The programme outline is as follows:

Duration	Location	Activities	Summary of Steps
10 min	Hands-on House	Introduction	1. Arrival of participants 2. Ice-breaking session 3. Simple stretching activity
15 min	Therapeutic Garden @ HortPark Restorative Zone	Contact with Nature	4. Guided tour of Therapeutic Garden @ HortPark, highlighting the different zones of the garden. Participants will get to know the plants and be encouraged to smell, touch and feel the plants, stimulating their brain and senses
10 min	Therapeutic Garden @ HortPark Restorative Zone	Rest	5. The tour will end at the Gazebo where the group will rest and enjoy the scenery 6. Sharing session can be conducted during this time to encourage interaction among participants
45 min	Therapeutic Garden @ HortPark Restorative Zone	Therapeutic Garden Activities	7. Participants will be guided to carry out the programme activities
10 min	Hands-on House	Reflection	8. Participants return to Hands-on House to refresh, reflect on their activities and end with a sing-along session

Therapeutic Garden Activities	Summary of Steps
1. Gardening	• Propagation of edible plants • Growing of edible sprouts • Maintenance (Pruning/watering/weeding)
2. Art & Floral Appreciation	• Leaf printing • Pebble or pot design • Floral Arrangement
3. Exercise & Music Reminisce	• Simple stretching with music

PART 2

DESIGN GUIDELINES

OVERALL DESIGN CONSIDERATIONS

In a piece that appeared in the *Journal of Art and Design* (2012), M.S. Erickson offers design considerations to apply to every component of all therapeutic gardens:

A) Safety, security and privacy

Outdoor spaces, in particular those within healthcare facilities, serve people who may be vulnerable in one way or another. All aspects of the outdoor space must ensure users' physical and emotional safety and security.

B) Accessibility

Ensuring safe and comfortable use for all people regardless of age or ability is essential. The design should adhere to Universal Design (UD) principles[1] as much as possible.

C) Physical and emotional comfort

The overall goal is to create an environment in which people feel cared for and nurtured. When people are physically and emotionally comfortable, they tend to stay in a garden longer and benefit more from the experience.[2] The design should provide safe and comfortable places to walk and sit as well as create opportunities for social connection.

D) Positive distraction

Elements in the garden should, as much as possible, distract users from stress. The purpose of the garden should be to provide a place of natural beauty to let users get away, both physically and emotionally, from interior environments that may be alien, stressful, threatening, or intimidating.[3]

E) Engagement with nature

Research has shown that connection to nature, especially in healthcare settings, is one of the most effective forms of positive distraction.[4] Planting, natural materials and sounds, and the presence of water are some examples of positive natural distractions.

F) Maintenance and sustainability

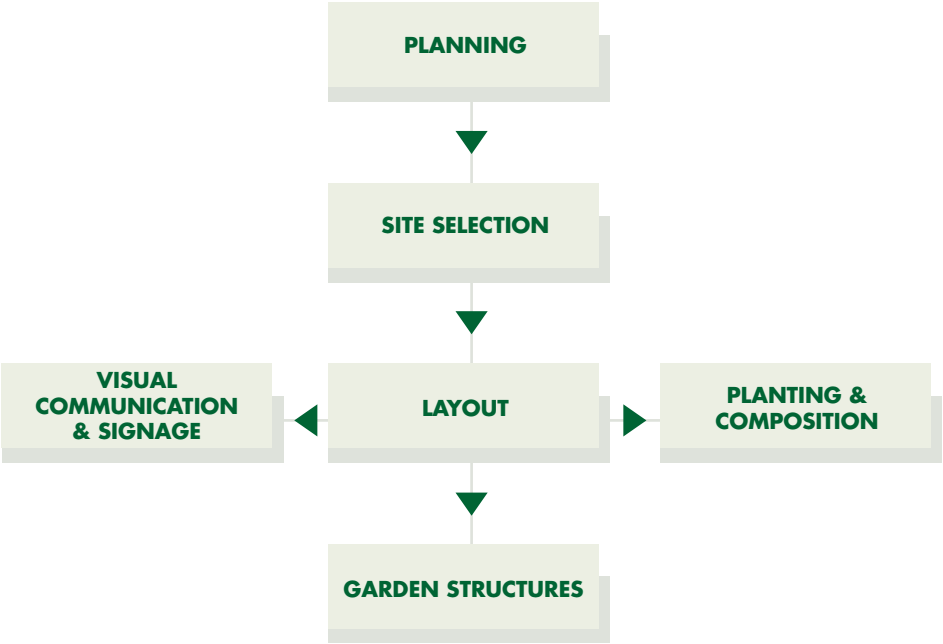
All therapeutic gardens have to be properly maintained to function as safe, useful and enjoyable spaces for their target users.[5] Damaged garden elements such as paving or seats can compromise users' safety. Also, plants that are not properly maintained may affect the mood of users and create a negative experience towards the garden.

As much as possible, garden design should be ecologically sustainable by using recycled materials, tapping on green infrastructure for stormwater management, and choosing plants that require low maintenance.

References

1. Mace, R.L., Ostroff, E., Connell B.R., Jones, M., Mueller, J., Mullick, A., Sanford, J., Steinfeld, E., Story, M. and Vanderheiden, G. (1997). *The Principles of Universal Design*. Center for Universal Design, NC State University. Retrieved from http://www.ncsu.edu/project/design-projects/udi/center-for-universal-design/the-principles-of-universal-design/.
2. Bengtsson, A., and Carlsson, G. (2006). Outdoor environments at three nursing homes: Focus group interviews with staff. *Journal of Housing for the Elderly*, 19(3-4), pp. 49-69.
3. Ulrich, R. (1992). How design impacts wellness. *Healthcare Forum Journal*, 20, pp. 20-25.
4. Ulrich, R. (1999). Effects of gardens on health outcomes: Theory and research. In C. C. Marcus & M. Barnes (Eds.), *Healing Gardens* (pp. 27-86). New York: Wiley.
5. Davis, B.E. (2011). Rooftop hospital gardens for physical therapy: A post-occupancy evaluation. *HERD: Health Environments Research & Design Journal*, 4(3), pp. 14-43.

FRAMEWORK FOR DESIGNING THERAPEUTIC GARDENS

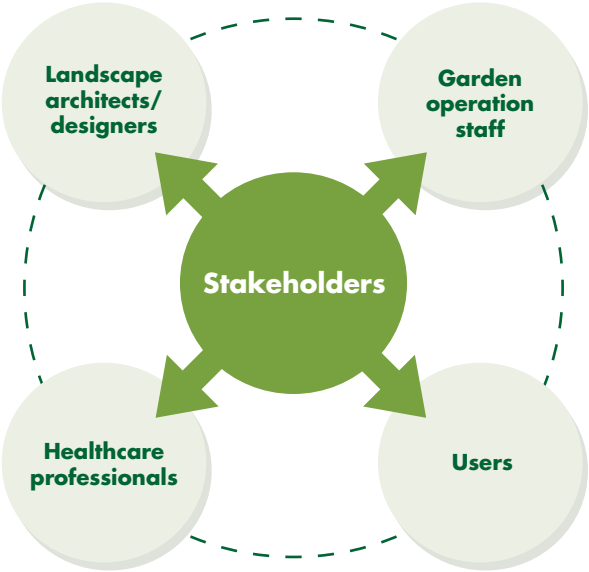


PLANNING

A) Involve all stakeholders in the planning and design process, including users, caregivers and healthcare staff, to ensure their needs and concerns are considered. Multiple perspectives help to maximise the value of the garden[1]

B) Identify users' cultural backgrounds, age groups, and extent of their illnesses (e.g. stage of dementia disease) to better design for their needs

C) Consider programming in tandem with the planning, design and development of the garden



Stakeholders of therapeutic gardens

Reference

1. **Multiple perspectives must be considered in healthcare facility and garden master planning to maximise the value of the garden for patients and staff alike.**
Davis, B.E. (2011). Rooftop hospital gardens for physical therapy: A post-occupancy evaluation. *HERD: Health Environments Research & Design Journal*, 4(3), pp. 14-43.

SITE SELECTION

A) Accessibility

i. It is recommended that vehicular drop-off access be as close to the site as possible to avoid making elderly users walk long distances

ii. It is recommended that, in the case of rooftop gardens, Universal Design (UD) elements such as lifts are included to ensure accessibility for all users

B) Vicinity

It is recommended that the site be located near amenities like toilets, wash areas, or drinking fountains to ensure users have easy access

C) Terrain

It is recommended that the site be relatively flat to facilitate ease of movement for users

D) Noise

It is recommended that the site be situated away from roads and amenities such as basketball courts and playgrounds to minimise disturbance to the users

E) Shade

Adequate shade is recommended on the site to provide respite for users from the sun[1]

F) Borrowed landscape

Choose a site with existing landscape or scenic views to enhance the landscape experience in the garden

G) Good ventilation

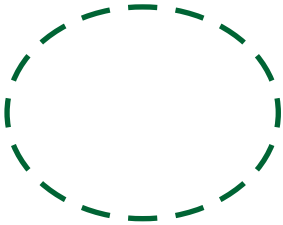
The site should have good airflow and be located away from the exhaust flow of building air vents

LAYOUT

A) Simple, clear layout[2]

i. It is recommended that the circulation path be easily navigable and identifiable from the entrance

ii. The general circulation path should be a simple looped pattern or a figure-of-8 pattern, without dead ends



Simple loop path

Figure-of-8 path

B) Zoning

i. Active zone – includes space for group activities such as horticultural therapy, as well as exercise equipment

ii. Passive zone – includes space for strolling and seating

C) Boundaries

Provide a boundary with shrubs to soften the sight of fences or walls and create a secure space without having a sense of being enclosed

D) Visibility

i. It is recommended that caregivers be given a clear view of all parts of the garden from all vantage points

ii. The garden should not have any blind spots which might hide users from their caregivers

References

1. **Shade is critical as Alzheimer's patients have difficulty recognising that they are too hot and may not take the precaution to wear a hat or put on sunblock.**
   Marcus, C.C. and Sachs, N. A. (2013). *Therapeutic Landscapes: An Evidence-Based Approach to Designing Healing Gardens and Restorative Outdoor Spaces.* New Jersey: John Wiley and Sons.
2. **Ensure garden design is legible for dementia patients; people with dementia, who have problems with spatial orientation and memory impairments, are most likely to become disorientated at decision points such as junctions and corners.**
   Mitchell et al., (2003). Making the outside world dementia-friendly: Design issues and considerations. *Environment and Planning B: Planning and Design*, 30(4), pp. 605-632.

