Creating a Dementia-Friendly Environment
Through the Use of an Outdoor Natural Landscape Design in a Residential Aged Care Facility

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Abstract

Background

People with dementia living in institutionalised residential aged care facilities (RACFs) may manifest behavioural and psychological symptoms of dementia (BPSD), such as agitation and apathy, resulting from their unmet needs. These unmet needs are often due to inappropriate environmental conditions, including excessive or insufficient levels of stimulation in the environment and limited opportunities for engagement. In response to these shortcomings, there has been a recent trend to improve the quality of RACF environments through the de-institutionalisation of facilities by the creation of dementia-friendly environments (DFEs) incorporating outdoor natural landscapes, such as gardens, into RACFs. Garden elements, for example, green spaces and blue spaces, have been shown to have positive impacts on the health and well-being of individuals, and this includes for older people with dementia. In the past few years, several new initiatives have been attempted to enable people with dementia to take advantage of the potential benefits of gardens by encouraging residents to spend more time in the gardens and to actively engage with garden-related activities. It has been found that to maximise the potential benefits of gardens for people with dementia, eight DFE characteristics can be incorporated into their design. However, to date, there is very little evidence about the positive outcomes of a garden that has been created with DFE characteristics on agitation, apathy and engagement for older people with dementia living in RACFs. This is due to both the paucity of studies and the limitations of previous studies, for example, the use of weak methodological approaches as well as the lack of environmental assessment of the gardens and the exclusion of an architectural design phase. Therefore, this current study aims to fill the gaps in the existing studies.
**Objectives**

This research aims to determine the effect of a garden which had been improved according to the DFE characteristics on the level of agitation, apathy, and engagement of people with dementia living in a RACF in Queensland.

**Methods**

This study utilised a single case study design involving two units of analysis: (1) a garden and (2) 10 people with dementia living in one RACF. This study is organised into three phases. Phase One consisted of an environmental assessment of the selected RACF garden via the Dementia Therapeutic Garden Audit Tool and an interview with the gardener of the facility, as well as the recruitment of 10 participants and the compiling of their social biographies in order to understand the participants’ needs and interests. In Phase Two, the chosen garden, Ruby Garden, improvements were identified which addressed the DFE deficiencies found during the environmental assessment in Phase One. Following this, a 3D model of the garden was created to incorporate and visualise the DFE characteristics. After the garden beds were prepared, the items consisting of softscapes and hardscapes were incorporated into the Ruby Garden based on the model created. In Phase Three, the participants were taken into the garden to experience the improved garden for 20 sessions, 5 days a week for 4 weeks, each session lasting 60 minutes. During this period, the participants’ levels of agitation, apathy and engagement was assessed.

Assessment of agitation was conducted pre- (Week 0) and post-intervention (Week 5). On-site observations of engagement and apathy were conducted pre-intervention (Week 0) over one session and once a week during the 4-week intervention period except for Week 1, when two assessments took place (i.e., beginning (Week 1-1) and end (Week 1-2) of the week). At Week 8, a follow-up assessment was undertaken to
determine whether the intervention effects on agitation, engagement and apathy were sustained over time. Participants’ activities in the garden were also observed every day at 10-minute intervals over the 4-week intervention period from the time they entered the garden until they left. Post-intervention qualitative interviews with the 10 participants with dementia and 10 staff were also conducted to seek their views on the improved garden.

**Results**

The results of the environmental assessment via the Dementia Therapeutic Garden Audit Tool carried out in Phase One showed the original garden to be a poor environment for people with dementia with more than half of the assessing questions (39 out of 74 questions) scoring 0-1 (i.e., poor). The Ruby Garden was found to be successful (score of 3) in only 21 out of 74 questions. The lack of the eight DFE characteristics, particularly those concerning sensory stimulation and meaningful engagement, was noted in the Ruby Garden original design. Participants also highlighted the need for these two characteristics while their social biographies were being collected.

In Phase Two the results of the post-design assessment of the garden showed that the garden was improved from the perspectives of all eight DFE characteristics. In total, the evaluation showed an increase in the total number of questions scoring very good (score of 3), from 21 for the environmental assessment phase (i.e., Phase One), to 36 for the post design assessment of the garden (i.e., Phase Two). Likewise, sensory stimulation and meaningful engagement, which were identified as the characteristics with the greater number of poor scores in Phase One, were improved in the number of questions scoring 2 or 3 (i.e., moderately good or very good) from 3 to 12 (out of 12) and from 0 to 4 (out of 7), respectively.
In Phase Three the quantitative findings of the assessment of agitation of participants at Week 0 (baseline), Week 5 (post-intervention) and Week 8 (follow-up), assessed through the Cohen Mansfield agitation inventory-short form (CMAI-SF), demonstrated no significant improvement in the level of agitation following visits to the improved garden ($\chi^2 (2) = 5.167, p = .076$). However, the results showed an increase in the level of participants’ engagement and a reduction in their level of apathy following the intervention. The statistical analysis showed a significant difference in participants’ level of engagement between Week 0 (before intervention) and during the intervention (Week 1-1, $p < .01$; Week 1-2, $p < .01$; Week 2, $p < .01$; Week 3, $p < .05$; Week 4 $p < .05$), where the level of engagement was higher than that before the intervention.

Furthermore, the assessment of participants’ level of engagement at follow-up (Week 8) demonstrated a significantly lower level of engagement when compared to the 4 weeks of intervention (Week 1-1, $p < .01$; Week 1-2, $p < .05$; Week 2, $p < .05$; Week 3, $p < .05$; Week 4 $p < .05$). Similarly, the statistical analysis found a higher level of apathy in participants at Week 0 (before intervention) when compared to during the intervention (Week 1-1, $p < .05$; Week 1-2, $p < .01$; Week 2, $p < .05$; Week 3, $p < .01$; Week 4 $p < .01$). A significant difference was also found in participants’ level of apathy when comparing Week 8 (follow-up) and during Week 1-2 ($p < .05$), Week 2 ($p < .05$), Week 3 ($p < .01$) and Week 4 of the intervention ($p < .05$), where the level of apathy was higher at follow-up than during the intervention.

A combination of deductive (concept-driven) and inductive (data-driven) thematic analysis was employed to analyse the qualitative data. Three themes were developed via the deductive approach: the presence of sensory provoking elements in the garden, meaningful engagement in the garden, and accessibility of the garden, which indicated that the improved garden was successful in providing such DFE
characteristics. Moreover, two themes emerged from the inductive approach: garden impacts and garden experiences. The findings of the inductive approach showed that the improved garden had several benefits for people with dementia, staff members and families. The garden was perceived by the interviewees to improve the mood and restless behaviours of people with dementia as well as the mood of the staff members and families. The inductive qualitative results also indicated that the majority of people with dementia and other residents had a good perception and positive feedback on the garden. Nevertheless, they recommended some solutions for improving the garden, which need to be considered in the future development of the garden.

**Conclusions**

The results of this case study demonstrated that the garden, which was improved in line with DFE characteristics, had positive outcomes for people with dementia. This finding validates and supports several previous studies reviewed in the area of creating such gardens, which showed the positive outcomes of the gardens for people with dementia. This study is the first known case study that comprehensively assessed the environment before the design, collected the participants’ social biographies and also created a 3D model for improvement of the garden. Also, it is the first intervention study that evaluated the impacts of an enhanced garden on the level of apathy as an outcome measure and it also showed promising results. Thus, this study can lay a foundation for future studies in this area.
Statement of Originality

This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

Parinaz Motealleh

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<th>Term</th>
<th>Definition</th>
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<tr>
<td>2D</td>
<td>Two-dimensional</td>
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<tr>
<td>3D</td>
<td>Three-dimensional</td>
</tr>
<tr>
<td>AARS</td>
<td>Apparent Affect Rating Scale</td>
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<tr>
<td>ADL</td>
<td>Activities of daily living</td>
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<tr>
<td>AGAT</td>
<td>American Alzheimer’s Garden Audit Tool</td>
</tr>
<tr>
<td>ASLA</td>
<td>American Society of Landscape Architects</td>
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<tr>
<td>BPSD</td>
<td>Behavioural and psychological symptoms of dementia</td>
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<tr>
<td>CBA</td>
<td>Caregiver Burden Assessment</td>
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<tr>
<td>CMAI</td>
<td>Cohen-Mansfield Agitation Inventory</td>
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<tr>
<td>CMAI-SF</td>
<td>Cohen-Mansfield Agitation Inventory Short Form</td>
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<tr>
<td>DCM</td>
<td>Dementia care mapping</td>
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<tr>
<td>DEMQOL</td>
<td>Dementia Quality of Life Instrument</td>
</tr>
<tr>
<td>DFE</td>
<td>Dementia-friendly environment</td>
</tr>
<tr>
<td>EPWDS</td>
<td>The Engagement of a Person with Dementia Scale</td>
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<tr>
<td>GCFs</td>
<td>Green care farms</td>
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<tr>
<td>GUHREC</td>
<td>Griffith University Human Research Ethics Committee</td>
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<tr>
<td>HT</td>
<td>Horticultural activities</td>
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<tr>
<td>ID</td>
<td>Identification</td>
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<tr>
<td>IQCODE</td>
<td>Questionnaire on Cognitive Decline in the Elderly</td>
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<tr>
<td>LTC</td>
<td>Long-term care</td>
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<tr>
<td>MANOVA</td>
<td>Multivariate analysis of variance</td>
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<tr>
<td>MEDLO-Tool</td>
<td>The Maastricht Electronic Daily Life Observation Tool</td>
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MMAT  Mixed Methods Appraisal Tool
MMSE  The Mini-Mental State Examination
MPES  Menorah Park Engagement Scale
MSR   Multisensory room
MSSE  Multi-sensory stimulation environment
NPI   Neuropsychiatric Inventory
NPI-NH Neuropsychiatric Inventory-Nursing Home Version
PAS   Psychogeriatric Assessment Scale
PEAR  The Person-Environment Apathy Rating scale
PSQI  Pittsburgh Sleep Quality Index
Q-SIT The Quick Smell Identification Test
RACFs Residential aged care facilities
RCT   Randomised control trials
RDCF  Regular daycare facility
RISE  The Revised Index for Social Engagement
S-MMSE Standardised Mini-Mental State Exam
SCDD  Cornell Scale for Depression in Dementia
SCUs  Special care units
SD    Standard Deviation
SGs   Sensory gardens
SPSS  Statistical Package for the Social Sciences
TA    Traditional activities
VRF   Virtual reality forest
WL    Waiting list
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Dissemination of Study Outcomes

Peer-reviewed Publications


Oral Presentations

List of Approved Publications in this Thesis

Section 9.1 of the Griffith University Code for the Responsible Conduct of Research (“Criteria for Authorship”), in accordance with Section 5 of the Australian Code for the Responsible Conduct of Research, states:

To be named as an author, a researcher must have made a substantial scholarly contribution to the creative or scholarly work that constitutes the research output, and be able to take public responsibility for at least that part of the work they contributed. Attribution of authorship depends to some extent on the discipline and publisher policies, but in all cases, authorship must be based on substantial contributions in a combination of one or more of:

- Conception and design of the research project
- Analysis and interpretation of research data
- Drafting or making significant parts of the creative or scholarly work or critically revising it so as to contribute significantly to the final output.

Section 9.3 of the Griffith University Code (“Responsibilities of Researchers”), in accordance with Section 5 of the Australian Code, states:

Researchers are expected to:

- Offer authorship to all people, including research trainees, who meet the criteria for authorship listed above, but only those people.
- Accept or decline offers of authorship promptly in writing.
- Include in the list of authors only those who have accepted authorship.
- Appoint one author to be the executive author to record authorship and manage
correspondence about the work with the publisher and other interested parties.

- Acknowledge all those who have contributed to the research, facilities or materials but who do not qualify as authors, such as research assistants, technical staff, and advisers on cultural or community knowledge. Obtain written consent to name individuals.

Included in this thesis is one paper, in Chapter 2, which is co-authored with my supervisors. My contribution to this co-authored paper is outlined at the front of the relevant chapter. The bibliographic details of this published paper, including all authors, is as follows:


Chapter One: Introduction

Chapter One provides an overview of the background and significance of the proposed research. Definitions and a discussion of an outdoor natural landscape and a dementia-friendly environment (DFE) are also provided. In addition, the eight characteristics of a DFE within the context of the outdoor natural landscape are explained so as to provide insight into their significance in the design of residential aged care facilities (RACFs).

Research Background

Dementia is a debilitating condition with a gradual decline in the brain’s functioning that leads to a number of problems for people with dementia in their daily life (Alzheimer’s Australia, 2017b). There are 459,000 people with dementia in Australia in 2020, and it is estimated that this will increase to 1,076,129 by the year 2058 (Dementia Australia, 2018, 2020). The rapid growth of older Australians diagnosed with dementia affects care and service demands because of their constant need for high-quality RACFs (Australian Institute of Health and Welfare, 2012). Although many people with dementia receive adequate quality of care in Australian RACFs, they do not necessarily reside in a suitable environment that can enrich their life (Alzheimer's Australia, 2013). Aged care residents with dementia often have unmet needs, which may be the precursor of behavioural and psychological symptoms of dementia (BPSD), including agitation and apathy (Cohen-Mansfield, Dakheel-Ali, et al., 2015; Krishnamoorthy & Anderson, 2011; Lionells et al., 2014). According to Rabinowitz et al. (2005), agitation is one of the manifestations of BPSD, which encompasses aggressive behaviour, physically non-aggressive behaviour, verbal agitation, hiding and hoarding. Apathy, another manifestation of BPSD, is identified as
a lack of enthusiasm, motivation and loss of interest that leads to a reduction in positive emotions and social interaction (Robert et al., 2018). Research also shows that there is an association between engaging in social activities and apathy (Ellis et al., 2016). That is, people with dementia who actively participated in social activities in a RACF had a lower level of apathy compared to others who were involved in fewer social activities.

People with dementia living in RACFs can experience feelings of boredom and loneliness that emerge as agitated behaviours as a reflection of their unmet needs (Cohen-Mansfield, Dakheel-Ali, et al., 2015). The literature shows that these unmet needs, which may cause BPSD, such as agitation and apathy, in people with dementia, are often due to excessive or insufficient levels of stimulation (over or under) in the environment, inappropriate environmental conditions, as well as the lack of engagement or socialisation with others (Cohen-Mansfield, Dakheel-Ali, et al., 2015).

An excessive or insufficient level of stimulation in the environment has been found to adversely affect people with dementia (Cohen-Mansfield, Dakheel-Ali, et al., 2015; Dewing, 2009). Over-stimulation in residential aged care environments can agitate and bring discomfort to people with dementia (Joosse, 2012). As the dementia syndrome progresses, the person may be unable to process continuous environmental stimulation leading to fatigue, and eventually the person may show this intolerance as agitated behaviour (Joosse, 2012). Similarly, under-stimulation and the lack of appropriate cues or signals in the environment can cause individuals to feel a lack of control over the environment that may result in feelings of anger and helplessness (Jakob & Collier, 2017). This lack of control over the environment reduces the desire in people with dementia to be involved in tasks or activities, which in turn leads to passivity and apathy (Jakob & Collier, 2017; Peck, 2007).
Several studies have reported the effectiveness of well-balanced sensory stimulations in improving agitated behaviours, emotions or engagement in people with dementia (Anderson et al., 2011; Sanchez et al., 2016). These studies used different kinds of stimulation including visual, auditory, olfactory and tactile stimulation in multi-sensory rooms in RACFs, and the researchers found a considerable reduction in some BPSD. As a result, the premise is that such stimulation might play a key role in decreasing BPSD, such as agitation and apathy, among aged care residents with dementia. Additionally, there is a general consensus that people with dementia in RACFs display apathetic behaviours and cannot appropriately respond to environmental stimulation (Robert et al., 2009). Jao et al. (2015) examined the relationship between environmental characteristics of a RACF and apathy in people with dementia and found that adequate levels of stimulation in the aged care environment resulted in lower levels of apathy in people with dementia. Thus, this signifies the importance of an adequate level of stimulation in the aged care environment in order to avoid some BPSD, including agitation and apathy. As mentioned previously, the second major problem of aged care residents with dementia is related to the inappropriate environmental conditions of RACFs, which can confuse residents and create problems in navigation and spatial orientation (Kleibusch, 2018; Marquardt & Schmieg, 2009). These problems are among the primary symptoms of dementia that can affect a resident’s independence and the ability to perform daily tasks (Marquardt et al., 2011). Similarly, inappropriate environmental conditions can cause BPSD, such as agitation and apathy (Cohen-Mansfield, Dakheel-Ali, et al., 2015).

Bicket et al. (2010) in a prospective cohort study reported that the environmental quality of assisted living facilities, such as homeliness of the facility with its outdoor natural landscape (defined on page 5), along with privacy, affected both
neuropsychiatric symptoms (e.g., agitation and apathy) as well as quality of life in both people with and without dementia. The higher quality of physical environments caused either a significant or modest reduction in the level of neuropsychiatric symptoms. In addition, Smith et al. (2010), in an observational assessment of people with dementia in a traditional nursing home, demonstrated that there was a higher level of engagement, as well as family satisfaction after they moved into new dementia care cottages. These care cottages consisted of a number of environmental design features, for example, orientation cues, visual access to other spaces and an outdoor natural landscape as well as the provision of a number of activities.

A third problem faced by people with dementia in RACFs is reduced social interaction or engagement in meaningful activities. A study on unmet needs assessment of 89 people with dementia from six Maryland, USA nursing homes demonstrated that some of the most prevalent unmet needs of these people were the need for social interaction and meaningful activities, the lack of which caused loneliness and boredom as precursors of BPSD in people with dementia (Cohen-Mansfield, Marx, et al., 2015). An observational study conducted by Cohen-Mansfield et al. (2011) demonstrated that the engagement of 193 people with dementia was influenced by both environmental and stimulus features. Various kinds of stimulation in the environment, including human social stimuli, inanimate social stimuli, music stimuli and task- and work-related stimuli, caused a higher level of engagement among people with dementia compared with the control stimulus. Furthermore, Zuidema et al. (2010) reported that people with dementia showed fewer apathetic symptoms in those special care units (SCUs) where there were more staff to engage with, when compared to those in regular SCUs where there were few or limited staff members to engage with. Hence, providing support and
care for people with dementia in RACFs requires an environment that is stimulating and comforting, and which enhances socialisation among residents.

These three challenging problems have initiated a trend towards improving the quality of environments in RACFs. The de-institutionalisation of health and social care facilities has involved a number of environmental changes, including moving towards small-scale residential facilities, creating DFEs that incorporate living elements, such as plants and animals, and the creation of outdoor natural landscapes (de Bruin et al., 2017; Marcus & Sachs, 2014). To better understand why there is a move towards using outdoor natural landscapes, this study first defines what is an outdoor natural landscape and determines its related health benefits. Next, the advantages of utilising the characteristics of a DFE when designing an outdoor natural landscape are explained further.

**Definition of Outdoor Natural Landscape**

An outdoor natural landscape is a multifaceted concept, which is more than just scenery, and is developed through the interaction between nature and human beings (European Landscape Convention, 2000). The structure of the outdoor natural landscape is composed of hardscape (i.e., the man-made features of an outdoor natural landscape, such as decks, walking paths, patios and arbors) and softscape (i.e., the animated part of the outdoor natural landscape, such as plants and trees) containing the sensory provoking elements of colour, sound, scent and texture that can stimulate our various senses, including visual, auditory, olfactory and tactile (Worden & Moore, 2010). The outdoor natural landscape is perceived not only visually but also by both the sensory and spatial experiences of individuals (Scott et al., 2009; Worden & Moore, 2010).
For people with dementia, it is important to have an outdoor natural landscape that allows them to actively take part in gardening activities as well as providing an opportunity for relaxation (Graham-Cochrane, 2010). An outdoor natural landscape for those with dementia is a peaceful place where a person with dementia can readily engage in familiar meaningful activities, such as planting, digging, relaxing and enjoying natural sounds (Graham-Cochrane, 2010; Kamp, 2016). Outdoor natural landscapes include various elements that provide a number of benefits for individuals, especially for those with dementia, namely green and blue space and sensory provoking elements. The following section details these elements.

**Green and Blue Space**

Green space often constitutes the dominant part of outdoor natural landscapes, categorised as public, semi-public and semiprivate green spaces (Kiani et al., 2014). Abundant scholarship has already shown that nearby green spaces affect either physical, psychological or social health (Kuo, 2010; Mackay & Neill, 2010; Van Herzele & de Vries, 2011; White et al., 2018). For example, a quasi-experimental study conducted by Mackay and Neill (2010) demonstrated a significant reduction in the level of people’s anxiety after they took part in physical activities conducted in green spaces (i.e., green exercise), such as cycling, walking and orienteering, when compared to their pre-exercise level of anxiety at baseline. Similarly, there is a positive relationship between social well-being and outdoor natural landscape through the social interactions developed in parks, green spaces and other natural environments. By creating social ties in these environments, people are able to create a coherent friendship (Kuo, 2010). Furthermore, green space can promote psychological well-being. People living in neighbourhoods with more green space exhibit less stress and also higher scores in
satisfaction and in the self-report scale of happiness (Van Herzele & de Vries, 2011). Additionally, a study conducted by White et al. (2018) demonstrated that exposure to the outdoor natural landscape with green spaces led to improvements in the moods of people with mid- and late-stage dementia in a care facility in the UK.

Blue space or waterscape, which ranges from oceans to smaller water forms, such as streams or fountains, constitutes another significant part of the outdoor natural landscape, and there is increasing evidence that blue space can play a role in human health and well-being (Finlay et al., 2015; MacKerron & Mourato, 2013). MacKerron and Mourato (2013), in a quantitative study, demonstrated that there is a relationship between an individual’s well-being and proximity to the outdoor natural landscape, including blue and green spaces. They reported that people were happier in the outdoor natural landscape that included blue and green spaces. In addition, a qualitative study carried out by Finlay et al. (2015) in Vancouver, Canada, revealed that the interaction between older adults with both blue and green spaces had a positive impact on their physical, mental and social well-being. Further research conducted by Garrett et al. (2019) demonstrated that having a view from older adults’ homes in Hong Kong to blue spaces, including lakes, ponds or water fountains, was associated with their self-reports of good health. In addition, frequent visits to blue spaces by older adults was positively related to their sense of well-being.

**Sensory Provoking Elements**

Colour is considered an important sensory provoking component of the outdoor natural landscape (VanDerZanden & Rodie, 2008; Worden & Moore, 2010), and the existing variety of colours in the outdoor natural landscapes can diminish the monotony of the environment and stimulate an individual’s visual sense (Franco et al., 2017;
VanDerZanden & Rodie, 2008). Each colour has its own psychological effect on mood, and there is an association between colour and the psychological status of individuals (Kurt & Osukeye, 2014; Meerwein et al., 2007). For example, feelings of tranquility, happiness and enthusiasm are aroused by various colours. Blue and green colours are associated with the feeling of peace and tranquility, while red and orange colours can create feelings of happiness and enthusiasm (Fukuda, 2018; Meerwein et al., 2007).

Another important sensory component of an outdoor natural landscape is sound, for example, the sound of water, birds and the sound of the wind rustling in plants and trees (Worden & Moore, 2010). Such sounds have the potential to create a pleasant sensation, calmness and improved mood for individuals (Benfield et al., 2014; Cerwén et al., 2016; Hedblom et al., 2017). Furthermore, sounds can bring back joyful memories from different periods of an individual’s life, which can be regarded as an influential source of reminiscence (Augoyard & Torgue, 2014).

In addition, several studies have shown the importance of sound therapy in improving symptoms of dementia and other disorders (Moyle et al., 2016; Saadatmand et al., 2013). Saadatmand et al. (2013), in a randomised placebo-controlled trial, found that nature-based sounds, including birds, rain, waterfalls, or walking through a forest, when played on a media player, had the potential to decrease anxiety in mechanically ventilated patients. Furthermore, in a mixed-methods pilot study by Moyle et al. (2016), the stimulating environment created by a virtual reality forest (VRF) consisting of relaxing natural sounds, such as bird songs, reduced the level of apathy in participants, who experienced more positive affect and pleasure.

The fragrance from plants or flowers is another sensory constituent of an outdoor natural landscape that arouses the olfactory sense (Worden & Moore, 2010). Brawley (1997) showed how our sense of smell has a strong impact on our emotions,
mainly because our olfactory system is connected to the specific part of the brain that is associated with emotion and processing memories. Since then, several studies have highlighted the importance of aromatherapy in alleviating symptoms in dementia and other disorders (Jimbo et al., 2009; Seyyed-Rasooli et al., 2015; Yang et al., 2016). For example, Jimbo et al. (2009) conducted a study in which they revealed that aromatherapy was effective in improving both movement and cognitive functions of people with dementia.

Furthermore, in a randomised clinical study conducted by Seyyed-Rasooli et al. (2015), aromatherapy was found to reduce pain and anxiety in patients after surgery compared with those in the control group receiving routine care. Similarly, Yang et al. (2016) compared the impact of reminiscence therapy, cognitive stimulation therapy and aroma-massage therapy on agitation and depressive mood in people with dementia. The findings of their study showed that aroma-massage therapy was more effective in alleviating both agitation and depression in people with dementia compared to reminiscence therapy and cognitive stimulation therapy.

Tactile senses are stimulated by the soft and hard textures of various plants (Gonzalez & Kirkevold, 2016; VanDerZanden & Rodie, 2008). Some textures are recognised as being enjoyable, such as the soft surfaces of grass or lawns, which can become a place for relaxation, lying down or walking through (Worden & Moore, 2010). Although there is a paucity of evidence showing the positive effects of touching softscape elements, including the surfaces of plants, on health and well-being, the results of the study by Franco et al. (2017) showed that schools built in woodland areas were able to involve students in woodland activities, such as touching trees and doing exercise. These activities developed higher levels of motor skills and social skills in students, while the forest had a calming effect on them. In addition, the importance of multi-sensory
stimulation rooms, such as a Snoezelen room, and the placement of tactile objects, in alleviating some disorders in people with dementia has been reported by Sanchez et al. (2016). In their study, two different groups of people with dementia were compared to investigate the effect of the multi-sensory stimulation environment (MSSE), containing tactile objects, fiber-optic cables, water columns, music, aroma and one-to-one activity sessions (Sanchez et al. 2016). Their findings highlighted that people in the MSSE group had considerable improvements in both neuropsychiatric symptoms and severity of dementia compared to the activity group.

Overall, outdoor natural landscapes provide numerous health and well-being benefits, including for people with dementia, and can be implemented in RACFs in order to de-institutionalise the environment. As such, designing an outdoor natural landscape for people with dementia in LTC facilities must not only respond to their needs but also incorporate existing good practices and features, such as the DFE characteristics, to respond to their needs appropriately (Motealleh et al., 2019).

**Dementia-Friendly Environments**

Several studies in recent decades have demonstrated the efficacy of a DFE in improving the health and well-being of people with dementia (Davis et al., 2009; Fleming & Purandare, 2010; Mitchell & Burton, 2010). According to Davis et al. (2009, p. 187), a DFE “is a cohesive system of support that recognises the experiences of the person with dementia and best provides assistance for the person to remain engaged in everyday life in a meaningful way”. Indeed, it is a way to create a home-like environment which contributes to the comfort and independence of residents (Health Building Notes, 2015; Health.vic, 2018a). Although the care of people with dementia was previously based on a medically-driven approach with a focus on pharmacological
treatment, the current trend in creating DFEs is towards improving quality of life by psychosocial approaches (Alzheimer’s Australia, 2017a). According to the World Health Organisation (2007), creating a DFE is not limited to the indoor environment; the outdoor environment is an equally important domain that should meet the criteria of DFEs. In other words, the holistic design of an environment involving both indoor and outdoor spaces needs to be undertaken (Zeisel, 2012). The eight different characteristics of a DFE for creating an outdoor natural landscape, presented by Graham-Cochrane (2010) are outlined next.

**Orientation**

Orientation is the ability to reach the intended destination and to find ones’ own way without confusion (Gordon et al., 2016). Elements that facilitate orientation and wayfinding are significant for those with dementia as cognitive impairment, such as loss of memory and sensory impairments (e.g., reduced hearing and visual acuity), affect the spatial orientation of people with dementia (Davis & Weisbeck, 2016; Farage et al., 2012). A study conducted by Marquardt (2011) emphasised the importance of environmental design and the usage of orientational cues in wayfinding abilities to avoid disorientation in people with dementia in RACFs. Colours, lighting, furnishings and pictorial signage, for instance, are appropriate cues to facilitate navigation for people with dementia (Alzheimer’s Society, 2015).

Davis et al. (2017) in a comparison study demonstrated that people with dementia found their way faster through salient cue conditions in comparison with standard cue conditions where there was no signage, furniture or any other orientation cues. These cues included a number of colour cues, such as a model of a rainbow, a
bright yellow sun, a purple butterfly model, and an American flag, which were placed at particular decision points, such as the intersection of routes.

Additionally, some structures such as gazebos, vegetation and furnishings are considered major or minor landmarks in the outdoor natural landscape and can be an appropriate source of orientation for people with dementia (Health Building Notes, 2015). A study conducted by Mitchell and Burton (2010) on the identification of wayfinding strategies of older people diagnosed with dementia revealed that landmarks are essential factors in their outdoor spatial orientation. The results of this study showed that people with dementia used a wide range of wayfinding cues, such as taking advantage of major or minor landmarks on routes, including church spires, street furniture and post boxes. Legible and familiar environments enabled them to find their way more quickly, while long streets with uniform architecture could cause disorientation. In addition, visibly marked entrances and exits in outdoor natural landscapes, as well as looped walkways that return to the starting point, have been found to be strategies to encourage orientation of people with dementia (Delhanty, 2013; Marcus & Sachs, 2014).

**Accessibility**

Accessibility, including both visual access and the unrestricted physical use of the environment, are other features of a DFE recommended in the design of an outdoor natural landscape (Greasley-Adams et al., 2012; Marcus & Sachs, 2014; Queensland Health, 2018). A study conducted by Faith et al. (2015) investigated the role of physical environmental design in the wayfinding abilities of people with dementia living in long-term care settings in Northern Ireland. The findings of this study showed that windows provided a visual connection for people with dementia to see and identify the features of
the outdoor natural landscape without directly going there, and this identification assisted them in their wayfinding abilities.

Research has also shown that the lack of physical access to the outdoor natural landscape negatively impacts mood where this accessibility was restricted in a number of ways, including locked doors, insufficient seating areas and slippery walking paths (Potter et al., 2018). Accessibility to outdoor natural landscapes is enhanced by taking advantage of wide walkways where people in wheelchairs can also pass easily (Graham-Cochrane, 2010). Similarly, implementation of both handrails and durable furniture is another strategy for improving both the safety and accessibility to outdoor natural landscapes since these elements enable people with dementia to rest or balance while walking (Alzheimer’s Australia WA, 2015; Graham-Cochrane, 2010).

Socialisation

Creating an opportunity for social interaction among people with dementia in a homelike care environment is another significant factor in designing an outdoor natural landscape (Alzheimer's WA, 2019; Graham-Cochrane, 2010). Gardening activities can provide opportunity for people with dementia to connect with others and share their experiences (Bould, 2017). Semi-structured interviews with people with dementia who participated in a day service program at green care farms showed that green care farms not only improved social interaction in people with dementia, but also created a sense of being part of the society through participation in meaningful activities at the farms (de Bruin et al., 2015). The green care farm concept refers to the use of an outdoor natural landscape for farming and agricultural-based activities, including planting and harvesting crops or caring for livestock, and its combination with care activities is
aimed at providing social health for vulnerable groups of people (Care farming UK, 2015; de Boer, Hamers, Zwakhalen, Tan, Beerens, et al., 2017; Pedersen et al., 2016).