GARDEN STRUCTURES

A) Garden entrance

i. Engage the senses

Include design features that engage a user's senses[1] (hearing, touch, sight, smell and taste)

ii. Provide contrast

Create a distinct colour contrast between the circulation path and plants, furniture, and other garden structures for easy wayfinding[2]

iii. Evoke memories

Provide features to evoke the memory of users, such as plants with familiar smells[3]

iv. Incorporate views

Allow for views out to a wider landscape for a sense of belonging to a broader community[4]

B) Wheelchair accessibility

All areas and appropriate structures within the garden should be accessible by wheelchairs

C) Amenities

Provide an abundance of attractive and well maintained destination points and facilities:

i. Create pockets of interest throughout the garden

ii. Cluster together interesting elements such as garden ornaments and colourful plants, to capture users' attention

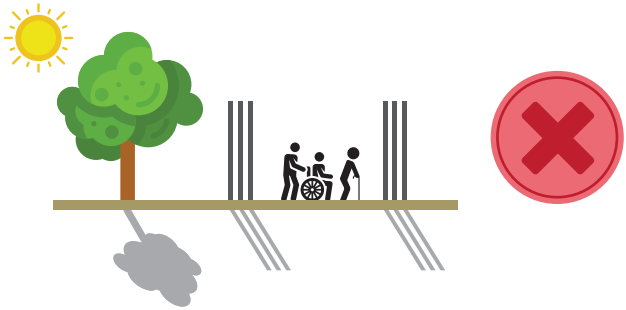
iii. Include choices for seating and gathering spaces

iv. Provide for semi-private spaces for 2 to 3 people as well as larger interactive spaces to accommodate groups of 8 to 10 people

D) Shade + Shadow

Shadows cast on site by garden structures should be monolithic rather than slatted to avoid causing agitation for dementia participants.[5] If possible, provide maximum shade using plants

Monolithic shadows cast by solid buildings



Slatted shadows cast by trellises

References

1. **Sensory stimulations help reduce declines in cognition and function in dementia patients.**
   Kovach, C.R. (1997). *Late-Stage Dementia Care: A Basic Guide*. Washington, DC: Taylor & Francis.
2. **Patients with Alzheimer's disease are significantly weaker in detecting colour contrast.**
   Rizzo, M., Anderson, S.W., Dawson, J. and Nawrot, M. (2000). Vision and cognition in Alzheimer's disease. *Neuropsychologia*, 38, pp. 1157–1169.
3. **Dementia patients tend to retain large amounts of memories and familiar smells and sounds can be used to stimulate positive sensory experiences into therapeutic programmes to bring about positive outcomes.**
   Woods, B., Spector, A., Jones, C., Orrell, M. and Davies, S. (2005). Reminiscence therapy for dementia. Cochrane Database of Systematic Reviews, 18(2), CD001120. Serrani Azcurra, D. J. (2012). A reminiscence programme intervention to improve the quality of life of long-term care residents with Alzheimer's disease: A randomized controlled trial. *Rev Bras Psiquiatr*, 34(4), pp. 422–433.
4. Bengtsson, A. and Carlsson, G., (2013). Outdoor environments at three nursing homes: qualitative interviews with residents and next of kin. *Urban For. Urban Green*, 12(3), pp. 393–400.
5. **Alzheimer's patients exhibit a phenomenon known as sundowning, displaying increased agitation in the late afternoon. One suggestion to reduce this problem is to avoid slatted shadows as it is thought that the casting of long shadows in the late afternoon contributes to this problem.**
   Randall, P., Burkhardt, S.S.J. and Kutcher, J. (1990). Exterior Space for Alzheimer's Disease and Related Disorders. *The American Journal of Alzheimer's Care and Related Disorders and Research*, 5(July/August), pp. 31 – 37.

AMENITIES

A) Garden entrance
Entrance into the garden should be distinct to make it easy for users to identify the start and end point[1]

B) Secondary access
i. Provide a secondary entry to enable maintenance staff to enter, or users to leave in an emergency

ii. Secondary entry needs to be subtly located or designed to be less visually obvious

C) Signage
Install signage for informative and interactive purposes

D) Sculptures
Install features or landmarks in the garden. They can be located near to the entrance as a focal point

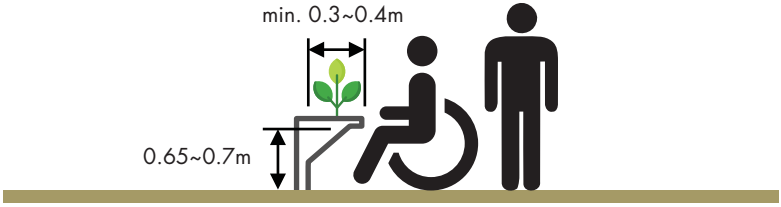
E) Storage area
Provide storage area for tools and materials to support horticultural activities

F) Watering point
Provide a watering source to support horticultural activities

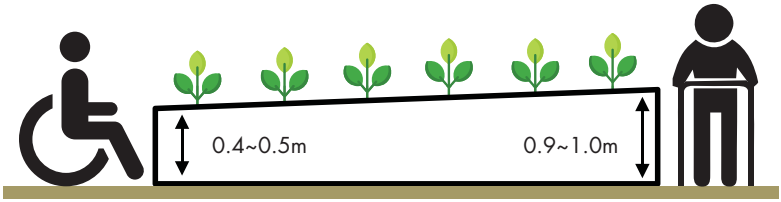
G) Planter

i. Provide raised planters at varying heights for users to interact with plants. They can be used for horticultural therapy or general ease of viewing

ii. Plants in planters should be within reach of all users



Recommended height for wheelchair accessible planter



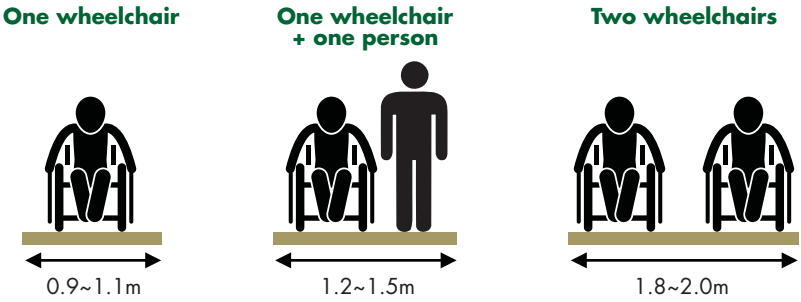
Recommended height for planter

Reference

1. **Surroundings that make it easy for users to familiarise themselves help them to recognise the environment and feel at home.**
   Bengtsson, A. and Carlsson, G. (2013). Outdoor environments at three nursing homes: qualitative interviews with residents and next of kin. *Urban For. Urban Green*, 12(3), pp. 393–400.

H) Paving

i. Minimum width of 1.2m for wheelchair access



Pavement widths

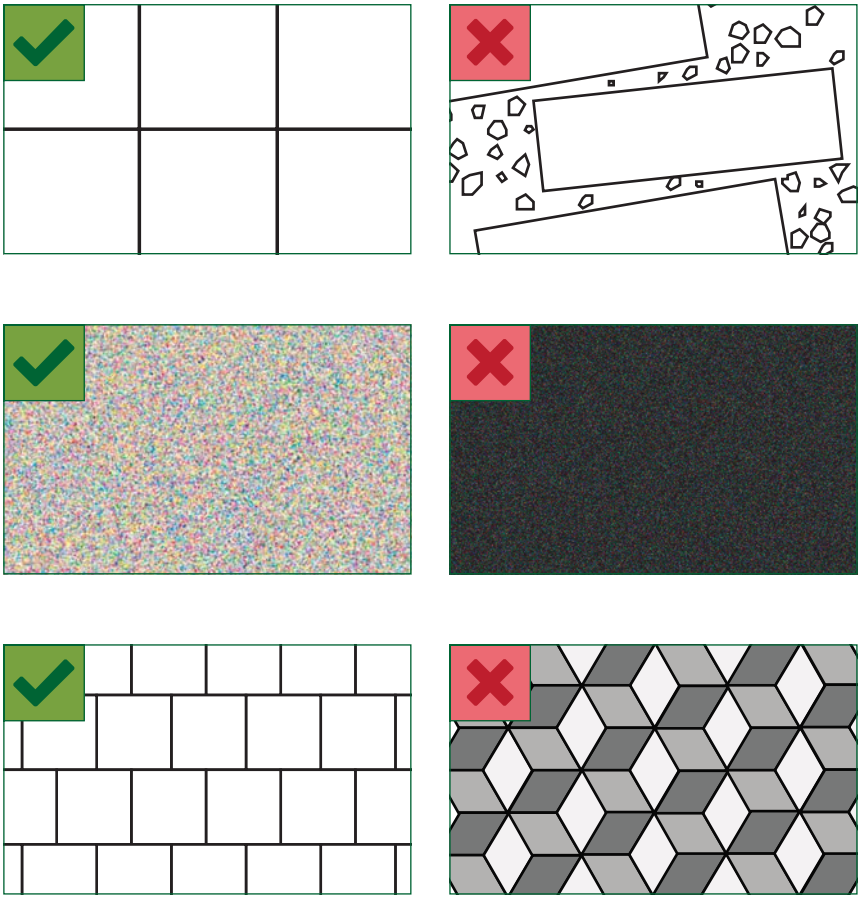
ii. Simple and consistent finishes

iii. Level with good traction to prevent slipping when wet

iv. Glare-free with consistent, light colour

v. Avoid gaps in-between paving (except for expansion joints)[1]

vi. Provide edging on either side to support wayfinding and define the edge of the path[2]



Types of paving to be used and avoided

References

1. **Users with Alzheimer's Disease may start to forget how to perform basic motor acts so they tend to shuffle as they move along. Gaps between paving may cause them to trip and fall.**
   Randall, P., Burkhardt, S. S. J. and Kutcher, J. (1990). Exterior Space for Alzheimer's Disease and Related Disorders. *The American Journal of Alzheimer's Care and Related Disorders and Research*, 5(July/August), pp. 31 – 37.
2. **Users with Alzheimer's Disease tend to have problems identifying edges and contrast.**
   Risacher, S.L. *et al.* (2010). Visual contrast sensitivity as a novel biomarker for neurodegeneration in early Alzheimer's disease, mild cognitive impairment, and older adults with cognitive complaints. *Alzheimer's & Dementia*, 6(4).