Providing a place for people with dementia to have interactions with other residents can be achieved by the presence of suitable furnishings or spaces in outdoor natural landscapes (Charras et al., 2018). Such furnishing, such as discussion tables, in outdoor natural landscapes can provide opportunities for people with dementia to socialise and communicate with one another (Charras et al., 2018). The Sunshine Centre in Midwest, USA is a case example of an outdoor natural landscape where designers utilised several comfortable sitting areas for improving socialisation in people with dementia. Findings from both observations of people with dementia and interviews with staff showed that one of the most frequent activities undertaken by residents in this outdoor natural landscape was sitting on the chairs and talking with each other (Hernandez, 2007).

**Meaningful Activity**

People with dementia tend to be actively involved in various tasks ranging from household activities to gardening if given the opportunity (Graham-Cochrane, 2010). The various activities carried out by people with dementia give value to their lives and provides an opportunity to have social interactions with others (Brawley, 2007; Hooker et al., 2019). Gardening is a meaningful activity that can promote engagement and social interaction among such people (Bould, 2017; Van den Bosch & Bird, 2018). A 6-week gardening intervention among eight aged care residents with dementia revealed that gardening can be a meaningful complementary activity for people with dementia and helps them to be functionally active (Thelander et al., 2008). Additionally, Hall et al. (2018), in a mixed-method study conducted with 14 people with dementia who took
part in a horticultural activities program, which included planting, weeding and grass cutting, reported that the program improved the well-being of those with dementia during the study.

**Reminiscence**

According to Bluck and Levine (1998, p. 188) “Reminiscence is the volitional or non-volitional act or process of recollecting memories of one’s self in the past”, and enhancing reminiscence is another characteristic of DFE (Alzheimer's WA, 2019; Graham-Cochrane, 2010; Marcus & Sachs, 2014). Various features in an outdoor natural landscape, for example, colours, sounds, scents, plants, herb gardens, telephone boxes and even farm equipment, can be appropriate sources for evoking long-held memories in people with dementia (Delhanty, 2013; Marcus & Sachs, 2014). Goto et al. (2014) in a comparison study between two groups (i.e., an indoor natural landscape group and a Snoezelen group) reported that people with dementia who were in the indoor natural landscape group recalled old memories more often when compared to those in the Snoezelen group, which accentuates the significance of the indoor garden as a reminiscence factor.

Another important factor in providing reminiscence in outdoor natural landscapes is the compatibility of the outdoor natural landscape elements with the culture of those with dementia (Delhanty, 2013; Marcus & Sachs, 2014). The elements of the outdoor natural landscape should be of familiar material, context or style for that particular group of people with dementia (Detweiler et al., 2012; Graham-Cochrane, 2010; Health Building Notes, 2015; Marcus & Sachs, 2014), and this can be achieved by compiling peoples’ social biographies to understand their culture and background (Burke III, 2007). Hogewey in the Netherlands is a village designed for people with
dementia, incorporating a domestic environment with decorations and furnishings based on the residents’ culture and lifestyle (Godwin, 2015).

**Sensory Stimulation**

Providing an adequate amount of sensory stimulation is another important feature of DFE in creating an outdoor natural landscape. The outdoor natural landscape has the potential to provide a sensory experience through engaging the individuals’ five senses (Alzheimer's WA, 2019). Goto et al. (2014) tested the effect of two environments (i.e., Snoezelen room and a Japanese indoor natural landscape) on the well-being of two groups of people with advanced dementia living in a nursing home. The results of their study showed that those in the Japanese indoor natural landscape experienced more positive affects compared to the Snoezelen group. The Haugmotun in Norway is a case example of a village designed for people with dementia with the usage of sensory provoking elements, such as colourful flowers in raised beds, a pond with the trickling sound of water and European mountain ash trees for attracting singing birds (Pollock & Marshall, 2012).

**Safety**

Another characteristic in creating a DFE in an outdoor natural landscape is safety (Alzheimer's WA, 2019; Delhanty, 2013). An outdoor natural landscape in RACFs should be surrounded by a fence or wall to create a safe and secure area for people with dementia, where a wide variety of meaningful activities, such as exercise, walking, talking and horticulture activities, can be carried out (Borgen & Guldahl, 2011; Brawley, 2007). However, it is essential that the outdoor natural landscapes enclosed by a fence or wall should not induce a sense of confinement (Marcus & Sachs, 2014). Furthermore, those entrances and exit areas which are not for the use of people with
dementia should be suitably camouflaged to prevent disorientation in people with dementia (Delhanty, 2013; Graham-Cochrane, 2010; Greasley-Adams et al., 2012; Queensland Health, 2018). Utilising non-glare and low sloped walkways with appropriate textures and contrasting colours can be a helpful and suitable means of identifying elements as well as lessening spatial disorientation and the risk of falls in people with dementia (Graham-Cochrane, 2010; Health Building Notes, 2015).

Another important criterion for fulfilling safety in the outdoor natural landscape is the inclusion of non-toxic plants mainly because some people with dementia may unknowingly consume the plants (Greasley-Adams et al., 2012; Marcus & Sachs, 2014; Queensland Health, 2018). The Jewish Home of San Francisco, USA is a case example of an outdoor natural landscape for people with dementia, where a number of non-toxic and edible plants were planted for the use of people with dementia (Nakajo, 2013).

**Sustainability**

Sustainability is another characteristic of a DFE in creating an outdoor natural landscape, as overall self-sufficiency, reduced maintenance costs, water and energy efficiency and long-term use contributes to the success and management of the outdoor natural landscape (Graham-Cochrane, 2010). The self-sufficiency of the outdoor natural landscape can be fulfilled by planting low maintenance native plants compatible with the conditions of each region, removing weeds and placing debris of the outdoor natural landscape in the compost bins (Brisbane City Council, 2014; Graham-Cochrane, 2010; Queensland Health, 2018). The long-term use and success of the garden can be achieved through the staff’s comprehension of the purpose and importance of designing DFEs in RACFs. This would allow staff to support the creation of DFEs, plan various activities, and encourage people with dementia to use the garden (Graham-Cochrane, 2010).
Research Aims

This research proposes to examine the effect of a newly designed outdoor natural landscape that is aligned with the characteristics of a DFE on agitation, apathy, and engagement in people with dementia living in RACFs.

Research Questions

1. Does an outdoor natural landscape incorporating characteristics of a DFE decrease agitation among people with dementia in a RACF?

2. Does an outdoor natural landscape incorporating characteristics of a DFE decrease apathy among people with dementia in a RACF?

3. Does an outdoor natural landscape incorporating characteristics of a DFE increase the level of engagement among people with dementia in a RACF?

Research Significance

Research evidence suggests there are adverse effects of an institutionalised or inappropriately designed RACF on some BPSD displayed by people with dementia, including agitated behaviours (Waller & Masterson, 2015). To reduce these symptoms, a well-designed DFE is recommended (Barrett et al., 2019; McLean, 2007). This study will focus on a DFE outdoor design and is one of the first known case studies that aims to improve the outdoor environment (i.e., garden) of a RACF in accordance with the DFE characteristics. The study aims to reduce agitation and apathy and enhance engagement of people with dementia living in a RACF. This study also provides insight into how the outdoor environment (i.e., garden) can be assessed and how to design a garden with DFE characteristics in a RACF. The design solutions presented in this study consist of a range of sensory plants, activities and other features that are in line with DFE characteristics. These design solutions have arisen either from detailed
research into empirical studies in the literature or through consultations with experts and may be used as a guideline in future case studies.

**Thesis Structure**

This thesis consists of seven chapters. The first chapter is the introduction in which an overview of the research background, a definition of outdoor natural landscape, the DFE concept and its characteristics along with the main objectives and questions of the thesis are addressed. Chapter Two consists of a comprehensive narrative review of the studies concerning the creation of the outdoor natural landscape, such as a garden for people with dementia in RACFs to reduce BPSD. At the end of the chapter, an update to the literature review along with the theoretical framework underpinning the study are presented.

The first phase of the three phases of the data collection, which provides an overview of the environmental assessment of the garden in the selected RACF is described in Chapter Three. First, it outlines the study design and methods, and this is followed by the results of the environmental assessment using the Dementia Therapeutic Garden Audit Tool (Alzheimer’s Australia WA, 2015). In addition, the social biographies of the participants are presented.

Chapter Four describes Phase Two of the three phases of the data collection and discusses the procedure for improving the Ruby Garden in the RACF along with its related 3D layouts. The results of the reassessment of the Ruby Garden with the Dementia Therapeutic Garden Audit Tool following the changes to the garden are also described. The final phase (Phase Three) of the data collection and focuses on the intervention and its schedule, the instruments used and the results of the intervention on agitation, apathy and engagement of people with dementia in the RACF are described in
Chapter Five. In addition, the findings of the on-site observation of people with dementia during the 4-week intervention period are described.

Chapter Six contains a discussion of the main findings from the collected data in relation to the outcome measures of the study as well as addresses the strengths and limitations of the study. Chapter Seven concludes the study along with recommendations for future studies, clinical practice and designers.

**Summary of this Chapter**

This chapter described an overview of the introduction and research background. In summary, the environment is an influential factor in improving BPSD, such as agitation and apathy, for people with dementia. Creating a good environmental condition in RACFs for people with dementia is essential. One such area is the dementia-friendly outdoor natural landscape. Designing an outdoor natural landscape for people with dementia in RACFs must not only correspond to their needs but also incorporate DFE characteristics to respond to those needs appropriately. The overarching aim of this thesis is to investigate the effect of an improved outdoor natural landscape (i.e., garden) that is aligned with the characteristics of a DFE on agitation, apathy and engagement in people with dementia living in RACFs. The following chapter contains a comprehensive narrative review of the studies investigating the potential effects of outdoor natural landscape interventions on BPSD, namely agitation and apathy as well as the engagement of older people with dementia.
Chapter Two: Literature Review

Introduction

This chapter presents a published narrative literature review on the effectiveness of dementia-friendly outdoor natural landscape interventions in long-term care (LTC) facilities in reducing behavioural and psychological symptoms of dementia (BPSD), such as agitation and apathy. Following this, an update of the narrative literature review is presented. Finally, the theoretical framework underpinning this study is described.

Overview of the Literature Review

The main purpose of the literature review was to gain an insight into existing studies concerning the creation of outdoor natural landscapes which were designed based on the characteristics of dementia-friendly environments (DFEs) as an intervention to reduce agitation and apathy and to improve the engagement of people with dementia living in LTC facilities. In addition, the strengths, gaps and limitations of the studies included in the review were evaluated.

Statement of Contribution to Co-authored Published Paper

This chapter includes a co-authored paper. The bibliographic details of the co-authored paper, published in Health & Place, including all authors, are:


My contribution to the paper involved conceptualising and designing the literature review, undertaking a comprehensive search, data screening, data extraction,
carrying out the quality assessments of the studies, conducting the primary analysis, interpretation, drafting and finalising the manuscript.

Minor modifications have been applied to the original publication to fit the thesis formatting.

(Signed)  
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Creating a Dementia-Friendly Environment Through the Use of Outdoor Natural Landscape Design Intervention in Long-Term Care Facilities: A Narrative Review


Abstract

There is an increasing volume of literature on the positive effects of outdoor natural landscapes on health and well-being. However, to date, there is a paucity of research on the effect of outdoor natural landscapes designed for people with dementia living in long-term care (LTC) facilities, in particular, those which have incorporated the characteristics of a dementia-friendly environment (DFE). This narrative literature review synthesises current knowledge on the effect of outdoor natural landscape design, which is aligned with the characteristics of a DFE, to improve agitation, apathy and engagement of people with dementia living in LTC facilities. The reviewed studies predominantly support the positive effects of outdoor natural landscapes on agitation, apathy and engagement of people with dementia. However, there are concerns about the methodological approaches, principles incorporated in the applied outdoor natural landscapes’ designs, and the environmental assessment. Further rigorous research is required to understand the impact of the outdoor natural landscapes, with the application of DFE characteristics in the design, on agitation, apathy and engagement of people with dementia living in LTC facilities.

*Keywords*: outdoor natural landscapes, long-term care facilities, dementia-friendly environment, narrative literature review
Introduction

The concept of landscape has evolved from being just a scenery to a multifaceted one which represents an area or setting characterised by the interaction between nature and human beings (European Landscape Convention, 2000). From a health perspective, there is a long-held traditional belief originating from religion that landscape serves as a healer or therapy for its users (Gesler, 1992; Marcus & Sachs, 2014; Streep, 2003). A number of ancient cultures, including the Greeks, considered landscape as a holy element with curative power, utilising it spiritually in both their cleansing rituals and constructions (Gesler, 1992). More recent studies on landscape have demonstrated the benefit of its various components, including green and blue spaces for the physical (Mackay & Neill, 2010; Mytton et al., 2012), social (Alaimo et al., 2010; Finlay et al., 2015; Gorman, 2017; Kuo, 2010; Mokos, 2017; Nutsford et al., 2016) and psychological well-being (Barton & Pretty, 2010; Van Herzele & de Vries, 2011; White et al., 2010) of individuals, especially for older adults (Astell-Burt et al., 2013; Finlay et al., 2015; Sulander et al., 2016). Today, some specific landscapes, such as outdoor natural spaces, are considered essential to human well-being, having some therapeutic effects that address the physical, psychological and social needs of people to promote health and well-being (Abraham et al., 2010).

The term therapeutic landscape was first defined by Gesler (1993) as being all types of places, natural or built (human-made) environments or milieus associated with healing or treatment which have “attained an enduring reputation for achieving physical, mental, and spiritual healing” (Gesler, 1993, p. 171). His earliest studies investigated the potential healing processes found in traditional settings, such as mineral springs (Gesler, 1993) and pilgrimage sites (Gesler, 1996), as popular belief attributed curative or restorative power to these places. Evolving from the health geography discipline, the
overall definition shifted over time to other foci, such as the dynamic relationship between health and place, and the factors contributing to healing and its promotion. For instance, Williams (1998) demonstrated that meaning, value and experience were crucial elements to healing within the current philosophy of holistic medicine. Andrews (2002) indicated that the characteristics and quality of place could affect health care provisions and the health and well-being of individuals. Further studies show that the therapeutic landscapes effect is mainly dependent on the association or interaction between people and their social environments based on their attitude, identity and culture (Conradson, 2005; Finlay, 2018), and what is therapeutic for one individual, may simultaneously have some adverse effect or even harm for someone else (Finlay, 2018).

The emphasis on the significance of place (e.g., built environment) has driven researchers to evolve the concept to consider and examine therapeutic effects of a wide range of sites, such as home environments (Nagib & Williams, 2018; Williams, 2002), hospitals (Curtis et al., 2007; Heathcote & Jencks, 2010; Marcus & Sachs, 2014), green milieus (parks, gardens, etc.) (Barton & Pretty, 2010; Finlay et al., 2015; Sharma-brymer et al., 2015) and blue spaces (sea, rivers, lakes) (Dempsey et al., 2018; Finlay et al., 2015; Foley & Kistemann, 2015; Nutsford et al., 2016; Volker & Kistemann, 2011; White et al., 2010). For instance, there is an association between the higher level of exposure to sea views and a lower level of depression in older adults (Dempsey et al., 2018).

Bell et al. (2018) further investigated the changes in the therapeutic landscape concept and showed that the continuing evolution of the term creates ambiguities. Hence, they propose hierarchisation within the concept to address this, while keeping the four original dimensions proposed by Gesler (1993): material, social, spiritual and
symbolic. An outdoor natural landscape incorporating green and blue components is regarded as a specific subset of therapeutic landscapes that embodies the therapeutic potential to promote health and well-being. Hence, this categorisation of an outdoor natural landscape is used for this review.

Although the positive effects of outdoor natural landscapes on health and well-being have been well documented, there remains a gap in the understanding of the effect of outdoor natural landscapes for people with dementia in long-term care (LTC) facilities. A large number of older people with dementia living in LTC facilities manifest negative behavioural and psychological signs and symptoms of dementia (BPSD), such as agitation and apathy. Agitation encompasses physically aggressive and non-aggressive behaviour, verbal agitation and repetitive behaviours (Rabinowitz et al., 2005). Apathy, another manifestation of BPSD, is identified as a lack of enthusiasm, motivation, and loss of interest (Marin, 1990) that leads to a reduction in positive emotions and social interaction (Robert et al., 2009). People with dementia living in LTC facilities can experience agitated behaviours and apathy as a reflection of their unmet needs.

The literature shows that these unmet needs are often due to the institutionalised environments of LTC facilities, where there are either excessive or insufficient levels of stimulation, inappropriate environmental conditions, and lack of engagement (Cohen-Mansfield, Dakheel-Ali, et al., 2015; Kales et al., 2015). In addition, due to the short-term memory problems in people with dementia, they often have difficulty in spatial perception as well as time and place identification, which makes the LTC facilities environment confusing and disorienting (McLean, 2007). This confusion and disorientation resulting from inappropriate environmental conditions, in turn, cause several BPSD, and results in people with dementia becoming agitated (Waller &
Masterson, 2015). To reduce these challenges necessitates a high quality and well-designed LTC environment for people with dementia (McLean, 2007).

In recent years, there is a trend towards improving the quality of LTC environments with the creation of dementia-friendly environments (DFEs) (Davis et al., 2009). According to Davis et al. (2009, p. 187), a DFE “is a cohesive system of support that recognises the experiences of the person with dementia and best provide assistance for the person to remain engaged in everyday life in a meaningful way”. It is a way to create a therapeutic environment that contributes to the comfort and independence of residents aiming to take the environmental requirements of those with dementia into consideration (Alzheimer’s Australia, 2004).

The creation of a DFE was first initiated in indoor spaces of hospitals and LTC facilities through several environmental modifications, such as improving flooring, lighting, furniture and visual signage to increase comfort and inclusion of people with dementia in daily life (Handley et al., 2017; Waller, 2012). Similarly, along with these changes, there has been increasing attention to the whole environment, namely both indoor and outdoor spaces (Marcus & Sachs, 2014). In other words, creating a DFE is not limited to the indoor environment. The outdoor environment (e.g., outdoor natural landscape) is an equally important area that should accommodate the unmet needs of people with dementia (World Health Organisation, 2007) so that residents have access to an outdoor natural landscape (Marcus & Sachs, 2014).

Hence, in recent years, several new initiatives have evolved to allow people with dementia to take advantage of the potential therapeutic effects of an outdoor natural landscape. One of these is the creation of green care farms where people can spend time in an outdoor natural landscape, and they can take part in various farming and gardening activities (Bruin et al., 2009). The creation of gardens aimed at promoting general well-
being in people with dementia, named therapeutic gardens, is another initiative, where people can sense various components of natural landscape while participating in horticulture activities (Graham-Cochrane, 2010).

An outdoor natural landscape for people with dementia, based on principles of DFE, is where individuals’ well-being is promoted by relaxation in the environment and also enhanced by their active participation in garden-related activities (Graham-Cochrane, 2010). The design of outdoor natural landscapes based on the characteristics of DFE has been examined in a few LTC facilities, such as the Living Garden at the Family Life Center in Michigan (Marcus, 2007b; Marcus & Sachs, 2014). The positive effects of such outdoor natural landscapes on the well-being of residents have been documented; however, their specific impact on the adverse behavioural and psychological signs and symptoms of people with dementia are unclear.

Designing an outdoor natural landscape for people with dementia in LTC facilities must not only correspond to their needs but also incorporate DFE characteristics, such as orientation, accessibility, socialisation, meaningful activities, reminiscence, sensory stimulation, safety and sustainability (Table 2.1), to respond to their needs appropriately. The ideal design process should incorporate two specific phases: site analysis (Hansen & Alvarez, 2016) and environmental assessment (Alzheimer’s WA, 2018) to provide analysis of the environment that can maximise our understanding of the site and facilitate the drawing of the site.
Table 2.1

**DFE Characteristics That Should be Followed when Designing Outdoor Natural Landscapes**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Descriptions</th>
</tr>
</thead>
</table>
| Orientation           | Utilising appropriate pictorial signage and visual cues  
                        | Utilising appropriate structures, including gazebos, arbours, water features, furnishings and vegetation as major or minor landmarks in the outdoor natural landscape  
                        | Utilising marked entrance and exit areas in the outdoor natural landscape  
                        | Utilising looped walkways that return to the starting point  
                        | Locating the outdoor natural landscape in a way that people with dementia can easily see and identify the outdoor natural landscape |
| Accessibility         | Having visual access to the outdoor natural landscape  
                        | Having unrestricted physical access to the outdoor natural landscape  
                        | Taking advantage of wide walkways where people in wheelchairs can also pass easily  
                        | Implementation of handrails and durable furniture at regular intervals  
                        | Providing several garden beds of different heights for the ease of access  
                        | Making the outdoor natural landscape accessible all year long by providing sunrooms or indoor gardening activities  
                        | Supplying the outdoor natural landscape with specific tools requiring slight strength for the use of people with dementia  
                        | Providing enough shade spaces for summer and warm places for winter in the outdoor natural landscape |
| Socialisation         | Providing meaningful activities or interactive elements in the outdoor natural landscape that bring people together, such as herb gardens, sheds, etc.  
                        | Providing suitable furnishings for increasing social interaction  
                        | Providing enough places as quiet refuges for residents’ privacy as well as activity areas for groups  
                        | Providing a place for people with dementia to interact with others, including a place for family visits and celebrations  
| Meaningful activities | Providing some meaningful activities ranging from household chores to gardening for people with dementia  
                        | Doing horticulture/gardening activity programs, such as attending to herb garden tasks which also encourages food production activity  
| (Meaningful engagement)| Providing some elements that create social interaction in people with dementia, such as a herb garden and a birdfeeder  
                        | Designing safe walkways which encourage people with dementia to walk and take exercise as meaningful activities |
| Reminiscence | Utilising various memory-evoking elements of an outdoor natural landscape, including plants, gardening equipment, bird baths, old cars |
| Sensory-stimulations | Utilising familiar plants, materials or elements compatible with the culture of people with dementia |
| | Providing an adequate amount of sensory stimulation by utilising different sensory-provoking elements in an outdoor natural landscape, such as colour, sound, texture and scent |
| | Designing the outdoor natural landscape in a way to stimulate the five senses |
| | Installing flower or plant beds of various heights for ease of touching, smelling and viewing |
| | Integrating nature-attracting plants in the outdoor natural landscape to attract singing birds and butterflies |
| | Integrating the outdoor natural landscape with appropriate lighting for night use |
| | Locating the outdoor natural landscape and windows in a way that people with dementia can easily see and hear the sound of rain when it is cold outside |
| Safety | Creating a fenced outdoor natural landscape disguised with plants to make the fence less obvious |
| | Planting trees at a suitable distance from the outdoor natural landscape fence to prevent people with dementia from climbing |
| | Utilising non-glare and gently sloped walkways with appropriate textures and contrasting colours on the edge of pathways |
| | Utilising non-toxic plants in the outdoor natural landscape |
| | Disguising the entrances and exit areas which are not for the use of people with dementia |
| | Providing sufficient shade spaces for hot summer weather |
| | Providing durable elements or furniture in the outdoor natural landscape to prevent individuals from falling down |
| | Providing awnings over external doorways to help people’s eyes adjust to light changes |
| Sustainability | Utilising low maintenance plants |
| | Utilising native plants compatible with the conditions of each region |
| | Removing weeds and composting plant beds |
| | Utilising waste and debris of the outdoor natural landscape in compost bins |
| | Providing a self-sufficient outdoor natural landscape by providing a rainwater tank for watering |
| | Providing a gardening group for maintaining the outdoor natural landscape |
| | Locating the therapeutic landscape in a way that people with dementia are visible to staff in the outdoor natural landscape |

*Note.* Based on the work by Brisbane City Council, 2014; Graham-Cochrane, 2010; Health Building Notes, 2015; Marcus and Sachs, 2014.
Therefore, this narrative review aims to investigate recent studies that examine and use the characteristics of a DFE in the design of an outdoor natural landscape to reduce agitation and apathy and to encourage engagement of people with dementia in LTC facilities.

**Method**

This study addresses a novel area of inquiry, though built on previous studies. A narrative review is a comprehensive, realistic and critical analysis of the current knowledge on a specific topic in which the author narratively and critically summarises the body of literature to identify the existing gaps (Baker, 2016; Charles Sturt University, 2019). It provides a broader perspective compared to the other types of reviews (Grant & Booth, 2009) and was chosen for this study to identify (a) the breadth and scope of available research on the effect of outdoor natural landscapes incorporating characteristics of a DFE on agitation, apathy and engagement, as well as (b) the outcomes of these studies, and (c) any gaps in the literature.

**Search Strategy**

A comprehensive literature search from 2007 to 2017 in peer-reviewed journals was carried out through the following databases: Scopus, ProQuest, Web of Science, Science Direct, Embase, CINAHL plus with full text, MEDLINE, PubMed, and Google Scholar. Additional studies were also found through manual reference checking. The search terms applied in the databases included four diverse groups of terms: 1: “landscape” OR “green space*” OR “healing garden” OR “wander* garden” OR “therapeutic garden” OR “therapeutic landscape*” OR horticulture OR “green care” OR “dementia-friendly garden*” OR “sensory garden*” OR “Ecotherapy” OR “blue space*” OR “therapeutic sound*” OR “natural sound*” OR “bird sound*” OR “water

**Eligibility**

This narrative review included studies that reviewed the effects of any type of outdoor natural landscape interventions (e.g., therapeutic gardens, green care farming, ecotherapy and therapeutic horticulture) on agitation, apathy and engagement of people with dementia (aged 65 years and over) in LTC facilities. Studies that reported a comparison between the effects of outdoor natural interventions and indoor spaces that included either a multisensory room (MSR) or an indoor activity program for older people with dementia were included. Peer-reviewed studies reporting qualitative, quantitative or mixed-method studies written in English and published from 2007 to 2017 were included.

**Included Studies**

As shown in Figure 2.1, a total of 1,256 studies were identified in the selected eight databases. After removing 513 duplicates, 743 studies were screened based on their title and abstract. This resulted in the deletion of 613 studies considered irrelevant. Reasons for these exclusions were that they were not related to the topic, or they did not examine the effects of an outdoor natural landscape designed for older people with dementia on the outcomes of agitation, apathy and engagement.
A total of 130 studies were retained for full-text review; 119 of these were excluded as they did not meet the inclusion criteria, leaving 11 eligible studies. These 119 studies were excluded because of the following reasons:

1. Involved populations without dementia, including healthy older adults or older adults with other disorders.
2. Reported the effect of other environment-based interventions, including multisensory rooms (MSRs) and special care units (SCUs) with a focus on interior design rather than an outdoor environment.
3. Involved settings other than LTC facilities, such as a daily horticultural activities program in the park.
4. Examined other outcomes: (1) medications, (2) falls, (3) cognitive functioning, (4) stress and (5) staff satisfaction.
5. Reported the effects of indoor gardening on agitation, apathy or engagement for older people with dementia rather than the review focus on outdoor natural landscapes in LTC facilities.
6. Involved multiple interventions in combination with an outdoor natural landscape intervention, and therefore it was difficult to distinguish between the effects of each intervention.
7. Provided insufficient research information (e.g., editorial and opinions).
8. Non-English studies were excluded.

A further four studies identified through manual reference checking were included, resulting in a total of 15 studies being included in this narrative review (Figure 2.1).
Figure 2.1

The literature Review Flow Diagram

Studied identified through a search of 8 databases \( (n = 1,256) \)

Duplicates removed \( (n = 513) \)

Studies after duplicates removed \( (n = 743) \)

Excluded studies that did not meet inclusion criteria based on title and abstract \( (n = 613) \)

Studies for full text review \( (n = 130) \)

Excluded studies not meeting inclusion criteria based on full text \( (n = 119) \)
Other environment-based interventions \( (n = 62) \)
Indoor gardening \( (n = 2) \)
Non-dementia population \( (n = 21) \)
Insufficient information \( (n = 12) \)
Settings other than RACFs \( (n = 3) \)
Other languages \( (n = 8) \)
Other outcomes of interest \( (n = 7) \)
Reviews \( (n = 4) \)

Studies included \( (n = 11) \)

Additional eligible studies identified through reference checks \( (n = 4) \)

Studies included in the literature review \( (n = 15) \)
Horticulture or gardening activities \( (n = 3) \), therapeutic gardens \( (n = 8) \)
green care farms \( (n = 4) \)

Note. PRISMA chart from Moher et al., 2009

**Quality Assessment**

The quality assessment of included articles was guided by the (Pluye et al., 2011) Mixed Methods Appraisal Tool (MMAT) and was carried out by three members of the research team (PM, WM & CJ) independently. Disagreement among assessors was solved through discussion. Each article was examined for its methodological quality according to the type of study, including qualitative, quantitative (RCT), quantitative (non-RCT), quantitative (descriptive) and mixed-method studies, by answering two general screening questions. These questions aimed to evaluate the clarity and appropriateness of the study design and data collection procedures to address the research questions. In addition, several questions exclusive to individual types of study were posed.

The possible responses were “Yes”, “No” or “Cannot tell”. Having answered the question, the scores were presented by using four different symbols: *, **, *** and ****. To score both the qualitative and quantitative studies, the number of Yes responses indicating meeting of the criteria are counted. That is, when one response was Yes (i.e., one criterion was met) the study was given * (25%) score. Two, three and four Yes response were given ** (50%), *** (75%) and **** (100%), respectively. For mixed-method studies, both qualitative and quantitative components of the study were assessed. The overall quality score of these mixed-method studies equals the lowest score of the study component (i.e., qualitative or quantitative). For example, if just one criterion was met by the qualitative component of the study (i.e., one Yes response) and two criteria were met by the quantitative component of the study, the overall quality score of the mixed-method study was *(25%) (Pluye et al., 2011) (Table 2.2).
<table>
<thead>
<tr>
<th>Methods</th>
<th>Articles</th>
<th>Questions</th>
<th>Score(^1)</th>
</tr>
</thead>
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<tr>
<td>Qualitative</td>
<td>(Raske, 2010)</td>
<td>Y Y Y Y Y Ct</td>
<td>%75 (***), Y N Y Y Y N</td>
</tr>
<tr>
<td></td>
<td>(Hernandez, 2007)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(de Bruin et al., 2015)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quantitative</td>
<td>(Connell et al., 2007)</td>
<td>Y Y</td>
<td>%25 (*)</td>
</tr>
<tr>
<td>(RCT)</td>
<td>(Jarrott and Gigliotti, 2010)</td>
<td>N N Ct Ct</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Luk et al., 2011)</td>
<td>N Ct N Y Ct Ct</td>
<td>%25 (*)</td>
</tr>
<tr>
<td>Quantitative</td>
<td>(Calkins et al., 2007)</td>
<td>Y Y</td>
<td>%25 (*)</td>
</tr>
<tr>
<td>(Non-RCT)</td>
<td>(Detweiler et al., 2008)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quantitative</td>
<td>(Bruin et al., 2009)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Descriptive)</td>
<td>(de Boer et al., 2017a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(de Boer et al., 2017b)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) Score: %75 (***), %75 (***), %100 (****), %25 (*), %25 (*), %25 (*), %25 (*)
<table>
<thead>
<tr>
<th>Mixed-method</th>
<th>N</th>
<th>Ct</th>
<th>Y</th>
<th>Ct</th>
<th>Ct</th>
<th>N</th>
<th>%25 (*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Gonzalez and Kirkevold, 2015)</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Ct</td>
<td>Y</td>
<td>Ct</td>
<td>Ct</td>
</tr>
<tr>
<td>(Rappe and Topo, 2007)</td>
<td>Ct</td>
<td>Y</td>
<td>Y</td>
<td>Ct</td>
<td>Ct</td>
<td>N</td>
<td>%50 (**)</td>
</tr>
<tr>
<td>(Anderson et al., 2011)</td>
<td>Ct</td>
<td>Y</td>
<td>Ct</td>
<td>Ct</td>
<td>Y</td>
<td>Y</td>
<td>Ct</td>
</tr>
<tr>
<td>(Edwards et al., 2013)</td>
<td>Ct</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>%100 (****)</td>
</tr>
</tbody>
</table>

**Findings**

A data extraction form was created in an Excel file for the data management of included studies. Data extracted from each of the included articles was tabulated in terms of methodological approach, study region, study participants (i.e., demographic characteristics of participants), intervention studies (i.e., intervention dose and assessment tools) and types of landscape design (i.e., site analysis, environmental assessment phase, DFE characteristics and the landscape plan (Table 2.3). Each category is presented in this findings section.
<table>
<thead>
<tr>
<th>Study/Region</th>
<th>Purpose</th>
<th>Study design</th>
<th>Study participants</th>
<th>Intervention dose</th>
<th>Assessment tools</th>
<th>Findings</th>
<th>DFE characteristics</th>
<th>Site analysis/Architectural plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Anderson et al., 2011)/Australia</td>
<td>To know whether a multisensory room is more effective than Sensory Stimulation provided by a therapeutic garden space.</td>
<td>One group pre-post-test study design and a focus group with staff.</td>
<td>12 permanent residents of a care facility. Mean age = 89 years, Mean MMSE scores = 5.7.</td>
<td>Snoezelen room and garden space 20 min per session * Once a week * 6 weeks = 2 hrs.</td>
<td>1. Cognitive impairment: Minimal Mental Status Exam (MMSE). 2. Coding of observed months post-intervention behaviours into 4 Categories (disturbed/dese ngaged, neutral, engaged, very engaged).</td>
<td>Reduction in disengaged/disturbed behaviour was noted after both Snoezelen and garden. However, the sample size for the garden group was too small to evaluate statistically. No significant differences in behaviour were observed across groups over time. No significant differences were observed between Snoezelen and garden.</td>
<td>Provision of sensory stimulations by using plants, trees and fish pond.</td>
<td>No.</td>
</tr>
</tbody>
</table>
A comparison between activities undertaken in green care farms and regular daycare facilities.