I) Seating

i. Armrests with a minimum width of 0.1m should be provided to support movement while sitting down or getting up

ii. Provide a minimum of one bench every 5m along the path. This not only allows users to rest frequently, but also provides a visual cue to encourage them to walk further[1]

iii. Provide a variety of seating options in spaces that cater to different needs; from benches for small groups of people in semiprivate spaces to a mix of seating options in public settings

iv. Provide appropriate type of seats in gathering spaces to suit target users' needs

v. Provide seating at right angles or opposite each other and close together to allow social interaction[2]

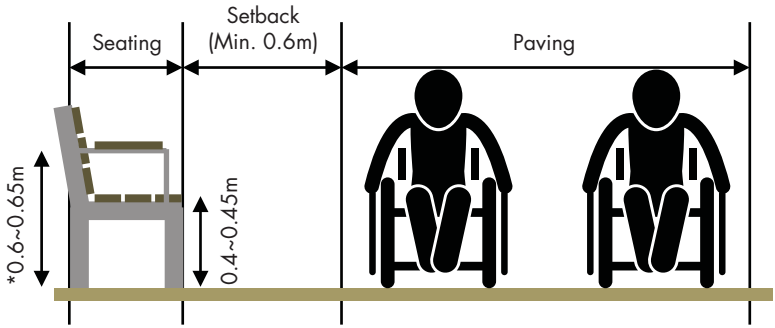
vi. Provide a variety of seating options

vii. Provide a hard surface setback with a minimum width of 0.6m between paving and seat

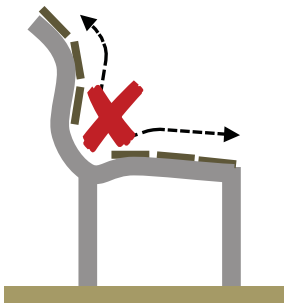
viii. Provide colour contrast between seating and hard surface setback

ix. Do not introduce benches with slumped backs

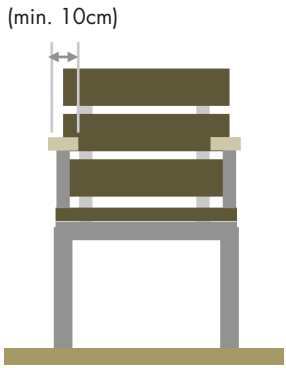
x. Provide room for a wheelchair next to seats to allow both wheelchair users and non-wheelchair users to gather



Distance of setback between seating and paving



Avoid benches with slumped backs



Armrest should be min. 0.1m width

References

1. **Seats are especially important for users not using wheelchairs, allowing them to pace, rest briefly, and pace again.**
   Marcus, C.C. and Sachs, N. A. (2013). Therapeutic Landscapes: *An Evidence-Based Approach to Designing Healing Gardens and Restorative Outdoor Spaces.* New Jersey: John Wiley and Sons.
2. **It is important to provide opportunities for social interactions as social activities are important to in helping elderly slow down the rate of cognitive decline.**
   Glei, D. A. et al. (2005). Participating in social activities helps preserve cognitive function: an analysis of a longitudinal, population-based study of the elderly. *International Journal of Epidemiology*, 34(4), pp. 864-871.
   Bengtsson, A. and Carlsson, G. (2013). Outdoor environments at three nursing homes: qualitative interviews with residents and next of kin. *Urban For. Urban Green*, 12(3), pp. 393–400.

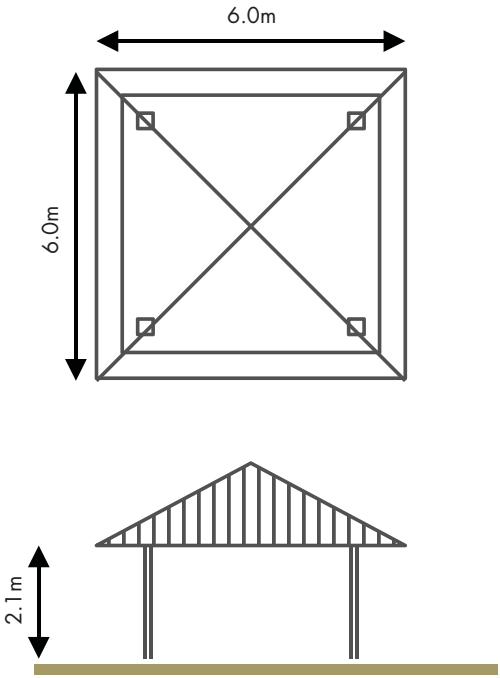
J) Shelter

i. Provide a shelter large enough to accommodate groups of 10 to 12 people

ii. Provide a smaller shelter to accommodate smaller groups

iii. Include a minimum of one electrical socket for activity use in each shelter

iv. Provide access for users with wheelchairs

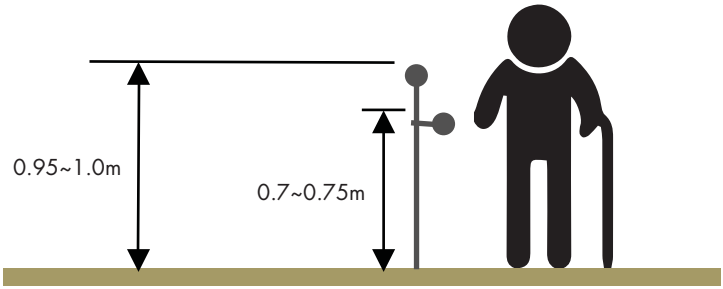


Recommended shelter dimension for 10 to 12 people

K) Hand rails

i. Hand rails should be provided intermittently along the pathway to support users and help them to balance themselves while moving through the gardens[1]

ii. If possible, provide hand rails at various heights



Recommended height for hand rails

Reference

1. Bengtsson, A., Carlsson, G., (2013). Outdoor environments at three nursing homes: qualitative interviews with residents and next of kin. *Urban For. Urban Green*, 12 (3), 393–400.

VISUAL COMMUNICATION AND SIGNAGE

A good visual communication and signage design helps to convey information effectively, enhancing the users' visiting experience.

This can be achieved with the effective application of graphic elements, such as images, layout, colours, typography, signage scale and placement, with specific considerations of the needs for the elderly and/or users suffering from cognitive conditions such as dementia.

Generally park users can be categorised into three common groups – A, B and C – depending on the user's health:

User can move about independently.

User has declined mobility, dependent and/ or has mild health conditions.

User has a severe cognitive condition such as dementia.

Signage can be installed at the entrance, within, or outside the therapeutic garden to provide direction, educational information and/or advisory messages for different users:

Sign type	User A	User B	User C
Directional marker (Placed outside therapeutic garden)	✔	✔	✔
Directional marker	✔	✔	✔
Interpretive sign to provide educational information (If required)	✔	✔	—
Advisory sign (If required)	✔	✔	✔

DIRECTIONAL MARKER

An effective directional marker helps to inform, direct and identify a space. It leads and informs users that they have reached their intended destination.

A) Placement and design of sign

i. Be visible from far and remains unobstructed

ii. Use colours that provide differentiation from the immediate surrounding to draw the user's attention

iii. Placed at decision-making points or junctions for clearer orientation of the space around

iv. The distance between each sign should be less than 50m (subject to the extent of the line of sight)

v. Placed perpendicularly to pedestrian flow

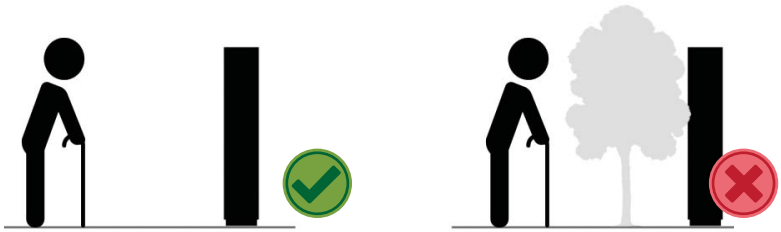
vi. Information such as distance and direction should be sequentially linked to surrounding signs

vii. Information such as 'exit', 'toilet' and 'shelter' are important to users and should be clearly displayed on the sign

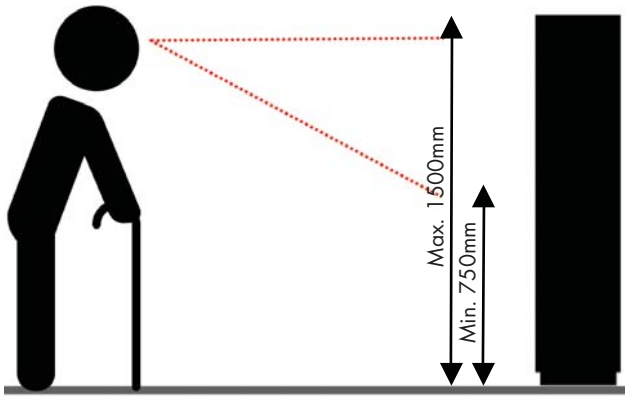
viii. Use bigger font to help older users read easily from afar. The suggested minimum font height is 20mm

Information stated in this section is referenced from the following publications:
Singapore Standards SS 599 : 2014 Guide for wayfinding signage in public areas.
Singapore Standards SS 618 : 2016 Guidelines on user interface design for older adults.

Directional marker should be placed at decision-making points or junctions for clearer orientation of the space around.



It should be visible from afar and remains unobstructed.



An example of a directional marker with suggested clearance perimeter for the information displayed

INTERPRETIVE SIGN

It is more comfortable to tilt the head down to read, especially for older users. For a sign with more content such as an interpretive sign, it is recommended that information is placed below the natural eye level.

In addition, a sturdy and level pedestal for wheelchair users allows them to get closer to the sign and read the content more easily.

B) Clarity of layout and content

i. Layout should be clear of clutter for the user to read, navigate and digest the content easily

ii. Ensure contrast to distinguish foreground from background elements

iii. Use a light coloured background instead of white to help the user read comfortably

iv. Keep the content simple, short and easily digested with minimal need to rely on memory

v. Use prominent headers or sub-headers

vi. Use sharp images and ensure copyrights are sought or to seek valid permission before use

vii. Use bigger font to help older users read easily. The suggested minimum font height is 5mm

viii. Avoid using all capital letters (other than for the header)

Information stated in this section is referenced from the following publications:
Singapore Standards SS 599 : 2014 Guide for wayfinding signage in public areas.
Singapore Standards SS 618 : 2016 Guidelines on user interface design for older adults.