Study 1: Green care farms: groups of an average of 10 older people per day. Regular daycare facilities: groups of on average of 9 older people per day.

Study 2: 30 individual older people at a green care farm. 25 individual older people with dementia attending daycare at a regular daycare facility with dementia.

Mean MMSE in study 1: G:19.4, R: 20.0. Mean MMSE in green care farms and regular daycare facility.

In study 1, the observations were performed on consecutive weekdays, except at 1 green care farm where the observations were performed on 3 consecutive weekdays and, due to practical reasons, 1 weekday 6 weeks later. In study 2, observations were performed on either 1 or 2 weekdays per person.

2. Observation through libitum sampling to gain insight into the main activity (the activity with the longest duration) every 15 minutes.
3. An inventory was made for the location of activities.

1. Activities of older people at green care farms were more frequent, occurred outdoors more often, were of higher physical intensity, and aimed more at individuals than were activities at regular daycare facilities. The green care farms’ environment may be more beneficial for older people with dementia than the regular daycare facility environment.

Provision of meaningful activities horticulture or gardening activities.
(Calkins et al., 2007)/USA

To examine the effects of increased time spent outdoors on agitation and sleep.

Quasi-experimental design with pre-test/post-test design.

Residents from three nursing homes ($n = 17$), 15 females and 2 males.
Mean MMSE score = 10.5.

Outdoor activities.
2 weeks with activity. 1 week without activity.
(a) 30mins per day * 7 days per week * 2 weeks = 7hrs
(b) 30 mins per day * 7 days per week * 1 week = 3.5 hrs.

1. Sleep:
   (a) Actilume-L
   (b) Pittsburgh Sleep Quality Index (PSQI).

2. Agitation:
   (a) Cohen–Mansfield Agitation Inventory Short Form (CMAI-SF)
   (b) Actiwatch.

Increased time spent outdoors caused a modest improvement in sleep; however, no measurable changes in agitation.

Not enough information on the characteristics of the therapeutic garden.

---

(Connell et al., 2007)/USA

To evaluate the influence of an outdoor horticultural activity program compared with an indoor horticultural

Randomised controlled trial.

Residents in nursing homes ($n = 20$), 1 female, 19 males.
Mean MMSE score = $15.3 \pm (8.4)$

Horticultural activities
60 mins per day*5 days per week* 10 days=10 hrs.

1. Cognitive status: Minimal Mental Status Exam (MMSE).
2. Agitation: CMAI.

There was an improvement in maximum sleep duration in the outdoor activity group. The total sleep minutes in both outdoor and indoor groups

Provision of meaningful activities including horticulture/garden activities.
To evaluate whether residents of green care farms participate more in (physical) activities and social interaction compared with residents of traditional and regular small-scale nursing homes.

Longitudinal observation study.

A total of 115 nursing home residents at baseline, 100 at follow-up. S-MMSE, mean (SD) = 8
Baseline phase: 75% of participants were female.
Follow up phase: 76% of participants were female.
Mean age of participants in entire groups = 84 (7.8).

Green care farm (a period of 2 weeks)
4.5 hrs. per session * 7 sessions in 2-week period = 63 hrs.
Observation at baseline phase. 4.5hrs session * 6 times in 2 weeks = 54 hrs. at follow-up phase.

2. Activities of daily living (ADLs): the Barthel index.

Residents of green care farm significantly more often participated in domestic activities and in nature-related activities and significantly less often engaged in passive activities compared with residents of traditional nursing homes. Residents of green care farm had significantly more active engagement and had more social interaction.
Besides, they came outside significantly more than residents of traditional nursing homes. Residents of green care farms were significantly more physically active than were residents of regular small-scale living facilities.

To compare the quality of care, quality of life and related outcomes in green care farms, regular small-scale living facilities and traditional nursing homes for people with dementia, a cross-sectional design was used. 115 residents of 18 nursing homes, five green care farms, nine regular small-scale living facilities, and four traditional nursing homes were included. The mean MMSE was 9.7.


Higher quality of life scores were reported for residents of green care farms, in comparison with residents of traditional nursing homes. Residents of green care farms scored higher on three quality of life domains:

- Provision of meaningful activities
- Gardening activities
75% of participants are females.
Mean age = 83.8 7.8.

4. Quality of life: QUA-LIDEM and QoL AD.
5. Quality of care: Assessed by outcomes, structure and process indicators (falling incidents) during last 30 days.
6. Agitation: Agitation Inventory (CMAI).
7. Depression: Cornell Scale for Depression (CSDD).

To examine the benefits of day services at green care farms (GCFs) and regular daycare facilities. For both the GCF and RDCF groups, it was indicated that day services made provision of meaningful activities horticulture or positive affect, social relations and having something to do. No differences with regular small-scale living facilities were found.

(de Bruin et al., 2015)/Europe

A qualitative study with semi-structured interviews. People with dementia who attended day services at a GCF
regarding social participation for people with dementia. (n = 21), or they were on a waiting list (WL) for day services at a GCF group (n = 12), or attended day services in a regular daycare facility RDCF (n = 17).

People with dementia in the GCF and WL group were primarily males, with an average age of 71 and 76 years, respectively. People with dementia in the RDCF group were mostly females with an average age of 85 years.

The most important domains of social participation addressed by RDCFs were social interactions and recreational activities. GCFs addressed the domains of “paid employment” and “volunteer work.” GCFs are valuable concerning social participation for a particular group of people with dementia.

To evaluate the effects of a dementia A wander garden with 1. Agitation: The use of medications was The therapeutic gardening activities.
(Edwards et al., 2013)/Australia

To examine the impact of a garden on the quality of life of residents with dementia.

Observation of residents 12 months before and after opening the garden. Unit ($n = 34$ males). Mean age = 80.71 years. Free and direct access from the dementia unit. (a) Cohen–Mansfield Agitation Inventory (CMAI) 
(b) Incidents reports from staff 
(c) Inappropriate behaviour reported from relatives 
(d) needed medications.

1. Quality of Life: Dementia Quality of Life Instrument (DEMQOL and DEMQOL Proxy).
2. Cognitive impairment: Mini-mental Status Exam (MMSE).
3. Depression: Cornell Scale for Depression

Reduced after the wander garden was opened; however, verbal agitation did not change considerably. Staff and the relatives believed that the garden resulted in less agitation and improvements in mood and quality of life.

The garden improved the mean quality of life scores in participants by over 10%. Mean agitation and depression scores decreased by half. The garden improved the quality of life for residents. The garden offered

Provision of sensory stimulations by using trees and plants.

The garden is incompatible with criteria of safety and accessibility. Not much information was provided on the characteristics of the therapeutic garden.

Voluntary access to an interactive, sensory garden for residents and staff. Baseline phase = 10 days, residents assessed 3 months after the construction of the garden. 10 participants; age range: 79-90 years old. Mild to moderate dementia, 9 females, 1 male.

To examine the impact of a garden on the quality of life of residents with dementia.
<table>
<thead>
<tr>
<th>Reference</th>
<th>Study Objective</th>
<th>Methodology</th>
<th>Participants</th>
<th>Findings</th>
<th>Provision of sensory stimulations by using different plants.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Gonzalez and Kirkevold, 2015)/Europe</td>
<td>To ascertain the opinions of the leaders and staff regarding the benefits of sensory gardens (SGs) for the residents with dementia.</td>
<td>A Cross-sectional E-mail survey.</td>
<td>121 leaders of nursing homes and 302 staff leaders: 87 females, 13 males; staff: 95 females, 5 males.</td>
<td>Sensory gardens (a kind of therapeutic garden). SGs facilitated taking residents outdoors, offered topics for communication and improved contact and social privacy for relatives.</td>
<td>No.</td>
</tr>
<tr>
<td>(Hernandez, 2007)/USA</td>
<td>To evaluate the effects of garden design on the quality of life of residents.</td>
<td>Multi-method qualitative research techniques Interviews with staff, family members and architects.</td>
<td>Staff ( n = 28 ) Family members ( n = 12 ), Architects ( n = 5 ) in two dementia units in Midwest USA.</td>
<td>Behaviour mapping was conducted during a minimum of five randomly assigned 30 min periods from 7:00 AM–11:00 PM every day of the week, including 1. Residents, staff and family members were interviewed to ascertain garden use. 2. Observation of how the garden was used by people with dementia 3. The garden improved residents’ quality of life. Gardens created a better quality of life, through passive use (sitting outside), mild activities (reduction in stress and agitation), active</td>
<td>No/briefly.</td>
</tr>
<tr>
<td>Study</td>
<td>Design</td>
<td>Participants</td>
<td>Activities</td>
<td>Outcome Measures</td>
<td>Results</td>
</tr>
<tr>
<td>-------</td>
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<td>---------</td>
</tr>
<tr>
<td>(Jarrott and Gigliotti, 2010)/USA</td>
<td>RCT, Comparative study</td>
<td>129 participants diagnosed with dementia from eight care programs</td>
<td>Horticultural (HT) or traditional (TA) activities</td>
<td>1. Cognitive impairment: Minimal Mental Status Exam (MMSE). 2. Affect: Apparent Affect Rating Scale (AARS). 3. Engagement: Menorah Park Engagement Scale (MPES).</td>
<td>There were no significant differences in affect between the two groups. The HT group showed a higher level of active, passive and other engagement, while the TA group was self-engaged.</td>
</tr>
<tr>
<td>(Luk et al., 2011)/Asia</td>
<td>A single-blind with pre-post-test design</td>
<td>14 subjects with dementia, C-MMSE score = 13.4, mean age = 84.9 (± 8.3). Percentage of female in the entire group = 92.9%.</td>
<td>Gardening activities for the intervention group and table-top activities for the control group.</td>
<td>1. Cognitive impairment: Mini-mental Status Exam (MMSE). 2. Agitation: CMAI.</td>
<td>There was a decreasing trend in physically non-aggressive behaviour in the experimental group. However, no significant reduction in agitation resulted</td>
</tr>
<tr>
<td>Study</td>
<td>Location</td>
<td>Aim</td>
<td>Methodology</td>
<td>Sample</td>
<td>Findings</td>
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<tr>
<td>(Rappe and Topo, 2007)/Europe</td>
<td>Europe</td>
<td>To examine the influence of plants on the well-being of older people with dementia.</td>
<td>Study 1: Survey with both scaled and open-ended questions with staff. Study 2: Observation of residents.</td>
<td>Study 1: Staff $(n = 65)$, 10 residential care homes. Study 2: Residents with dementia $(n = 123)$, from two daycare units, (Mean MMSE = 20), mean age 77 years and six residential care units, (mean MMSE score = 12) mean age = 84 years. More females than males.</td>
<td>Plants improved the psychological well-being and social relationships of people with dementia by offering topics for conversation. Green environments supported the identity of people with dementia and created an active atmosphere in the units.</td>
</tr>
<tr>
<td>(Raske, 2010)/USA</td>
<td>USA</td>
<td>To evaluate the impact of the construction and use of an enabling garden on resident quality of life.</td>
<td>Descriptive study. Qualitative interviews with staff, family members and residents. 43 participants; included 16 residents, 6 family members, 15 staff members, and six gardens An enabling garden (a kind of therapeutic garden).</td>
<td>1. Cognitive impairment: Minimal Mental Status. Exam (MMSE) 2. Coding of type and 3. Coding of quality of life.</td>
<td>Results revealed the garden had positive effects on residents’ quality of life, particularly regarding meaningful daily</td>
</tr>
</tbody>
</table>
club volunteers. Mean age of residents interviewed = (81.4); 6 were men and 10 were women.
**Methodological Approach**

Of the 15 studies included in this narrative review, several methods were used to assess the influence of outdoor natural landscape on people with dementia. Three studies adopted a mixed-method approach, while the remaining 12 studies exclusively utilised either a qualitative or quantitative approach. Five studies used a descriptive study design (de Bruin et al., 2015; Gonzalez & Kirkevold, 2015; Hernandez, 2007; Rappe & Topo, 2007; Raske, 2010), four were observational studies (Bruin et al., 2009; de Boer, Hamers, Zwakhalen, Tan, Beerens, et al., 2017; de Boer, Hamers, Zwakhalen, Tan, & Verbeek, 2017; Detweiler et al., 2008) and six studies were intervention studies (Anderson et al., 2011; Calkins et al., 2007; Connell et al., 2007; Edwards et al., 2013; Jarrott & Gigliotti, 2010; Luk et al., 2011) of which three were randomised control trials (Connell et al., 2007; Jarrott & Gigliotti, 2010; Luk et al., 2011) and three were quasi-experimental studies (Anderson et al., 2011; Calkins et al., 2007; Edwards et al., 2013).

**Study Region**

The majority of studies were conducted in Europe (n = 6); (Bruin et al., 2009; de Boer, Hamers, Zwakhalen, Tan, Beerens, et al., 2017; de Boer, Hamers, Zwakhalen, Tan, & Verbeek, 2017; de Bruin et al., 2015; Gonzalez & Kirkevold, 2015; Rappe & Topo, 2007) and the USA (n = 6); (Calkins et al., 2007; Connell et al., 2007; Detweiler et al., 2008; Hernandez, 2007; Jarrott & Gigliotti, 2010; Raske, 2010). Two studies (Anderson et al., 2011; Edwards et al., 2013) were conducted in Australia and one in Asia (Luk et al., 2011).

**Study Participants**

The reviewed studies included a total number of 1,179 participants (people with dementia, staff and family members) of which their sample size varied between 10
(Edwards et al., 2013) to 423 (Gonzalez & Kirkevold, 2015). The mean age of people with dementia who participated in the studies ranged from 71 (de Bruin et al., 2015) to 89 years (Anderson et al., 2011).

The number of female participants with dementia was higher than males, except in three studies where the number of male participants was higher than females (Bruin et al., 2009; de Bruin et al., 2015; Detweiler et al., 2008). In addition, the mean level of cognitive impairment in participants varied in the studies between mild to a severe level of dementia. The average Mini-Mental State Examination (MMSE) was between 5.7 (Anderson et al., 2011) and 20 (de Bruin et al., 2015; Rappe & Topo, 2007). However, some studies did not describe the precise level of cognitive impairment of participants (Detweiler et al., 2008; Hernandez, 2007; Raske, 2010).

**Intervention Studies**

Three types of outdoor natural landscape interventions were identified within the 15 reviewed studies. They were horticultural activities (Connell et al., 2007; Jarrott & Gigliotti, 2010; Luk et al., 2011), therapeutic gardens (Anderson et al., 2011; Calkins et al., 2007; Detweiler et al., 2008; Edwards et al., 2013; Gonzalez & Kirkevold, 2015; Hernandez, 2007; Rappe & Topo, 2007; Raske, 2010) and green care farms (Bruin et al., 2009; de Boer, Hamers, Zwakhalen, Tan, Beerens, et al., 2017; de Boer, Hamers, Zwakhalen, Tan, & Verbeek, 2017; de Bruin et al., 2015). The efficacy of outdoor natural landscape interventions on agitation, apathy and engagement of people with dementia was generally reported in the studies mentioned above. However, sometimes detailed information about the applied intervention protocol was missing, which could have been useful for replication of the protocol in future studies. Jarrott and Gigliotti
(2010) outlined a clear and detailed intervention protocol, while most of the other studies briefly described the intervention procedure.

Additionally, none of the randomised control trials (RCTs) provided an adequate description of the process of randomisation or blinding (Connell et al., 2007; Jarrott & Gigliotti, 2010; Luk et al., 2011) for eliminating selection bias in treatment assignment (Connell et al., 2007; Jarrott & Gigliotti, 2010). Two of the RCTs had small sample sizes. In the study conducted by Connell et al. (2007) 10 participants took part in each group of the study (i.e., outdoor activity group and indoor activity group). In the investigation conducted by Luk et al. (2011), just seven participants in the intervention group and six in the control group participated. These small sample sizes decreased the reliability of both the Connell et al. (2007) and Luk et al. (2011) study results. The following subsections will present more in-depth information regarding each type of intervention.

**Horticulture Activities**

The effectiveness of horticultural activities on the signs and symptoms of dementia have been addressed in three studies using quantitative approaches (Connell et al., 2007; Jarrott & Gigliotti, 2010; Luk et al., 2011). Two studies (Connell et al., 2007; Luk et al., 2011) applied horticultural activities as a way to reduce agitation, while one study (Jarrott & Gigliotti, 2010) used these activities to increase the level of engagement in people with dementia. Luk et al. (2011) did not report any significant effect of horticultural activities on reducing agitation, but the two others revealed that horticultural activities reduce verbal agitation (Connell et al., 2007) and increase engagement of people with dementia (Jarrott & Gigliotti, 2010). This increase in the level of engagement occurred either actively (i.e., physically or verbally responding to
the presented activity) or passively (i.e., observing and listening to the presented activity). However, both studies did not include a follow-up phase to determine the sustainability of the intervention’s effect.

**Therapeutic Gardens**

Therapeutic gardens as one type of an outdoor natural landscape consisting of green and blue components have been examined in eight studies for the influence of therapeutic gardens on the signs and symptoms of dementia (Anderson et al., 2011; Calkins et al., 2007; Detweiler et al., 2008; Edwards et al., 2013; Gonzalez & Kirkevold, 2015; Hernandez, 2007; Rappe & Topo, 2007; Raske, 2010). Three of these studies reported positive effects of therapeutic gardens on engagement and socialisation of people with dementia (Hernandez, 2007; Rappe & Topo, 2007; Raske, 2010). These studies showed that therapeutic gardens increase the level of participation in activities such as watering, planting and watching flowers (Hernandez, 2007; Raske, 2010), or increased communication among people with dementia (Rappe & Topo, 2007).

These studies are mainly based on descriptive or qualitative approaches with a duration of data collection varying between 2 consecutive days (Rappe & Topo, 2007) and 4 weeks (Hernandez, 2007). Unfortunately, a detailed interpretation or description of both the data collection and results were not provided in these studies. Additionally, only proxies such as staff or family members were interviewed rather than people with dementia (Hernandez, 2007; Rappe & Topo, 2007).

The next three studies (Calkins et al., 2007; Detweiler et al., 2008; Gonzalez & Kirkevold, 2015) employed a quantitative approach to investigate the impact of therapeutic gardens on people with dementia. Of these, two assessed the efficacy of therapeutic gardens on the level of agitation and reported no significant impact (Calkins
et al., 2007; Detweiler et al., 2008). The third study showed that the therapeutic garden improves socialisation and communication of people with dementia (Gonzalez & Kirkevold, 2015). However, none of these studies addressed objective outcome measures (i.e., results were based on web-based surveys of nursing home leaders). Also, none of these studies undertook qualitative interviews with people with dementia to seek their views on the effect of the therapeutic garden.

The two remaining studies used mixed-method approaches to evaluate the effects of therapeutic gardens on the agitation of people with dementia (Anderson et al., 2011; Edwards et al., 2013). One study showed a decrease in agitated behaviours of people with dementia (Edwards et al., 2013). There were no follow-up measurements to assess whether the intervention effects were sustained over time. In addition, qualitative interviews were only conducted with staff and not with people with dementia, who were the primary users of the therapeutic garden.

The last study by Anderson et al. (2011) compared the level of engagement and agitation of people with dementia when using a multisensory room and a therapeutic garden. They demonstrated a high level of engagement in people with dementia in both environments. They concluded that their small sample size ($n = 5$) limited an understanding of pre- and post-changes in the agitation of people with dementia.

**Green Care Farms**

The therapeutic impacts of green care farms as another type of designed outdoor natural landscape on people with dementia have been evaluated in four studies, focusing on either engagement (Bruin et al., 2009; de Boer, Hamers, Zwakhalen, Tan, Beerens, et al., 2017; de Bruin et al., 2015) or neuropsychiatric symptoms, such as agitation and apathy, (de Boer, Hamers, Zwakhalen, Tan, & Verbeek, 2017). Green care farms were
shown to have a positive influence on the level of socialisation and engagement of people with dementia, and no significant effect on the level of neuropsychiatric symptoms, including agitation. However, the use of an observational study design could hinder the determination of the cause and effect relationship to accurately show whether green care farms leads to an improvement in behavioural signs and symptoms of dementia (Bruin et al., 2009; de Boer, Hamers, Zwakhalen, Tan, Beerens, et al., 2017; de Boer, Hamers, Zwakhalen, Tan, & Verbeek, 2017). Semi-structured interviews can also be potentially biased when the selection of participants is undertaken by care professionals (de Bruin et al., 2015).

**Intervention Dose**

The average total intervention duration and frequency varied among the studies, which took place over weeks to months. That is, the total intervention dose in the studies was between 3.5 hours (Calkins et al., 2007) and 63 hours (de Boer, Hamers, Zwakhalen, Tan, Beerens, et al., 2017). The average total intervention duration and frequency in the studies was approximately 20 hours.

**Assessment Tools**

Among the assessment tools applied for measurement of agitation, five studies used the Cohen-Mansfield Agitation Inventory (CMAI) (Calkins et al., 2007; Connell et al., 2007; Detweiler et al., 2008; Edwards et al., 2013; Luk et al., 2011), while other studies used either the Neuropsychiatric Inventory-Nursing Home Version (NPI-NH) (de Boer, Hamers, Zwakhalen, Tan, & Verbeek, 2017) or coded different behaviours through observation of participants (Anderson et al., 2011). The single study that assessed apathy (de Boer, Hamers, Zwakhalen, Tan, & Verbeek, 2017) used the Neuropsychiatric Inventory-Nursing Home Version (NPI-NH).
Assessment tools used for the measurement of social engagement in people with dementia varied in different studies. Two studies (Hernandez, 2007; Rappe & Topo, 2007) observed participants’ social engagement and activities through Dementia Care Mapping 7th (DCM), one study (Jarrott & Gigliotti, 2010) through the Menorah Park Engagement Scale and one (de Boer, Hamers, Zwakhalen, Tan, Beerens, et al., 2017) via The Maastricht Electronic Daily Life Observation tool (MEDLO-tool). In two other studies, observers recorded participants’ type and location of activities, including indoor and outdoor activities (Bruin et al., 2009), or coded different activities undertaken by participants into the four levels of very engaged, engaged, neutral and disengaged (Anderson et al., 2011). Other studies examined social engagement through a survey (Gonzalez & Kirkevold, 2015), interviews (Raske, 2010) or focus groups (de Bruin et al., 2015).

Additionally, the review shows that different studies have different ways of defining engagement, thus making comparisons across studies difficult. Engagement was assessed via the level of stimulation, for example, active or passive stimulation (Hernandez, 2007; Jarrott & Gigliotti, 2010), the level of social interaction, for example, communication and interaction between residents (Anderson et al., 2011; Gonzalez & Kirkevold, 2015; Raske, 2010), the level of financial incentive, such as volunteer or paid work (de Bruin et al., 2015), temporal commitment, such as when residents visited or talked about the garden (Rappe & Topo, 2007), or type of activities (ranging from drinking to outdoor-related activities) (Bruin et al., 2009; de Boer, Hamers, Zwakhalen, Tan, Beerens, et al., 2017).
Outdoor Natural Landscape Design

The design of each outdoor natural landscape consists of the different phases of site analysis (Hansen & Alvarez, 2016), environmental assessments (Alzheimer's WA, 2018) to check whether DFE characteristics (Graham-Cochrane, 2010) are followed, and of providing conceptual diagrams and plans of the outdoor natural landscape (Chapman, 2015). These phases in the design of an outdoor natural landscape were investigated in the included studies as outlined below.

Site Analysis

The primary step for designing each outdoor natural landscape is an analysis or audit of the site or environment to recognise various conditions of the site, including soil, water, drainage and sunlight/shade requirements, which affect the type and location of plants (Hansen & Alvarez, 2016). Among the 15 studies investigated, none described the site analysis, site characteristics and the process of how the outdoor natural landscape was designed or how the plants were selected. There was no information on the plants, trees or any other architectural elements in the outdoor natural landscape. In one study (Rappe & Topo, 2007) the designers planted the plant called Néríum oleánder, which is toxic if eaten and may have placed people with dementia at risk of being poisoned.

Environmental Assessment Phase

Utilising audit tools that are aligned with the characteristics of a DFE is another complementary step in analysing the site before the design of the environment, which creates a useful framework for the assessment of the environment (Alzheimer's WA, 2018). Among the 15 studies retrieved, almost half \( n = 8 \) specifically discussed the design of outdoor natural landscapes for people with dementia (Anderson et al., 2011;
Calkins et al., 2007; Detweiler et al., 2008; Edwards et al., 2013; Gonzalez & Kirkevold, 2015; Hernandez, 2007; Rappe & Topo, 2007; Raske, 2010), yet none of these studies included an environmental assessment before the design. Such assessment is an essential phase in the outdoor natural landscape design process, which helps designers understand the strengths and weakness of the environment and users’ needs before any design takes place (Chapman, 2015; Hansen & Alvarez, 2016; Reardon, 2013).

**Dementia-Friendly Environment Characteristics**

As mentioned previously, DFE characteristics that should be applied in designing outdoor natural landscape are orientation, accessibility, socialisation, meaningful activities, reminiscence, sensory stimulation, safety and sustainability (Graham-Cochrane, 2010).

Of the 15 studies, the design of three outdoor natural landscapes did not comply with the characteristics of a DFE. These studies (Detweiler et al., 2008; Hernandez, 2007; Rappe & Topo, 2007) did not take into consideration the criteria of safety and accessibility of the outdoor natural landscape in the design. Seven studies focused on just one characteristic of a DFE in the outdoor natural landscape, such as the provision of meaningful activities, including gardening programs (Bruin et al., 2009; Connell et al., 2007; de Boer, Hamers, Zwakhalen, Tan, Beerens, et al., 2017; de Boer, Hamers, Zwakhalen, Tan, & Verbeek, 2017; de Bruin et al., 2015; Jarrott & Gigliotti, 2010; Luk et al., 2011). Three studies considered several sensory stimulations in outdoor natural landscapes, but other DFE characteristics were ignored (Anderson et al., 2011; Edwards et al., 2013; Gonzalez & Kirkevold, 2015). The two remaining studies (Calkins et al., 2007; Raske, 2010) did not provide adequate evidence concerning the characteristics of...
the outdoor natural landscapes to determine whether they are suitably compatible with DFE characteristics.

**Outdoor Natural Landscape Plan**

The last step in the design of an outdoor natural landscape is providing conceptual diagrams and plans involving the essential architectural elements and details for implementation in the outdoor natural landscape following site analysis and individuals’ need (Chapman, 2015).

None of the 15 studies investigated included a detailed architectural plan of the outdoor natural landscape as a guideline for future studies. Two out of the 15 studies briefly showed some layouts or architectural plans of the outdoor natural landscape in unspecified scales (Edwards et al., 2013; Hernandez, 2007).

**Discussion**

This narrative review investigated qualitative, quantitative and mixed-method studies to assess the effectiveness of outdoor natural landscapes concerning the behavioural and psychological signs and symptoms of dementia, including agitation and apathy, and engagement. Several major topics for discussion emerged from this review.

From a statistical point of view, when looking at the dates of publication, articles from the USA form one early group, while the most recent articles are from either Europe or Australia. Most of the articles are from Western countries, including those in Europe. This could be explained by the language criterion being restricted to English during the review process, thus automatically eliminating articles in any other languages, but these results could also be associated with the evidence that Europe has a long tradition in the history of therapeutic landscape design (Gesler, 2003; Heathcote & Jencks, 2010). For example, Epidaurus in Greece (Gesler, 1993), Lourdes in France
(Gesler, 1996) and Bath in England (Kearns & Gesler, 1998) were among the first traditional sites with a reputation for healing using therapeutic landscapes. St Thomas’s hospital in London, the Lariboisiere hospital in Paris and the Royal Navy Hospital at Plymouth, England, were among the first contemporary examples of the incorporation of landscape within indoor spaces for therapeutic purposes. For example, an outdoor natural landscape was incorporated within the hospital environment as a central courtyard, and patients were able to see the landscape through the windows (Marcus & Sachs, 2014). This also raises the question of whether culture is an influencing factor when exploring this topic, a concept first mentioned by Gesler (1992). For example, has the investigation of the therapeutic landscape effect been something that has interested Western countries due to their long tradition in designing therapeutic landscape, or, on the contrary, has there been a lack of interest or understanding in this area by other cultures? At a time of high international mobility across the globe, further studies on this aspect could provide a significant contribution to inform how cultural values contribute to well-being and healing for people with dementia.

The outcomes of preliminary studies in the study of outdoor natural landscape design and health to date suggest that outdoor natural interventions can lead to improved outcomes in people with dementia, specifically some BPSD, including agitation and apathy and also engagement, in people with dementia. However, with a limited body of literature, it is difficult to reach a definite conclusion. More rigorous studies with precise outdoor natural landscape designs are needed to investigate the impact of an outdoor natural landscape that is aligned with the characteristics of a DFE on agitation, apathy and engagement of people with dementia in LTC. Importantly, the voice of people with dementia could be a factor to consider during the design of outdoor natural landscapes. To date, this is a factor that has been widely disregarded in the 
literature. The needs and expectations of people with dementia living in LTC facilities could be sought in future research in order to have a better understanding of their preferences for outdoor natural landscape design.

From the perspective of outdoor natural landscape design, research on the outdoor natural landscape has provided insufficient layouts and architectural plans. This could be further developed not only to validate the entirety of the methodology but also to create a body of best practices. Although several studies have attempted to address some characteristics of a DFE in an outdoor natural landscape design, such as the inclusion of meaningful activities (i.e., gardening), or sensory stimulation, other aspects of a DFE, such as safety and accessibility, seem not to have been considered in the design. This limits the efficacy of the landscape for people with dementia in LTC facilities. Therefore, further research is needed in which the eight mentioned characteristics of DFE could be systematically applied, and their effectiveness evaluated. The Living Garden at the Family Life Center in Michigan is one case example of a successfully designed outdoor natural landscape for people with dementia (Marcus & Sachs, 2014), where specific measures have been taken for providing each of these characteristics. The approach used in designing the outdoor natural landscape in the Life Center could be used as a guideline for future researchers.

Additionally, this review highlights the need for the development of a comprehensive protocol of outdoor natural landscape interventions that include detailed information of the applied methodology, including follow-up and environmental assessment phases as well as the architectural design. Furthermore, if future studies would integrate both qualitative and quantitative approaches, this would address the limitations of a single method and gain more credibility for the approach (Agency for Healthcare Research and Quality, 2013).
Finally, several limitations should be considered when examining the outcomes of this review. First, indoor natural landscapes were excluded in the review since several studies have focused on this area previously (Lee & Kim, 2008; Tse, 2010). Future reviews could consider examining indoor horticultural activities (i.e., indoor gardening), which would lead to an in-depth understanding of the effects of indoor natural interventions. Secondly, the methodological diversity of the included studies, as well as the descriptive approaches of some studies, prohibited the use of a systematic or meta-analytic approach to undertaking quantitative evaluations of the effectiveness of outdoor natural landscapes during the review process. Last but not least, as indicated earlier, the search was limited to studies written in English, and as a result, some relevant articles published in other languages may have been eliminated from the search.