An example of an interpretive sign with an uncluttered layout and clear foreground elements

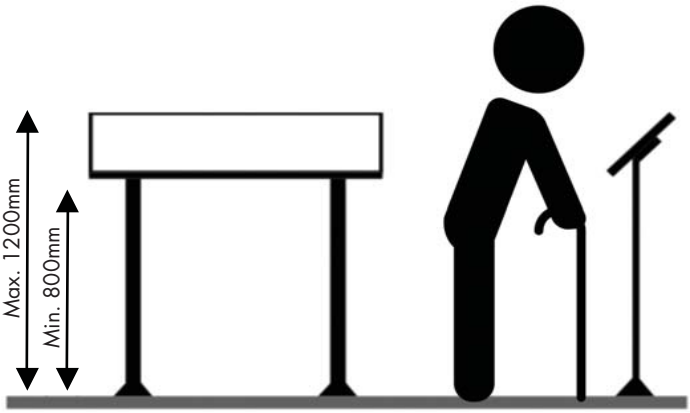
Therapeutic Garden

An outdoor garden specifically designed based on evidence to meet the needs of...

THERAPEUTIC GARDEN

AN OUTDOOR GARDEN SPECIFICALLY DESIGNED BASED ON EVIDENCE TO MEET THE NEEDS OF...

Avoid using all capital letters for body text.



An example of an interpretive sign with suggested heights

OTHER CONSIDERATIONS

C) Illumination

i. A well-illuminated sign helps the user read easily in a dim (night) environment

ii. The illumination level on the sign-face should not be significantly higher or lower than the ambient light around the sign

iii. For a non-illuminated sign, consider placing it next to an existing light source, e.g. park light, to enhance legibility at night

iv. Distance between light source and sign should be carefully planned to avoid undesirable highlights and shadows cast on sign-face

D) Finishing

Use non-reflective or anti-glare material/finishes on the sign-face as some users may be sensitive to glare or bright surfaces

E) Pictogram/Icon

Use pictograms or icons that are recognisable and easily understood

Examples of common and recognisable pictograms/icons

Information stated in this section is referenced from the following publications:
Singapore Standards SS 599 : 2014 Guide for wayfinding signage in public areas.
Singapore Standards SS 618 : 2016 Guidelines on user interface design for older adults.

F) Font

Use sans serif font for better differentiation. Avoid using serif and exotic fonts or fonts with thin lines as they are harder to distinguish under bright/dark conditions

Serif and sans serif fonts

Futura

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

An example of a sans serif font

PLANTING & COMPOSITION

A) Mature trees
Existing mature trees provide shade, and a symbolic sense of longevity, continuity, and character for the overall garden.

B) Sensory attributes
Diverse characteristics and features used in the selection of plants for a therapeutic garden include:

i. Colour
Warm colours like red, yellow and orange stimulate the mind and excite the senses while cool colours such as blue and purple create a calming experience.

ii. Texture
Plants with interesting leaf textures can be used to surprise and fascinate visitors through their sense of touch. These plants should be located within reach of all visitors, including those using wheelchair.

iii. Smell
The scent of plants may evoke memories by engaging visitors' sense of smell. Fragrance can be immediate through the perfume of flowers or released through rubbing/crushing of leaves.

iv. Auditory
The gentle rustling of leaves such as from grasses and trees or a gurgling water feature can create a serene and peaceful environment.

v. Fauna attracting plants
Opportunities should be created for visitors to observe and appreciate wildlife like butterflies and birds.

vi. Edibles
Plants that are used for cooking i.e. herbs and spices, fruits and vegetables can also engage users through a sense of familiarity and the associated comfort that food brings.

vii. Local cultural memory
Plants encountered in childhood or daily life can evoke memories and bring back a sense of nostalgia to the visitors. These could include culturally significant, edible, or wayside plants.

C) Plants to use with caution

i. Poisonous sap (ingestion)

ii. Irritating hairs/surface oils (contact)

iii. Thorns/spikes/prickles (contact)

iv. Plants with associations with undesirable fauna

D) Contrast in composition

Plant species with contrasting colours, leaf texture, and size can create captivating visual texture in a garden.

E) Plant labels

Plant identification labels and interactive educational signage will provide interesting information to visitors.

EXAMPLES OF PLANTS FOR USE IN THERAPEUTIC GARDENS

The following are some examples of plants that can be featured in therapeutic gardens for their different characteristics.

The list of plants is not exhaustive, and serves only as examples which can be used. Plants with similar characteristics can also be introduced into the gardens.

Plant selection should be made foremost on site suitability based primarily on soil, water and light conditions.

For more information on plant choices, growing conditions and unique plant characteristics, please visit **florafaunaweb.nparks.gov.sg**.

Key Symbols:

Prefers lots of water

Prefers moderate water

Prefers little water

Prefers full sun

Prefers semi-shade

Prefers full shade

Tree

Climber & Creeper

Bonsai

Aquatic plant

Fragrant plant

Native to Singapore

Bird-attracting plant

Host plant

Nectar plant

EXAMPLES OF PLANTS FOR COLOUR

***Arundo dona* 'Versicolour'**
(Variegated Giant Reed)

***Graptophyllum pictum* 'Tricolour'**

***Bridelia ovata* (variegated)**

***Aglaonema* cultivars**

Cyathula prostrata
(Purple Hookweed)

***Syngonium* cultivars**

***Hibiscus rosa-sinensis* 'Cooperi'**
(Checkered Hibiscus)

Planchonella obovata
(Sea Gutta)

***Ipomoea batatas* 'Margarita'**
(Margarita Sweet Potato Vine)

Saraca indica
(Asoka Tree)

Dillenia excelsa
(Simpoh Lak)

***Trachelospermum asiaticum* cultivars**

Clerodendrum thomsoniae
(Bleeding Heart)

***Hamelia patens* (variegated)**
(Variegated Firecracker)

***Plectranthus scutellarioides* cultivars**
(Coleus)

*** Fragrance scale:**
1 (fragrant up close or when crushed)
2 (fragrant from afar but faint)
3 (very fragrant from afar and can become overpowering)

EXAMPLES OF PLANTS FOR TEXTURE

***Pennisetum x advena* 'Rubrum'**
(Red Fountain Grass)

Leucophyllum frutescens
(Barometer Bush)

Dalbergia latifolia
(Black Rosewood)

Ficus villosa
(Villous Fig)

Argyreia nervosa
(Elephant Climber)

Licuala grandis
(Ruffled Fan Palm)

Conocarpus erectus* var. *sericeus
(Silver Buttonwood)

***Calathea* cultivars**

Pellionia repens
(Rainbow Vine)

***Microsorum musifolium* 'Crocodyllus'**
(Crocodile Fern)

Orchidantha fimbriata

Ipomoea quamoclit
(Cypress Vine)

Petrea volubilis
(Sandpaper Vine)

Tetracera indica
(Fireweed)

***Pilea mollis* 'Moon Valley'**

*** Fragrance scale:**
1 (fragrant up close or when crushed)
2 (fragrant from afar but faint)
3 (very fragrant from afar and can become overpowering)

EXAMPLES OF FRAGRANT PLANTS

Gardenia mutabilis
(Thai Gardenia)

Aloysia virgata
(Sweet Almond Verbena)

Cananga odorata var. fruticosa
(Dwarf Ylang Ylang)

Uvaria grandiflora
(Red Hot Poker)

Pleiocarpa mutica
(Kanwene)

Vallaris glabra
(Bread Flower)

Gardenia jasminoides
(Cape Jasmine)

Ocimum basilicum
(Basil)

Magnolia figo
(Banana Shrub)

Citharexylum spinosum
(Fiddlewood)

Ixora finlaysoniana
(Siamese White Ixora)

***Quisqualis indica* (double-petalled)**

Wrightia religiosa
(Water Jasmine)

Tarenna fragrans
(River Tarenna)

***Jasminum sambac* cultivars**
(Arabian Jasmine)

*** Fragrance scale:**
1 (fragrant up close or when crushed)
2 (fragrant from afar but faint)
3 (very fragrant from afar and can become overpowering)

EXAMPLES OF PLANTS FOR ATTRACTING FAUNA

Afgekia sericea
(Silky Afgekia)

Asclepias curassavica 'Silky Yellow'
(Milkweed)

Rhodomyrtus tomentosa
(Rose Myrtle)

Cratoxylum cochinchinense
(Kayu Arang)

Etlingera elatior
(Torch Ginger)

Calotropis gigantea
(Giant Milkweed)

Callerya reticulata
(Evergreeen Wisteria)

Cheilocostus speciosus
(Crepe Ginger)

Aristolochia acuminata
(Dutchman's Pipe)

***Gomphrena globosa* 'Fireworks'**
(Bachelor's Button)

Leea rubra
(Pucok Merah)

Odontonema cuspidatum
(Cardinal's Crest)

***Rotheca myricoides* 'Ugandense'**
(Blue Butterfly Bush)

Flacourtia inermis
(Thornless Rukam)

Ficus deltoidea
(Mistletoe Fig)

*** Fragrance scale:**
1 (fragrant up close or when crushed)
2 (fragrant from afar but faint)
3 (very fragrant from afar and can become overpowering)

EXAMPLES OF EDIBLE PLANTS

Annona squamosa
(Custard Apple)

Averrhoa bilimbi
(Belimbing)

Centella asiatica
(Indian Pennywort)

Platostoma palustre
(Chin Chow)

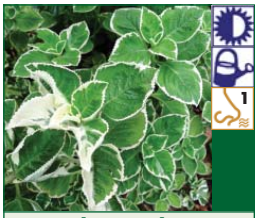
Coffea arabica
(Arabica Coffee)

Lansium domensticum
(Langsat)

Leptospermum madidum ssp. sativum
(Weeping Tea-Tree)

Kaempferia galanga
(Sand Ginger)

Basella alba 'Rubra'
(Red Ceylon Spinach)



Plectranthus amboinicus 'Variegatus'
(Variegated Indian Borage)

Tagetes lucida
(Sweetscented Marigold)

Persicaria hydropiper
(Laksa Leaf)

Gnetum gnemon
(Belinjau)

Piper nigrum
(Common Pepper)

Clitoria ternatea
(Butterfly Pea)

*** Fragrance scale:**
1 (fragrant up close or when crushed)
2 (fragrant from afar but faint)
3 (very fragrant from afar and can become overpowering)