Conclusion

This narrative review investigated the effect of outdoor natural landscape aligned with the characteristics of a DFE on agitation, apathy and engagement of people with dementia in LTC facilities. Although social scientists and health geographers have increasingly studied the relationship between the outdoor natural landscape, health and the healing process, currently there is inadequate evidence to support the use of the outdoor natural landscape for people with dementia living in LTC.

However, a significant body of research showed the therapeutic potential of outdoor natural landscapes on the health and well-being of individuals. Along with these studies, the poor environmental and institutional-like conditions of LTC facilities, which cannot fulfil the needs of people with dementia, have focused attention on transforming environments to more liveable places. These transformations could be
facilitated by the creation of DFEs encompassing both indoor and outdoor spaces. DFE characteristics could be applied in the design of outdoor natural landscapes in order to not only make a more liveable and comfortable environment for people with dementia but also to utilise the therapeutic potential of the outdoor natural landscapes.

However, due to the complexity of the outdoor natural landscape concept and its value in the health care system, especially for those with dementia living in LTC facilities, more studies are needed to address the existing studies’ limitations. Studies to date appear to have overlooked the role of architectural design which creates places or outdoor natural landscapes. An in-depth understanding of the characteristics of DFEs in the design of outdoor natural landscapes can help researchers and designers to design more effectively for users such as people with dementia.

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**Declaration of Interests**

None.
Literature Review Update

The narrative review of studies, which focused on the effects of the outdoor natural landscapes on agitation, apathy and engagement of people with dementia living in LTC facilities, was updated to include the period of January 2017 to February 2020 in peer-reviewed journals from the nine databases: Scopus, ProQuest, Web of Science, Science Direct, Embase, CINAHL plus with full text, MEDLINE, PubMed, and Google Scholar. The search strategy and search terms used were the same as reported in the earlier review (Motealleh et al., 2019). After importing the records into Endnote X9 software (Web of Science Group, 2019), they were screened based on the same eligibility and inclusion criteria as in the published review paper.

Having investigated the nine databases, 79 articles were retrieved. After removing 10 duplicates, 69 articles were screened based on their title and abstract, and following elimination of irrelevant articles, a total of 13 articles were retained for full-text review. Ten of these were excluded as they did not meet the inclusion criteria, leaving three eligible articles. The reasons the 10 articles identified were excluded are as follows: studies involved settings other than LTC facilities ($n = 3$), studies focused on other outcome measures, including mood and memory retrieval ($n = 2$), studies addressed the effects of indoor gardening or indoor gardens on BPSD ($n = 2$), editorial and opinions papers ($n = 3$). The three articles included are listed in Table 2.4.
<table>
<thead>
<tr>
<th>Study/Region</th>
<th>Purpose</th>
<th>Study design</th>
<th>Study participants</th>
<th>Intervention dose</th>
<th>Assessment tools</th>
<th>Findings</th>
<th>DFE characteristics</th>
<th>Site analysis/Architectural plan</th>
</tr>
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<tbody>
<tr>
<td>(Evans et al., 2019)/ the UK</td>
<td>To explore the opportunities, benefits, barriers and enablers to interaction with nature for people with dementia in residential care and extra care housing schemes in the UK.</td>
<td>Qualitative case studies with an online survey along with interviews with residents, staff and family carers.</td>
<td>144 respondents to the online survey from staff members, residents and families of six sites. Interviews with 19 residents, 5 managers and 11 staff members.</td>
<td>Green dementia care consists of indoor and outdoor nature-related activities and connection with nature.</td>
<td>1. Online survey. 2. Residents and staff members were interviewed to ascertain their perception of the garden.</td>
<td>A wide range of nature-based activities, both indoor and outdoor, was reported by the participants. Nature benefited both the residents in terms of improving mood and behaviours, promoting social interaction and motivation. In addition, nature improved job satisfaction for staff members.</td>
<td>Provision of several DFE characteristics in each of the six facilities, such as meaningful activities and socialisation.</td>
<td>No.</td>
</tr>
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</table>
To determine the benefits of gardens for people with dementia.

A pilot study with semi-structured questionnaires with staff members.

Staff members from nine dementia care facilities ($n = 42$). Free garden use group ($n = 7$) and limited garden use group ($n = 35$). Age Range: 19-70 years old.

Garden visits. No records of the exact intervention dose.

1. Open-ended questionnaires.

The garden decreased agitation and depression and also improved mood and socialisation in people with dementia. Staff reported that the positive impacts of the garden on participants with free access to the garden were higher.

Provision of several DFE characteristics in each of the nine facilities such as sensory stimulations, safety and meaningful activities.

No.
|Study (Prolo & Sassi, 2017)/Switzerland| To examine how regular visits to a sensory garden impact social interaction and quality of life. | A quasi experimental study with semi-structured interviews with people with dementia along with questionnaire to family members and care givers. | Residents from one dementia care facility ($n = 15$). 11 females and 4 males. Age Range: 69-87 years old. Mild to moderate dementia. | Sensory garden (therapeutic garden) for 3 months. No records of the exact intervention dose. | 1. Caregiver Burden Assessment tool (CBA). 2. Observation of how the garden was used by people with dementia and how people responded to the garden. | Provision of sensory stimulations safety, accessibility and socialisation. | No site analysis/a few architectural layouts. |
Three new studies investigating the positive effects of outdoor natural landscapes on engagement, agitation and/or apathy of people with dementia were retrieved: Evans et al. (2019), Liao et al. (2018) and Prolo and Sassi (2017). Four methodological approaches were used to assess the influence of outdoor natural landscape on people with dementia. Evans et al. (2019) adopted qualitative case studies at six sites along with an online survey, while Liao et al. (2018) applied a pilot study with semi-structured questionnaires with staff members. In addition, Prolo and Sassi (2017) conducted a mixed-method study consisting of a pre- and post-quasi-experimental study along with semi-structured interviews with people with dementia.

Of these three studies, two were conducted in Europe ($n=2$) (Evans et al., 2019; Prolo & Sassi, 2017) and one in the USA (Liao et al., 2018). The studies included a total number of 236 participants (i.e., people with dementia, staff and family members) of which the sample size varied between 15 (Prolo & Sassi, 2017) to 179 (Evans et al., 2019). The age range of people who participated in two of the studies was 19-70 (Liao et al., 2018) and 69-87 (Prolo & Sassi, 2017), and the level of cognitive impairment in people with dementia varied in the studies. In the study conducted by Prolo and Sassi (2017), individuals were in the moderate stage of dementia, while in the study by Liao et al. (2018) people were in the mild to severe stages of dementia. In general, the number of female participants in the studies was higher than males and was 11 out of 15 participants (Prolo & Sassi, 2017) and 42 out of 42 participants (Liao et al., 2018). Evans et al. (2019) did not describe the level of cognitive impairment of participants nor the mean age or the gender of participants.

Only two types of outdoor natural landscape interventions were identified within the three reviewed studies. Two were therapeutic gardens (Liao et al., 2018; Prolo & Sassi, 2017) and one was focused on the provision of outdoor and indoor nature-based
activities as well as outdoor exercises for people with dementia (Evans et al., 2019). Of the three reviewed studies, none assessed apathy as an outcome measure, while all three studies evaluated other behavioural symptoms of dementia, such as agitation as well as engagement. These studies reported the positive effects of the outdoor natural landscapes on improving socialisation and the agitated behaviours of people with dementia (Evans et al., 2019; Liao et al., 2018; Prolo & Sassi, 2017). Evans et al. (2019) in an online survey with 144 respondents along with interviews with people with dementia, staff and family members at three RACFs and three care housing schemes demonstrated that connection with nature and engaging in nature-based activities can improve social interaction and engagement in people with dementia. Respondents also highlighted that connection with nature and engaging in nature-related activities improved the mood, sleep and agitated behaviours of people with dementia. In addition, this connection improved staff members’ morale and job satisfaction. Liao et al. (2018) investigated the potential benefits of the gardens in nine dementia care facilities for people with dementia through semi-structured interviews with 42 staff members in a pilot study. The findings of the interviews determined that visiting the gardens improved agitation, mood, depression and level of socialisation in people with dementia. Furthermore, staff reported that the positive impacts of the gardens on the people with dementia who had free access to the garden were higher than those with limited garden access. Prolo and Sassi (2017) investigated the efficacy of a garden designed with several sensory plants and artistic elements in the socialisation and quality of life of people with dementia, and they indicated that after 3 months of experiencing such a garden the majority of participants felt calmer. They also reported that the garden improved socialisation and engagement in people with dementia.
The essential sequences of the design of an outdoor natural landscape consisting of site analysis, and environmental assessment, previously described in the literature (Motealleh et al., 2019), were investigated in the included studies. Among the three studies, none discussed the environmental assessment phase prior to the design. Prolo and Sassi (2017) presented the only study which adopted DFE principles into practice. They described the design and features of the garden for people with dementia and illustrated their study with some garden layouts. In the other two retrieved studies (Evans et al., 2019; Liao et al., 2018), there was limited information on the employment of the eight DFE characteristics in the facilities’ gardens. However, the descriptions of gardens in these studies showed the presence of a few features in line with DFE characteristics. For example, in the study by Evans et al. (2019), opportunities for undertaking nature-based meaningful activities (e.g., growing vegetable, observing birds, feeding pets) and socialisation with others were two DFE characteristics that were highlighted by the interviewees in the six research sites. In addition, in the study by Liao et al. (2018), the description of the gardens in nine dementia care facilities showed each garden varied in terms of design and the garden features promoted only a few DFE characteristics.

These three studies showed promising results of the effectiveness of outdoor natural landscapes on reducing agitation and improving engagement and socialisation of people with dementia. However, they were either descriptive in nature or lacked detailed information on the quantitative experiments, which emphasises the need and importance of further studies to evaluate the cause and effect relationship. Robust interventional studies comprising a larger group of people with dementia following a detailed protocol will lead to more definitive conclusions on the efficacy of the outdoor natural landscapes on BPSD, such as apathy, which, to date, has received little attention.
In addition, more studies considering all the necessary sequences of the design of such environments, for example the environmental assessment phase, are required to expand this area of knowledge in the future.

**Theoretical Framework**

The theoretical framework underpinning this research is the Eden Alternative philosophy, which signifies the importance of transforming residential aged care environments from a medical model of care to a more psychosocial one (Thomas, 1996). This philosophy aims to steadily transform care facilities in order to integrate living elements, such as animals, plants, and children (Thomas, 1996), and as such are included in the design of environments, while interactions are encouraged (Thomas & Johansson, 2003).

The Eden Alternative philosophy aims to facilitate the unmet needs of older people with dementia living in RACFs to enrich their lives. According to the Eden Alternative philosophy, residents of RACFs suffer from the three main problems of loneliness, helplessness and boredom, which contribute to BPSD and as a result a reduced quality of life (Thomas, 1996). Thomas (1996) advocates that loneliness in people with dementia living in RACFs can be overcome by friendship and companionship, which is essential for the human spirit. Thomas (1996) further claims that loneliness in older people can be alleviated by creating opportunities for friendship and contact with plants, animals, and children in RACFs.

Helplessness is also defined as a need to care for others (Thomas, 1996). Thomas (1996) suggests that people with dementia will gain satisfaction when they can give care to others as well as receive care (Thomas, 1996). This can be moderated through participation in a number of meaningful tasks in RACF environments (Thomas,
1996). An example of this is the provision of opportunities for people with dementia to undertake a number of gardening activities, including planting and caring for plants (Thomas, 1996).

Similarly, a sense of boredom can be diminished by creating variety in the resident’s environment. This variety can be created by various elements of an outdoor natural landscape, such as water, plants which provide sensory stimulation and birdfeeders (Thomas, 1996). Thomas (1996) concludes that these negative feelings can be overcome by creating a diverse human habitat in RACFs which facilitate a wide variety of social contacts between people and the elements of the habitat. Since loneliness, helplessness and boredom of residents in RACFs are the precursors of BPSD and a reflection of the residents’ unmet needs, they can cause a number of problems for residents as well as their carers.

According to this philosophy, incorporating animated elements, such as plants and animals, can lessen these negative feelings as well as BPSD, including agitated behaviours. However, Thomas (1996) indicated that this transformation is not achieved unless we change the attitudes regarding the ways RACFs are managed. That is, a shift in the perspectives and attitudes of care promotes the autonomy and independence of residents to improve their lives.

Considering all the issues mentioned, the Eden Alternative philosophy follows these main principles to ensure that older people in RACFs have a life worth living (Thomas, 1996). Firstly, we should become familiar with the main problems in RACFs which cause BPSD, including agitation and apathy, and create a human habitat where there is variety, companionship and opportunity to give care as well as receive care. There are also some issues that need to be addressed by RACFs administrators. They should put a sense of purpose and meaning back to older peoples’ lives by giving them
independence and decision-making opportunities as well as making sure that medical treatment is accompanied by the new psychosocial or non-pharmacological approaches. Finally, this process should move forward as a constant and continual process with wise leadership in RACFs. A successful implementation of the Eden Alternative philosophy in RACFs was first initiated in the United States in the Chase Memorial nursing home in 1991 (Thomas, 1996) and gradually applied in other countries, including the UK and Germany. The first implementation of the Eden Alternative philosophy in Australia is the Eden Alternative facility, in Kilsyth, Victoria, where all principles of the Eden Alternative philosophy were adopted (Brownie et al., 2011).

The theoretical framework of this thesis is based on the Eden Alternative philosophy, which suggests that the integration of outdoor natural landscapes with a wide variety of elements, including animated elements/features and sensory stimulations, within a RACF’s environment will reduce BPSD (Figure 2.2).
Figure 2.2

The Theoretical Framework

1. Constant contact with natural elements and other residents

2. Providing various natural landscape elements, such as water, plants, flowers providing sensory stimulations, and bird feeders

3. Engagement in meaningful activities including gardening or horticultural activities for caring plants

Eden Alternative (Thomas, 1996)

Loneliness, helplessness and boredom (Three problems in RACFs that cause BPSD)

Apathy↓ Engagement↑ Agitation↓

Summary of the Chapter

This chapter presented the results of a narrative review of studies focusing on the positive impact of any type of outdoor natural landscape interventions (e.g., therapeutic gardens, green care farming, ecotherapy and therapeutic horticulture) and their influence on agitation, apathy and engagement of people with dementia. The findings of the narrative review revealed a paucity of research focusing on this area of knowledge. The reviewed studies showed several limitations, such as poor
methodological approaches or the lack of focus on environmental assessment and the outdoor natural landscape design phases based on the DFE characteristics.

An update of the literature review resulted in three descriptive studies indicating the positive effects of the outdoor natural landscapes on improving agitation and socialisation of people with dementia. Further intervention studies are required to focus on the overlooked phases of assessment and creation of dementia-friendly outdoor natural landscapes in these studies as well as evaluating the effectiveness of such environments on the behavioural symptoms of dementia, including agitation and apathy of people living in LTC facilities.

This chapter also discussed the theoretical framework, the Eden Alternative philosophy, underpinning this study, which advocates transforming residential aged care environments from a medical model of care to a more psychosocial one by integrating living elements, such as plants and animals, into the environment. It is expected that this transformation reduces the unmet needs and adverse feelings of people living in RACFs as well as improves their BPSD, such as agitation and apathy. The following chapter focuses on the first phase of the three phases of the data collection procedure in which the results of the assessment of the outdoor natural landscape (e.g., garden) in the nominated RACF for creation of a DFE will be presented.
Chapter Three: Environmental Assessment Phase

Introduction

The aims of this study were to determine whether an outdoor natural landscape with the characteristics of a dementia-friendly environment (DFE) (Graham-Cochrane, 2010) reduces agitation and apathy, and improves engagement of people with dementia living in a residential aged care facility (RACF). A case study research design involving units of analysis and a mixed-method data collection approach was conducted. The case study involved three data collection phases that took approximately 12 months from February 2018 to February 2019. The three phases were interconnected, and each phase was formed based on the findings of the previous phase. Phase One was the environmental assessment of the outdoor natural landscape (i.e., a garden) at a Queensland residential aged care facility. Phase Two involved the improvement of the garden based on the findings of Phase One. Phase Three was the intervention, which involved residents experiencing the improved garden while their level of agitation, apathy and engagement were assessed (Figure 3.1).