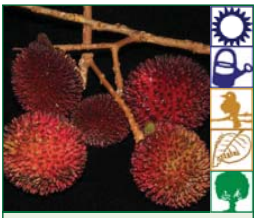
EXAMPLES OF PLANTS ASSOCIATED WITH LOCAL CULTURAL MEMORY

Psidium guajava
(Guava)
* Kampung home garden

Adenanthera pavonina
(Saga)
* Seeds are a symbol of love

Tamarindus indica
(Tamarind)
* Kampung home garden

Carica papaya
(Papaya)
* Kampung home garden



Nephelium ramboutan-ake
(Pulasan)
* Kampung home garden

Hymenocallis speciosa
(Spider Lily)
* Habitat of fighting spiders

Manihot esculenta
(Tapioca)
* Kampung home garden

Artocarpus heterophyllus
(Jackfruit)
* Kampung home garden

Syzygium aqueum
(Jambu Ayer)
* Kampung home garden

Ipomoea batatas
(Sweet Potato)
* Kampung home garden & commonly used in local cuisine

Manilkara zapota
(Chiku)
* Kampung home garden

Punica granatum
(Pomegranate)
* Symbol of good luck in Chinese culture

Impatiens balsamina
(Balsam)
* Kampung home garden

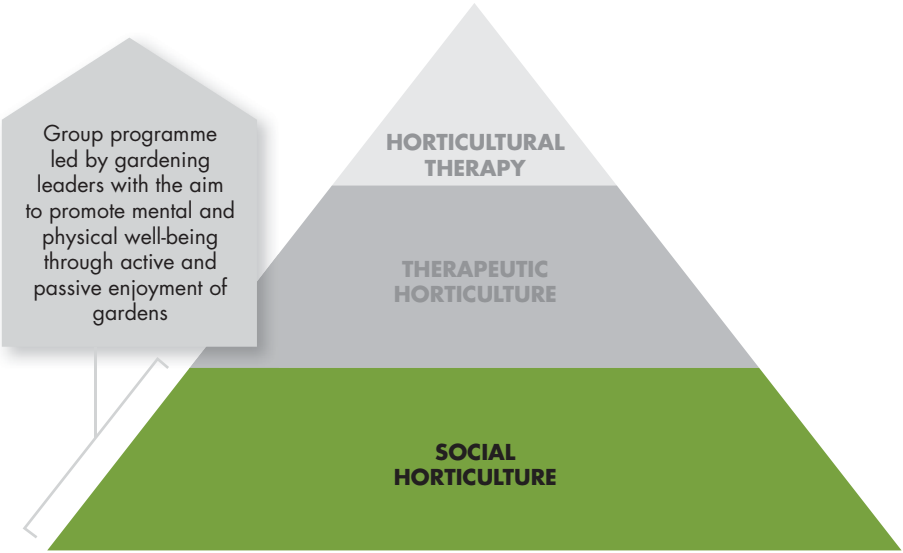
Azadirachta indica
(Neem Tree)
* Significance in Hinduism

Pandanus amaryllifolius
(Pandan)
* Kampung home garden & commonly used in local cuisine

PART 3

PROGRAMMING

TYPES OF SOCIAL AND THERAPEUTIC HORTICULTURE PROGRAMMES


Group programme led by gardening leaders with the aim to promote mental and physical well-being through active and passive enjoyment of gardens
HORTICULTURAL THERAPY
THERAPEUTIC HORTICULTURE
SOCIAL HORTICULTURE

SOCIAL HORTICULTURE PROGRAMME (SHP)

Social Horticulture Programmes (SHP) are broad-based horticulture engagement programmes which aim to improve participants' well-being through horticulture activities in a social setting. They are suitable for a group of people with a wide range of abilities and can be enjoyed with or without a facilitator.

A) Objective of designing a SHP

Promote greater physical and mental well-being through social participation of plant based activities. The objective is for participants to feel better about themselves at the end of each session.

B) Understanding SHP design process

i. Target profile

Understanding the desires, conditions and behaviour of the participants of SHP will help gardening leaders design purposeful and sustainable programmes and leverage available gardening resources.

ii. Objective

The purpose of the programme must be clear; usually, SHP aims to promote physical and mental well-being.

C) Output

A compilation of activities and steps designed for targeted groups or individuals

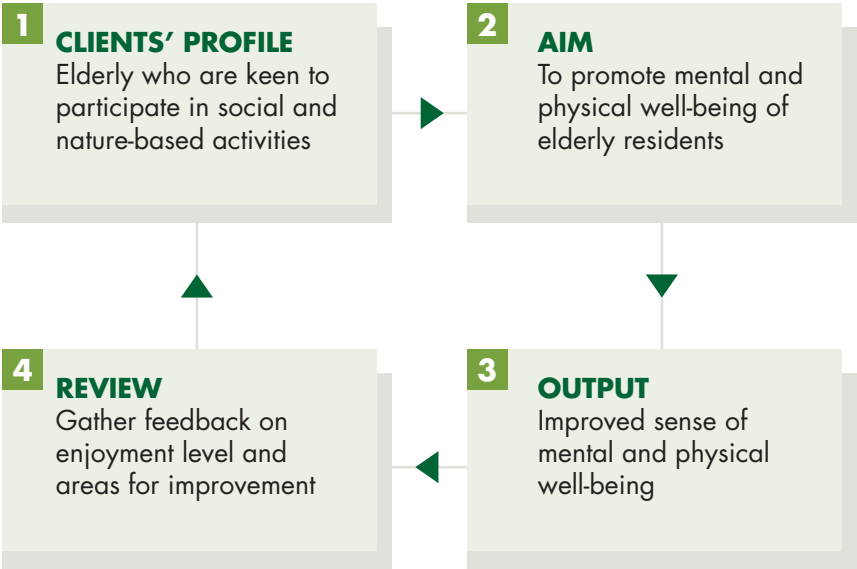
i. Session list (choices of activities and notes for trainers)

ii. Individual activity plan (detailed steps of the activity and tips to achieve the aims)

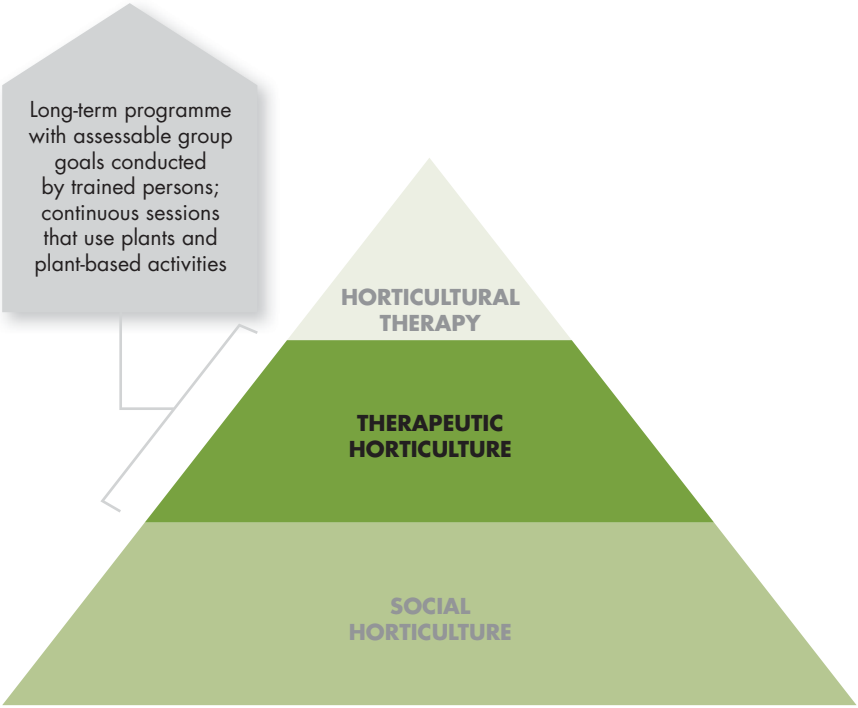
D) Review

Engage participants to gather feedback on their enjoyment level and feelings after the programme, and areas for improvements for continuity.

EXAMPLE OF SHP DESIGN FLOW



TYPES OF SOCIAL AND THERAPEUTIC HORTICULTURE PROGRAMMES


Long-term programme with assessable group goals conducted by trained persons; continuous sessions that use plants and plant-based activities
HORTICULTURAL THERAPY
THERAPEUTIC HORTICULTURE
SOCIAL HORTICULTURE

THERAPEUTIC HORTICULTURE PROGRAMME (THP)

Therapeutic Horticulture Programmes (THP) are long-term programmes that utilises plant-related activities to achieve group goals. The sessions are linked and build on previous sessions. Programme design and assessments are done in consultation with a trained person (individual trained in Horticultural Therapy); assessments may be designed into the plan and usually occur before, during and after the THP.

Objective of designing a THP

i. Mental well-being

Promote greater awareness of present moment of being in the garden and stimulate mental activity through spontaneous learning of plants and plant-based activities.

ii. Emotional well-being

Uplift mood through sensory experiences and self expression during interaction with other participants and the environment.

iii. Physical well-being

Improve muscular strength and motor skills through medium and low intensity exercises in the form of gardening activities and movement in the garden.

EXAMPLE OF THP DESIGN FLOW

1 CLIENTS' PROFILE
Elderly with mild cognitive impairment who live alone in a HDB flat, physically abled

2 AIM
To enhance quality of life for elderly persons who have mild cognitive impairment and are living in isolation by building social connections and promoting physical exercise

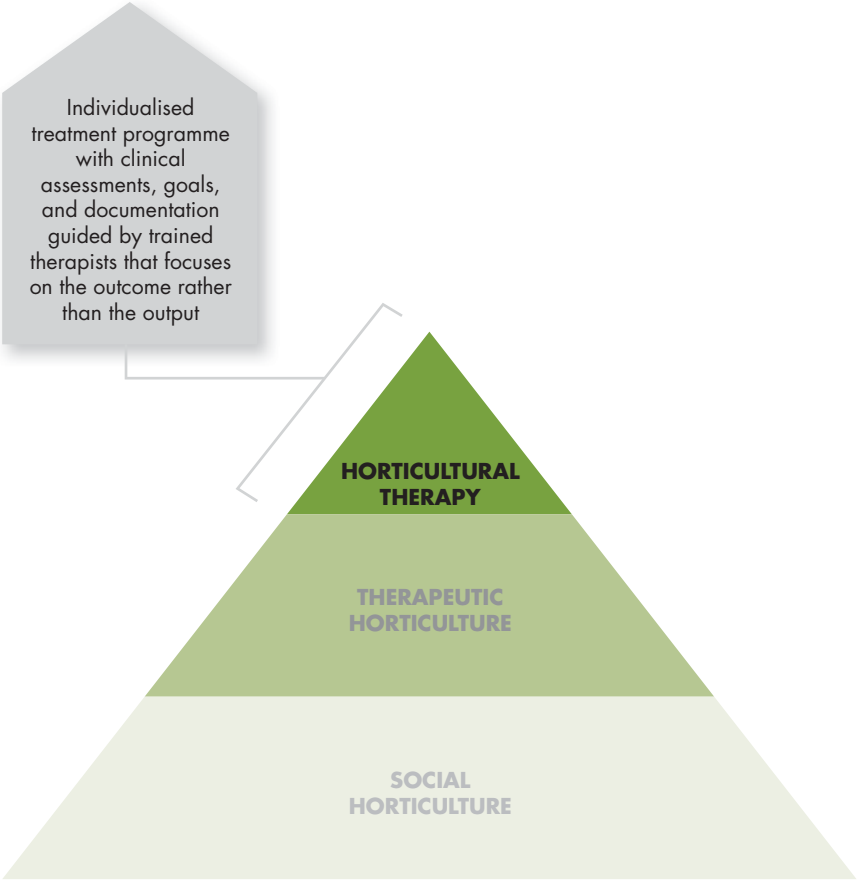
3 OUTCOMES
- Increase mental stimulation
- Encourage positive social and environmental connection
- Stimulate memory
- Promote mindfulness
- Promote medium and low intensity exercise

4 OUTPUT
End products of respective session such as potted seedlings or photos from park visit

5 ASSESSMENT
Combination of suitable quantitative and qualitative assessment tools that measures the outcomes before, during and after THP

6 REVIEW
Evaluate current programme effectiveness based on result of assessment and modify programme accordingly

TYPES OF SOCIAL AND THERAPEUTIC HORTICULTURE PROGRAMMES


Individualised treatment programme with clinical assessments, goals, and documentation guided by trained therapists that focuses on the outcome rather than the output
HORTICULTURAL THERAPY
THERAPEUTIC HORTICULTURE
SOCIAL HORTICULTURE

HORTICULTURAL THERAPY PROGRAMME (HTP)

Horticultural Therapy Programmes (HTP) are individualised treatment plans with prescribed horticultural activities administered by trained therapists to achieve clinically documented goals. It adopts a person-centred approach that emphasises the outcome over the output, adapts the environment, and modifies the task to increase participation in the prescribed horticultural activities to reach the goals. HTP is usually practised in healthcare institutions and long-term care centres.

Objective of designing a HTP

i. Cognitive well-being

Improve or maintain cognitive abilities through horticultural activities that practice concentration, memory, conceptual thinking and other cognitive domains.

ii. Emotional well-being

Improve one's ability to manage stress, anger, fear and other feelings through horticultural activities that promote awareness and self expression that progresses in a productive manner towards better emotional states.

iii. Social well-being

Improve the ability to relate and connect positively with others through horticultural activities in social settings that foster better communication and understanding of people and reduce incidences of isolation.

iv. Physical well-being

Increase specific muscle strength and endurance through medium and low intensity exercises in the form of horticultural activities. Improve gross and fine motor skills to increase independence in activities of daily living.

EXAMPLE OF HTP DESIGN FLOW

1 CLIENTS' PROFILE
An elderly person who is trying to improve grip and fine motor skill after a mild stroke, has no speech problem and is living with family

2 AIM
To improve independence in movement and motor function coordination through horticultural activities

3 OUTCOMES
- Improved mental health
- Promote mindfulness
- Improve fine motor skills
- Increase grip strength

4 OUTPUT
End products of respective session such as potted seedlings or photos from park visit

5 ASSESSMENT
Validated and reliable assessment tools that measure individual's specific and relevant outcomes before, during and after HTP

6 OUTCOME EVALUATION
Statistically evaluate the results to determine the results of intervention and refine the treatment to increase effectiveness

7 REVIEW
Engage client and family members to gather feedback on experience and enjoyment so as to improve future sessions

ANNEX A:

SCHEDULE DESIGN OF SOCIAL HORTICULTURAL PROGRAMME

Example of an activities list
with 8 individual activities

S/N	Programme	Aim	Notes to facilitator
1.	Introduction to sensory experience in the garden	Promote physical and mental well-being	**Ensure safety:** Visually assess participants who may be unwell for activity and may need to rest or require more assistance **Encourage interaction:** Use verbal cues like: • "What is your favourite…" • "How would you…" • "Why do you think…" **Increase physical exercise:** Promote physical activity by gardening or walking and exploring sensory features in the garden **Promote awareness:** Prompt participants about the activity of the day and direct them to areas of interest in the garden
2.	Vegetable pot creation		
3.	Indoor garden creation		
4.	Exercise in garden		
5.	Vegetable cooking session		
6.	Fruit and vegetable press painting		
7.	Pressed flower card creation		
8.	Herb propagation		

ANNEX A1:

SHP ACTIVITY PLAN DESIGN

Example of activity 1:
Introduction to sensory experience in the garden

Aims

Encourage interaction:
Use verbal cues such as:
- "Did you smell…"
- "What do you think this can be used for?"
- "What does this feel like?"

Increase physical exercise:
Promote movement in the garden that will allow bending, extension of arms and legs to experience certain sensory stimulants

Promote awareness:
Prompt participants to quietly listen at times to increase awareness of their environment

Steps (50 mins):
Introduce the use of five senses, lead participants through the garden and allow time for individual exploration within garden. Seek participants' opinion on additional uses for their senses in nature or the garden beyond the examples listed below:

a. Sight	To assess the plant condition, soil colour and appreciate the beauty of nature etc.
b. Smell	To assess scent from the plant parts (e.g. leaf, flowers) to appreciate change in seasons
c. Hear	To appreciate sound of nature and warn us of danger
d. Taste	To allow for enjoyment of eating besides filling our body energy needs
e. Touch	To assess the soil condition, fruit ripeness and appreciate natural texture

Reflection (5 mins):
Ask how participants feel about the session and what their favourite part of the activity is. Activity ends.

ANNEX A2:

SHP ACTIVITY PLAN DESIGN

Example of activity 7:
Pressed flower card creation

Aims

Encourage interaction:
Use verbal cues such as:
- "What could you use the pressed flower card for?"
- "How do you think pressed flowers are prepared?"

Increase physical exercise:
Encourage walking around the garden to find possible materials for plant pressing

Promote awareness:
Prompt participants to explore their creative side of themselves in the design of the card and increase their focus in the activity

Steps (50 mins):
Items needed: Toothpicks, glue, pre-pressed plant parts, A5 card, laminating pouch, laminator and scissors

a. Toothpicks are used to dab glue to apply on plant parts for pasting on the A5 card.

b. Participants are free to explore their creativity and discuss with others in the process of designing the card.

c. Participants then laminate the completed card and trim the excess and corners.

Reflection (5 mins):
Ask how participants feel about the session and what their favourite part of the activity is. Activity ends.

ANNEX B:

SCHEDULE DESIGN OF THERAPEUTIC HORTICULTURAL PROGRAMME

Example of 8-week sequential programme

S/N	Programme	Outcome
1.	Introduction to sensory experience in the garden	• Encourage positive connection • Promote medium and low intensity exercise • Stimulate memory
2.	Sowing of vegetable seedlings	• Encourage positive social connection • Promote fine motor skills • Increase mental stimulation
3.	Vegetable maintenance and sowing of herb seeds	• Promote medium and low intensity exercise • Promote fine motor skills • Stimulate memory
4.	Vegetable and herb maintenance	• Promote medium and low intensity exercise • Encourage positive social connection • Increase mental stimulation
5.	Vegetable and herb maintenance	• Promote medium and low intensity exercise • Promote mindfulness • Stimulate memory
6.	Harvest and cook	• Encourage positive social connection • Promote medium and low intensity exercise • Increase mental stimulation
7.	Pressed flower card	• Increase mental stimulation • Promote mindfulness • Promote fine motor skills
8.	Propagating herbs by cuttings	• Stimulate memory • Promote fine motor skills • Promote mindfulness

ANNEX B:

SCHEDULE DESIGN OF THP

Example of 8-week sequential programme

Notes to facilitators

a. Ensure safety:
Visually assess participants who may be unwell for activity, need to rest, or require more assistance.

b. Increase mental stimulation:
Use verbal cues like: "What do you think…," "How would you…," "When is the suitable…"

c. Encourage positive connection:
Promote buddy assistance to complete task and use leading questions to promote positive connection with activity and group.

d. Stimulate memory:
Provide session recap emphasising learning points, encourage association of plants with past experiences, and support descriptive expression.

e. Promote Mindfulness:
Emphasise engagement and attention to detail in the activity; invite participants to reflect and share their thoughts and feeling about the day's session.

f. Promote medium and low intensity exercise:
Encourage exploration of garden sensory features and active involvement in gardening activities such as hoeing, digging and lifting.

g. Promote fine motor skills:
Emphasise the control of finger grip strength and stability in activity.

ANNEX B1:

THP SESSION PLAN DESIGN

Example of session 2: Sowing of vegetable seedlings

Outcomes:

Encourage positive social connection:
Promote buddy assistance to complete task and prompt participants to share their thoughts on food related to *cai xin* vegetable.

Promote fine motor skills:
Guide participants to pick up seedlings delicately and plant with care; this emphasises on control of finger grip strength and keeping steady hands.

Increase mental stimulation:
Use verbal cues during the session to encourage thinking and conversation:
"How long do you think it takes to grow for harvest?"

"What do you think we will use the netting for?"
[Netting is needed to protect crops from pests such as birds and insects from eating the plants and removes the need to use pesticides.]

"Why are there plugs at the base and side of the pot?"
[**Side plug** – Overflow hole to drain excess water collected if the plug at the base is secured
Base plug – Reservoir creation by securing the plug or to remove during the rainy season for drainage]

Steps (50 mins):
Items needed: *cai xin* seedlings, stakes, soil, gloves, netting, pot, scissors, soil and file clips. 2–3 persons to share a square pot for this seedling session

a. Remove the drainage plug at the side of pot and fill pot ¾ full with potting soil.

b. Plant 10 seedlings per pot, evenly distributed, using a finger to create a small hole (half finger depth) sufficient to insert the seedling.

c. Lightly pat around the root collar to secure the seedling position and water 1 litre of water.

d. Insert four stakes at each corner of the pot.

e. Wrap the netting around the stakes, cover top and sides to form a net house over the pot and cut the excess, secure netting with file clip on each side of the pots.

Note: Each pot is only labelled with the plant name and date it was planted to encourage community spirit of sharing and caring for all the plants regardless of who planted it.

Reflection (5 mins):
Ask how participants feel about the session and what their favourite part of the activity is. Activity ends.

ANNEX B2:

THP INDIVIDUAL SESSION DESIGN

Example of session 8: Propagating herbs by cutting

Outcomes:

Promote fine motor skills:
Guide participants to use scissors in the comfortable way to cut the basil stem for cuttings; emphasis on control of finger grip strength and keeping steady hands

Promote mindfulness:
Use verbal cues during the session to encourage focus in execution: *"cutting below the node will increase success rate of propagation.."*

Stimulate memory:
"Do you remember what we used the netting for in vegetable planting?"
[Netting is needed to protect crops from pests such as birds and insects from eating the plants and removes the need to use pesticides.]

"Do you recall why are there plugs at the base and side of the pot?"
[**Side plug** – Overflow hole to drain excess water from the side, if the plug at the base is secured
Base plug – Reservoir creation by securing the plug or removed during the rainy season for drainage]

Steps (50 mins):
Items needed: pre-planted basil from previous session, potting mix, gloves, stakes, netting, file clips, scissors, square pots. 2 – 3 persons to share a square pot for this propagation session

a. Remove side plug and fill pot ¾ full with potting mix.

b. Choose three basil stems that have a minimum of four nodes. Cut between the 2nd and 3rd node from the top.

c. Create a hole approximately half index finger depth and insert the cutting.

d. Secure the cutting by patting down the soil around the cutting lightly.

e. Water 500 ml of water and install stakes and netting the same way as for the vegetable pot.

f. Cover the netting and place it in a cool area away from direct sun.

Note: The pots are only labelled with the plant name and date it was planted to encourage community spirit of sharing and caring for all the plants regardless of who planted it.

Reflection (5 mins):
Ask how participants feel about the session and what their favourite part of the activity is. Activity ends.

ANNEX C:

SCHEDULE DESIGN OF HORTICULTURAL THERAPY PROGRAMME

Example of 8-week sequential programme

S/N	Programme	Outcome
1.	Introduction to sensory experience in the garden	• Encourage positive social and environmental connection • Promote medium and low intensity exercise • Stimulate memory
2.	Sowing of vegetable seedlings	• Encourage positive social and environmental connection • Promote fine motor skills • Increase mental stimulation
3.	Visit to therapeutic garden and light vegetable maintenance	• Promote medium and low intensity exercise • Promote fine motor skills • Stimulate memory
4.	Vegetable maintenance and sowing of herb seeds	• Promote medium and low intensity exercise • Encourage positive social and environmental connection • Promote fine motor skills
5.	Visit to therapeutic garden and edible maintenance	• Promote medium and low intensity exercise • Promote mindfulness • Stimulate memory
6.	Harvest and cook	• Encourage positive social and environmental connection • Promote medium and low intensity exercise • Increase mental stimulation
7.	Visit to therapeutic garden	• Increase mental stimulation • Promote mindfulness • Promote fine motor skills
8.	Propagating herbs by cuttings	• Stimulate memory • Promote fine motor skills • Encourage positive social and environmental connection

ANNEX C:

SCHEDULE DESIGN OF HORTICULTURAL THERAPY PROGRAMME

Example of 8-week sequential programme

Adaptation notes for facilitators

a. Encourage positive social and environmental connection:

- Allow client to internalise the instruction and take his/her time to respond. The client could be going through this in a group setting but should be given personal space to perform the tasks independently monitored and guided by facilitator.
- If the client has difficulty reaching the sensory stimulants such as fragrant or textured plant parts, it could be brought within the client's range of movement.
- Allow client to move through garden at his/her own pace to build confidence in the control of movements. Maintenance can be done with dining spoons and fork to rebuild confidence for the use of cutlery.

b. Promote fine motor skills:

- Client can use a funnel to increase space consistency of distributing seeds in the pot. Facilitator can hold on to the funnel while the client deposits the seed. The option to replace gardening tool with dining fork and spoon to loosen soil and pick up weeds should be available.

- Facilitator can provide a long cutting for the participant to trim into shorter lengths with a blade. Allow client to insert the cutting into any area in the pot to build confidence.

- Support client in his/her process of harvesting, cleaning and cooking. Allow space and time for him/her to do it at his/her own pace. Give suggestions to decrease difficulty and adjust equipment access for easier completion of task. The use of cutlery is a revision to the constant use of gardening tools in maintenance to help build fine motor skills.

- Move pot within client's range of movement. Allow client to use metal spoon or fingers to facilitate the process of sowing seedlings when necessary. Allow client to try at his/her own pace.

c. Increase mental stimulation:

- Client can identify his/her favourite part of garden where he/she wants to spend more time exploring the area. Utilise full range of tasks in maintenance and allow participant to do so independently.

- Repeated visits will build familiarity in the client's mind. Therefore suggest areas or exercises which will extend his reach, grip and other physical coordination.

- Provide opportunity for independence through loosening and weeding of the vegetable and herb pot. Be open to client's alternative suggestion.

ANNEX C1:

HTP SESSION PLAN DESIGN

Example of session 4: Vegetable maintenance and sowing of herb seeds

Outcomes:

Promote fine motor skills:
Guide client on how to pick up seeds using fingers or spoon and either put it into soil direct or with help of funnel; this emphasises on control and stability of fingers. When inserting the seeds, funnel can be used to improve accuracy of sowing and encourage them to use both hands.

Promote medium and low intensity exercise:
Allow client time to complete the task as it require lifting, bending and walking during the process.

Increase mental stimulation:
Use verbal cues during the session to encourage thinking and conversation:
"How long do you think it takes for the seed to germinate?"

"What other ways can basil be propagated?"

Give client time to respond and opportunities to suggest his/her way of doing things. Allow modification to the steps below where appropriate.

Steps (50 mins):
Items needed: basil seeds, stakes, soil, gloves, netting, rectangle pot, trowel, file clips and funnel

a. Remove the drainage plug at the side of pot and fill pot ¾ full of potting soil.

b. Create five holes and three seeds per hole in evenly spaced fashion, using a finger to create a small hole (half finger depth) sufficient to insert each seed. Funnel can be used to increase accuracy of sowing.

c. Cover back the holes with surrounding soil and water 500 ml of water.

d. Wrap the netting around the stakes, cover top and sides to form a net house over the pot and cut the excess, and secure netting with file clip on each side of the pot.

Note: The pot is labelled with the client's name, plant name and date it was planted to encourage mindfulness and mental stimulation.

Reflection (5 mins):
Ask how client feels about the session and what their favourite part of the activity is. Activity ends.

ANNEX C2:

HTP INDIVIDUAL SESSION DESIGN

Example of session 5: Propagating herbs by cuttings

Outcomes:

Promote fine motor skills:
Guide client to use scissors/blade in the comfortable way to cut the basil stem for cuttings; this emphasises on control of finger grip strength, and coordination between the holding and cutting hand. Facilitator can provide a long cutting for the client to trim into shorter lengths with a blade. Allow client to insert the cutting into any area in the pot to build confidence.

Stimulate memory:
Use verbal cues during the session to encourage recollection of similar actions in earlier sessions.

"Have you done such cuttings in the past?"

Encourage positive environmental and social connection:
Allow client to internalise the instruction and take his/her time to respond. The client could be going through this in a group setting but should be given personal space to perform the tasks independently monitored and guided by facilitator.

Steps (50 min):
Items needed: pre-planted basil from previous session, potting mix, gloves, stakes, netting, file clips, scissors, square pot

a. Remove side plug and fill pot with ¾ potting mix.

b. Choose three basil stems that have a minimum of four nodes. Cut between the 2nd and 3rd node from the top.

c. Create a hole with approximately the depth of half an index finger and insert the cutting.

d. Secure the cutting by patting down the soil around the cutting lightly.

e. Water 500 ml of water and install stakes and netting the same way as for the herb pot.

f. Cover the netting and place it in a cool area away from direct sun.

Note: The pot is labelled with the client's name, plant name and date it was planted to encourage mindfulness and mental stimulation.

Reflection (5 min):
Ask how client feels about the session and what their favourite part of the activity is. Activity ends.

ANNEX D:
FURTHER READING

American Horticultural Therapy Association
www.ahta.org

Barton, J., Pretty, J. (2010). What is the best dose of nature and green exercise for improving mental health? A multi-study analysis. *Environmental Science and Technology*, 44, pp. 3947–3955.

Bereford, L. (2014). Legacy Emanuel Medical Center Plants with Purpose. *Healthcare Design*. Retrieved from http://www.healthcaredesignmagazine.com/article/legacy-emanuel-medical-center-plants-purpose.

Berman, M.G., Jonides, J. & Kaplan, S. (2008). The cognitive benefits of interacting with nature. *Psychological Science*, 19, pp. 1207–1212. Retrieved from http://libra.msra.cn/Publication/6994981/the-cognitive-benefits-of-interacting-with-nature.

Burton, A. (2014). Gardens that take care of us. *The Lancet Neurology*, 13(5), pp. 447–448. DOI: http://dx.doi.org/10.1016/S1474-4422(14)70002-X.

Chapman, N., Hazen, T. and Noell-Waggoner, E. (2005). Encouraging development and use of gardens by caregivers of people with dementia. *Alzheimer's Care Quarterly*, 6, pp. 349-356.

Children and Nature Network (2012). Health benefits to children from contact with the outdoor & nature. Retrieved from http://www.childrenandnature.org/downloads/CNNHealthBenefits2012.pdf. http://www.childrenandnature.org/.

Gies, E. (2006). The health benefits of parks. *The Trust for Public Land*. Retrieved from http://www.tpl.org/publications/books-reports/park-benefits/the-health-benefits-of-parks.html.

Hartig, T. and Marcus, C.C. (2006). Healing gardens – Places for nature in health care. *Lancet*, 368, pp. S36-S37.

Hazen, T. (2013). The participatory design process in healthcare garden design. In Marcus, C.C. and Sachs, N.A. (Eds.), *Therapeutic Landscapes: An Evidence-Based Approach to Designing Healing Gardens and Restorative Outdoor Spaces*. New Jersey: John Wiley and Sons.

Hazen, T. (2013). Horticultural therapy and healthcare garden design. In Marcus, C.C. and Sachs, N.A. (Eds.), *Therapeutic Landscapes: An Evidence-Based Approach to Designing Healing Gardens and Restorative Outdoor Spaces*. New Jersey: John Wiley and Sons.

Hazen, T. (2012). Activities and outside space. In Pollock, A. and Marshall, M. (Eds.), *Designing Outdoor Spaces for People with Dementia*. HammondCare Press.

Hazen, T. (1997). Horticultural therapy in the skilled nursing facility. In S. Wells (Ed.), *Activities, Adaptation & Aging*, 22 (1-2), pp. 39-60. Haworth Press.

Kahn, P. and Kellert, S. (Eds.), (2002). *Children and Nature: Psychological, Sociocultural and Evolutionary Investigations*. MIT Press.

Kaplan R. and Kaplan S. (1989). *The Experience of Nature: A Psychological Perspective*. New York: Cambridge University Press.

Kaplan R., Kaplan S. and Ryan, R. (1998). *With People in Mind: Design and Management of Everyday Nature*. Island Press.

Kaplan, R. and Kaplan S. (2005). Preference, restoration, and meaningful action in the context of nearby nature. In P.F. Barlett (Ed.) *Urban Place: Reconnecting with the Natural World*. MIT Press, pp. 271-298.

Kuo, F.E. and Taylor, A.F. (2004). A Potential natural treatment for attention-deficit/ hyperactivity disorder: Evidence from a national study. *American Journal of Public Health*, 94(9), 1580-1586. Retrieved from http://www.ncbi.nlm.nih.gov/pmc/articles/pmc1448497/.

Lee, J., Park, B.-J., Tsunetsugu, Y., Kagawa, T. and Miyazaki, Y. (2009). Restorative effects of viewing real forest landscapes, based on a comparison with urban landscapes. *Scandinavian Journal of Forest Research*, 24(3), pp. 227- 234. Retrieved from http://www.tandfonline.com/doi/abs/10.1080/02827580902903341#preview.

Legacy Health Therapeutic Garden programme www.legacyhealth.org/gardens.

Legacy Terrace Garden Dedication. April 16, 2014. http://www.youtube.com/watch?v=DyQnTX1zkMM.

Li, Q. (2010). Effect of forest bathing trips on human immune function. *Environmental Health and Preventative Medicine*, 15(1): pp. 9-17. Retrieved from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2793341/.

Louv, R. (2006). *Last Child in the Woods: Saving Our Children from Nature-Deficit Disorder*. Algonquin Books.

ANNEX D:
FURTHER READING

Marcus, C.C. and Sachs, N.A. (2013). *Therapeutic Landscapes: An Evidence-Based Approach to Designing Healing Gardens and Restorative Outdoor Spaces*. New Jersey: John Wiley and Sons.

Malenbaum, S., Keefe, F.J., Williams, A.C., Ulrich, R.S. and Somers, T.J. (2008). Pain in its environmental context: Implications for designing environments to enhance pain control. *Pain*, 134, pp. 241-244.

Mailer C., Townsend M., Pryor A., Brown P. and Leger L. (2005). Healthy nature healthy people: "contact with nature" as an upstream health promotion intervention for populations. *Health Promotion International* 21(1), pp. 45-54.

Maas, J., Verheij, R., Groenewegen, P., de Vries, S. and Spreeuwenberg, P. (2006). Greenspace, urbanity, and health: how strong is the relation? *Journal of Epidemiology and Community Health*, 60(7), pp. 587- 592. Retrieved from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2566234/.

Maller, C., Henderson-Wilson, C., Pryor, A., Prosser, L. and Moore, M. (2008) Healthy parks, healthy people: The health benefits of contact with nature in a park context. A review of relevant literature (2nd edition). *Parks Victoria*. Retrieved from http://parkweb.vic.gov.au/about-us/healthy-parks-healthy-people/the-research.

Mao et al. (2012). Therapeutic effect of forest bathing on human hypertension in the elderly. *Journal of Cardiology*, 60, pp. 495-502. Retrieved from http://www.sciencedirect.com/science/article/pii/S0914508712001852.

McAdam, J.L., Fontaine, D., White, D., Dracup, K. and Puntillo, K., (2012). Psychological symptoms of family members of high-risk intensive care unit patients. *American Journal of Critical Care*, 21(6), pp. 386-393.

Nature Sacred Initiative
www.naturesacred.org

Nordh H., Hartig T. et al. (2009). Components of small urban parks that predict the possibility for restoration. *Urban Forestry & Urban Greening*, 8(4), pp.225-235.

Park et al. (2011). Relationship between psychological responses and physical environments in forest settings. *Landscape and Urban Planning*, 102(1), pp. 24-32. Retrieved from

http://www.sciencedirect.com/science/article/pii/S0169204611001368.

Park, B-J., Tsunetsugu, Y., Kasetani, T., Kagawa, T. and Miyazaki, Y. (2010). The physiological effects of Shinrin-yoku (taking in the forest atmosphere or forest bathing): evidence from field experiments in 24 forests across Japan. *Environmental Health and Preventative Medicine*, 15(1), pp.18-26. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/19568835.

Park, S-H. and Mattson, R.H. (2008). Effects of flowering and foliage plants in hospital rooms on patients recovering from abdominal surgery. *HortTechnology*, 18, pp. 563-568.

Park, S-H. and Mattson, R.H. (2009). Therapeutic influences of plants in hospital rooms on surgical recovery. *HortScience*, 44, pp. 1-4.

Pati, D., Harvey, T., and Barach, T. (2008). Relationships between exterior views and nurse stress: An exploratory examination. *Health Environments Research and Design Journal*, 1(2). Retrieved from http://www.herdjournal.com/ME2/Defaultaspc.

Pleasant, M. S. and Pereira-Leon, M. (2013). Literature review: Environmental design and research on the human health effects of open spaces in urban areas. *Human Ecology Review*, 20 (1), pp. 36-49.

Pollock A., Marshall, M., Eds. (2012). *Designing Outdoor Environments for People with Dementia*. HammondCare Press.

Raanaas, R.K., Patil, G.G. and Hartig, T. (2011). Health benefits of a view of nature through the window: a quasi-experimental study of patients in a residential rehabilitation center. *Clinical Rehabilitation*, 26(1), pp. 21-32.

Rodiek S. and Schwarz B., Eds. (2007). *Outdoor Environments for People with Dementia*. Haworth Press.

Rothert, G. (1994). *The Enabling Garden: Creating Barrier-Free Gardens*. Taylor Publishing.

Scanlon, A. et al. (2013). Environmental design and research on the human health effects of open spaces in urban areas pleasant, Literature review: Environmental design and research on the human health effects of open spaces in urban areas. *Human Ecology Review*, 20(1), pp. 36-49.

Selhub, E. and Logan, A. (2012). *Your Brain on Nature: The Science of Nature's Influence on Your Health, Happiness, and Vitality*. John Wiley and Sons.

Simpson, S. and Straus, M., Eds. (1999). *Horticulture as Therapy: Principles and Practices*. Food Products Press.

Slavens, SP. (2007). The Psychosocial benefits of exposure to natural settings in long-term care: An evaluation of the wellness garden programme at Glacier Hills Retirement Community. *Journal of Therapeutic Horticulture*, XVII, pp. 32-41.

ANNEX D:
FURTHER READING

Sobel, D. (2008). *Childhood and Nature: Design Principles for Educators*. Stenhouse Publishers.

Stark, M. (2001). Nature as a complementary therapy for women. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 30(6), pp. 574-578.

Taylor, A.F. and Kuo, F.E. (2009). Children with attention deficits concentrate better after a walk in the park. *Journal of Attention Disorders*, 12(5), pp. 402-409. Retrieved from http://jad.sagepub.com/content/12/5/402.

Therapeutic Landscapes Network
www.therapeuticlandscapesnetwork.org

Thompson, C.W., Roe, J., Aspinall, P., Mitchell, R., Clow, A. and Miller, D. (2012). More green space is linked to less stress in deprived communities: Evidence from salivary cortisol patterns. *Landscape and Urban Planning*, 105(3), pp. 22-229. Retrieved from http://www.sciencedirect.com/science/article/pii/S0169204611003665.

Townsend, M. (2008). *Healthy Parks, Healthy People: The Health Benefits of Contact with Nature in a Park Context. A Review of Relevant Literature*. Deakin University. Burwood, Melbourne, Australia. Retrieved from http://parkweb.vic.gov.au/_data/assets/pdf_file/0018/313821/HPHP-deakin-literature-review.pdf.

Tsunetsugu et al. (2013). Physiological and psychological effects of viewing urban forest landscapes assessed by multiple measurements, *Landscape and Urban Planning*, 113, pp. 90-93. Retrieved from http://www.sciencedirect.com/science/article/pii/S0169204613000212.

Ulrich, R. *The Health Benefits of Gardens in Hospitals*. Retrieved from www.planterra.com/SymposiumUlrich.pdf

Ulrich, R.S. (1999). Effects of gardens on health outcomes: Theory and research. In C. Cooper-Marcus & M. Barnes (Eds.), *Healing Gardens: Therapeutic benefits and design recommendations*. New York: John Wiley, 27-86. http://www.majorfoundation.org/pdfs/Effects%20of%20Gardens%20on%20Health%20Outcomes.pdf.

University of Illinois at Urbana-Champaign, Landscape and Human Health Laboratory. http://lhhl.illinois.edu/adhd.htm.

University of Washington. Urban Forestry and Human Benefits. http://www.naturewithin.info/urban.html.

Wells S. (1997). *Horticultural Therapy and the Older Adult*. Haworth Press.

Whitehouse, S., Varni, J.W., Seid, M., Cooper-Marcus, C., Ensberg, M.J., Jacobs, J.R., et al. (2001). Evaluating a children's hospital garden environment: Utilization and consumer satisfaction. *Journal of Environmental Psychology*, 21(3), pp. 301-314.

Wichrowski, M., Whiteson, J., Haas, F., et al. (2005). Effects of horticultural therapy on mood and heart rate in patients participating in an inpatient cardio pulmonary rehabilitation programme. *Journal of Cardiopulmonary Rehabilitation and Prevention*, 25(5), pp. 270-274.

NATIONAL PARKS

NParks' Publication