This chapter first provides a description of the case study design followed by an overview of the setting and sample. Second, Phase One of the case study is presented to outline the procedure of data collection, namely the environmental assessment. Finally, the results of the environmental assessment along with a summary of the chapter are described.
Case Study

Case study research design, which is utilised in many disciplines, is an “empirical inquiry that examines a contemporary phenomenon in depth and within its real-life context especially when the boundaries between phenomenon and context are not clearly evident” (Yin, 2009, p. 18). In other words, the purpose of a case study is to understand a real-life phenomenon, but this understanding is associated with the contextual conditions in which the researcher has little control over events. It allows the researcher to study individuals in their actual contexts or settings over a sustained period of time in order to answer challenging questions (Farquhar, 2012).

One distinctive approach of case study design is that the researchers can not only ascertain individuals’ perspectives or voices, but they are also able to go beyond that and reflect the individuals’ interaction within their context, which would be difficult to achieve in surveys or experimental studies (Crowe et al., 2011; Tellis, 1997). As a result, not only do numerous case studies have exploratory innate characters in order to explore the phenomenon (Crowe et al., 2011; Gerring, 2011), or address causal links
among a number of socio-physical factors (Wang & Groat, 2013), but they also have the ability to explain the phenomenon descriptively with the utilisation of a variety of data sources and collection methods (Crowe et al., 2011; Yin, 2009). This enhances the validity and quality of the case study design and gives researchers a holistic grasp of the object or phenomenon (Crowe et al., 2011; Wang & Groat, 2013).

A single case study with embedded units of analysis is one common type of case study, in which the case might be a single organisation, such as a hospital, but the examination of outcomes of its various units should be included in the analysis in order to get an insight into the phenomenon (Yin, 2009). Embedded designs might encompass the combination of both qualitative and quantitative data in order for the researcher to examine the intervention or follow-up the results more efficiently (Creswell & Plano Clark, 2011). Thus, mixed-method approaches, in which researchers integrate both qualitative and quantitative data in the context of a single study (Agency for Healthcare Research and Quality, 2013; Yin, 2009), are common in case studies with embedded units where researchers need to collect data from multiple units by using various qualitative or quantitative techniques such as interviews, surveys, and observations (Yin, 2009). This leads to a more comprehensive utilisation and evaluation of data (Agency for Healthcare Research and Quality, 2013).

This study targeted people with dementia in a RACF as a unit of analysis. The study also incorporated a comprehensive analysis of the pre- and post-changes to an outdoor natural landscape; hence, the garden was another unit of analysis. A mixed-method approach was used to collect various data on the two units of the case study. As this study involved two units of analysis (i.e., the garden and the residents), and utilised data from these units, the research is considered as a single case study with embedded multiple units of analysis (Yin, 2009). Multiple data collection methods, including
semi-structured interviews, on-site observations and both qualitative and quantitative tools were used.

**Case Study Methodology**

**Case Study Setting and Sample**

The study was conducted in Stretton Gardens, Drewvale at a RACF in Brisbane, Australia. Stretton Gardens provides professional aged care services and palliative care within both its retirement living facilities and RACF. The RACF building comprises a large area with two wings for accommodating residents, consisting of different spaces, including living rooms, activity spaces and internal gardens, including gardens called Sapphire and Ruby. Since this study focuses on the creation of an outdoor natural landscape and Ruby Garden had fewer elements congruent to the characteristics of a DFE, such as less outdoor furniture or decorations, fewer plants and flowers for stimulating senses as well as no water features compared to Sapphire garden, the decision was made to upgrade Ruby Garden as an outdoor natural landscape in line with the characteristics of a DFE for the residents (Davis et al., 2009; Graham-Cochrane, 2010).

Generally, embedded case studies require a minimum of five participants (Stake, 1995; Yin, 2009). A total of 10 participants were purposively recruited from the residents of Stretton Gardens with the following inclusion criteria: older people ≥ 65 years old, with a mild to moderate stage of dementia (with a Psychogeriatric Assessment Scale (PAS) (Jorm et al., 1995) score approximately between 4-15); a recent history of agitated behaviour; acceptable sensory perceptions (i.e., hearing, vision, touch); mobile with or without a mobile walking aid or wheelchair on the condition that residents were able to choose their desired path or viewpoints in the
outdoor natural landscape. Bedridden people who could not use the outdoor natural landscape by themselves were excluded.

**Recruitment of Participants and Informed Consent.** Permission for conducting the study and identifying potential participants was obtained from the manager and administrators of the RACF. Ethical approval was obtained from the Griffith University Human Research Ethics Committee (HREC) (Appendix A). Approved ethics (GU Ref No: 2018/085) for conducting the study were provided to the manager of the facility. However, as the facility manager had changed, new permission for conducting the study was obtained. An email was prepared by the researcher and was sent to the potential participants’ family members by the manager to explain the objectives of the study and to attach the informed consent materials. Upon acceptance by participants who met the inclusion criteria, a meeting was held by the manager and the researcher to explain the research project to the participants. Once potential participants had provided their written consent to participate in the study, their eligibility to participate in the study was checked by the researcher with the assistance of the nursing staff. For those participants who could not provide informed consent, proxy consent was sought from their guardians or family members. Following this, demographic data, sensory perceptions and social biographies of selected participants were obtained. The participants’ demographic data, as well as their level of sensory perception, are described in Phase Three of the data collection procedure (i.e., Chapter Five).

**Environmental Assessment**

Assessment of the Ruby Garden was conducted over 4 weeks in March 2018. In addition to an audit of the Ruby Garden according to the DFE characteristics through
the Dementia Therapeutic Garden Audit Tool (Alzheimer’s Australia WA, 2015), further on-site observations involving photographs as a suitable comparison before and after transforming the Ruby Garden, and the site analysis were undertaken. Furthermore, an interview was conducted with the RACF gardener to clarify the main characteristics of the Ruby Garden. Results from the environmental assessment identified the strengths and the deficiencies of the Ruby Garden in relation to DFE characteristics and were used as a basis for improvement in the design process (i.e., Phase Two). Different steps of the data collection procedure in the environmental assessment phase are presented next.

**Dementia Therapeutic Garden Audit Tool.** A Dementia Therapeutic Garden Audit Tool was employed to investigate the strengths and weaknesses of the Ruby Garden. The Dementia Therapeutic Garden Audit Tool is an assessment tool for evaluating the outdoor natural landscape (Alzheimer’s Australia WA, 2015) (Appendix B). This audit tool is a revised version of the American Alzheimer’s Garden Audit Tool (AGAT) developed by Marcus (2007a) and is adapted for an Australian context (Alzheimer’s Australia WA, 2015). The original version of this audit tool (i.e., AGAT), developed by Marcus (2007a), was previously validated and tested in three pilot tests. The first pilot test was conducted in an acute care hospital in New Mexico, USA with the assistance of two landscape architects in 2002 (Marcus, 2007a). A second pilot test was carried out in an acute care hospital in Miami, Florida, USA in 2003 with the assistance of a landscape architect (Marcus, 2007a). In addition, this tool was revised by 30 members of the Therapeutic Garden Professional Group at a conference of the American Society of Landscape Architects (ASLA) held in 2004 (Marcus, 2007a). The revised audit tool was pilot tested in the summer of 2005 by 13 participants attending a multi-disciplinary symposium on healing landscapes in Portland, Oregon, USA
(Marcus, 2007a). The inter-observer reliability of the audit tool was reported to be more than 85% (Marcus, 2007a).

This assessment was completed by the researcher. The audit tool assesses six different categories: Location and Entry to garden; Orientation-Safety; Seating; Meaningful Engagement; Sensory Stimulation-Reminiscence and Sustainability. Each category involves multiple questions. The score which should be assigned to each question ranges from 0 to 3, and it also includes a ‘not applicable’ option for items which cannot be scored from 0 to 3 (Marcus, 2007a). Based on this assessment, if 0 to 1 scores are more frequently recorded, this indicates a poor outdoor natural landscape design. If there are more scores of 2 being reflected, this displays room for improvement, while scores of mostly 3 indicate a successful outdoor natural landscape, supportive for residents. Furthermore, there are five open-ended questions at the end of the form to ascertain perceptions of the outdoor natural landscape requirements. Ten staff, who had sufficient knowledge of those participants that used the Ruby Garden, were purposively recruited to answer these questions. To ensure this, the facility manager introduced 10 staff members who had experience of working with residents in the Ruby wing and had good awareness of the selected participants. Staff responses to these five open-ended questions were presented descriptively. The questions mainly focused on the main use of the Ruby Garden by the residents, the use or non-use of the Ruby Garden by the residents’ families and staff members, and suggested changes or additions to the Ruby Garden they might envision (See Appendix B).
Site Analysis. Site analysis is a comprehensive process of recognising various physical, biological and cultural attributes of the site (e.g., Ruby Garden) prior to any architectural design, which creates an appropriate foundation for design decisions (LaGro, 2008; Wang et al., 2014). Due to a change in RACF management prior to the start of the research, the manager was not able to locate and provide the property survey maps, including the Ruby Garden plan with its measurements. Therefore, the researcher prepared the base map of the Ruby Garden using a measuring tape. Every corner point was measured and recorded on an approximate sketch of the site, which was drawn to shape the boundary lines of the Ruby Garden as well as its access points.

A computer-aided design software for two-dimensional (2D) drafting, AutoCAD, was employed at this stage to adjust the sketch with the Google Earth plan of the site taken from the Google Earth website. The researcher then used Autodesk AutoCAD 2019 to create the base map of the site, reflecting on the existing condition and attributes of the Ruby Garden to ensure that a correct base map was produced. Subsequently, the researcher was able to create a scaled drawing with accurate measurements.

Ruby Garden was analysed from the perspectives of various physical and climatic features, including prevailing winds, sun/shade requirements, soil types and water drainage conditions, which all affect the type and/or location of plants as well as the outdoor natural landscape design (Hansen & Alvarez, 2016). The quality of each site can be easily affected by the prevailing winds, surrounding noises or sounds, and the sun/shade pattern (LaGro, 2008). Thus, their identification is essential prior to any design decisions. Likewise, identifying the natural assets and existing plants of the site is essential since plant selection and the use of native plants compatible with the conditions of each region is an important factor in creating a sustainable outdoor natural
landscape (Brisbane City Council, 2014). In addition, it was necessary to investigate how the site is used and how the residents want the site to be used, since design decisions will be made based on this information. The direction of prevailing winds, water drainage condition and soil type were all identified through an interview with the RACF gardener. Additionally, noises generated around the Ruby Garden, the uses of the Ruby Garden as well as all its natural assets were determined through obtaining information from staff members, an interview with the gardener, as well as on-site observation by the researcher. The on-site observations were undertaken for 1 week during the environmental assessment phase, from the morning till the afternoon in order for the researcher to observe how the Ruby Garden had been used by the residents visiting it.

The 3Dmax studio, which is a computer graphic program for modelling and visualisation in 3-D format (Autodesk Inc., 2018a) was also used to model the Ruby Garden along with its surrounding buildings, as well as sun/shade simulations. The sun and shade pattern in the Ruby Garden were simulated for different hours of the day from sunrise to sunset and different seasons. The provision of sun/shade simulation allowed for the identification of the sunny or shaded parts of the Ruby Garden site. Sun/shade patterns and the time that each plant was exposed to sunlight identified the best locations for growing various plants with different sun/shade requirements (Hansen & Alvarez, 2016).
Interview with the Gardener. Open-ended questions were asked of the gardener to seek an understanding of the various characteristics of the Ruby Garden as well as its native plants (See Appendix C and D). The gardener was assured that his participation was voluntary. The interview took approximately 15 minutes and was digitally recorded and transcribed verbatim. Following this, the transcriptions were coded and analysed using thematic analysis (Braun & Clarke, 2019). Thematic analysis is a popular method for analysing qualitative data through recognising and reporting the patterns existing in a dataset. The main questions asked of the gardener focused on the main features of the Ruby Garden in terms of attributes such as the soil type, water drainage condition, both the existing and recommended plants in the Ruby Garden, the watering regime and the time for fertilising the plants (See Appendix E).

Social Biographies. After the selection of participants, their social biographies were compiled through their “Key to Me Assessment Records” existing in the RACF, or directly asking them in case of uncertainty in their records in order to understand their backgrounds, cultures and interests. The social biographies of the 10 participants were completed over 2 weeks. The social biographies of participant numbers 1, 7, 8 and 9 were collected with the help of staff members since some information about their interests or favourite activities were found to be blank in their nursing records. The researcher took notes of staff explanations of the participants’ favourite activities and whether they were interested in visiting the existing garden or doing gardening activities. An understanding of each participant’s social biography enabled the researcher to implement either meaningful personalised activities or participants’ interests in the outdoor natural landscape.
Results

Ruby Garden

The Ruby Garden is located in the subtropical climate of Brisbane, with warm humid summers and mild winters (Queensland Government, 2018). Measurements completed by the researcher showed that the Ruby Garden has a length of 20 m with the two main garden beds of 5.8 m and 5.4 m wide. The pathways are at least 1.8-1.9 m wide, which allow wheelchairs to pass easily based on existing standards.

From the perspectives of climatic and physical features, the prevailing winds blow both from the east and the west over the site, informing where not to plant fragile plants. In addition, three different noise sources were identified around the Ruby Garden, namely the irregular sound of agricultural machinery in the wide lawn areas on the eastern side of the Ruby Garden, minor noise of passing cars from Illaweenia street and sound generated from the rustling of grass in the wind and the singing of native birds in the Ruby Garden. The latter were considered to be positive for individuals according to the Environmental Health Branch of NSW Health (2018). Figure 3.2 shows the direction of prevailing winds over the site and the noise generated around the Ruby Garden.
The orientation of the garden to the sun can be influential in having a successful planting growth (McLendon, 2017). The Ruby Garden faces east, which allows the garden to receive morning sun. The results of the sun/shade simulation with the Autodesk 3D Max (See Appendix F) Studio software showed that the western side of the Ruby Garden (i.e., entry patio) received the early morning sun. However, as there was a large fabric awning preventing the reach of the full sun, the entry patio was deemed an appropriate place for planting flowers or plants that need partial shade. Similarly, the southern side of the Ruby Garden has been blocked by walls and surrounding buildings and is therefore suitable for plants requiring shade. Thus, the southern side of the Ruby Garden is suitable for vegetables, herbs or plants which do
not require too much sunlight. The eastern and northern sides of the Ruby Garden receive sufficient sunlight for plants that need full and partial sun.

**Natural Assets**

According to the gardener, the soil type in the Ruby Garden is a combination of clay and builders’ rubble, which was amended by the gardener through adding fertiliser and gypsum in order to improve the suitability for growing most regional plants, and to ensure better drainage, since gypsum can break up heavy clay soil and facilitate water infiltration (Iowa State University, 2019).

An investigation of the natural assets (i.e., identifying the type and number of plants) in the Ruby Garden showed that there was little variety in terms of plants and trees. On-site observation revealed that the existing plant and tree species did not offer much variety in terms of colour, type or sun/shade requirements. The five main type of plants identified on the site were a combination of flowers including: (a) geranium, lavender, dianthus, hydrangea, impatiens walleriana, agapanthus, nasturtium, marigold, orange cosmos, hibiscus; (b) succulents such as cactus, yucca and agave attenuata; (c) a few trees such as, melaleuca, pink penda and passion fruit; (d) a limited number of herbs and vegetables, such as basil, tomatoes, and (e) a few buxus hedges along a border. These plants with their exact location on the plan are shown in the base map of the Ruby Garden (Figure 3.3).
Considering the Ruby Garden is exposed to the hot weather of Brisbane in summer, the gardener reported that drought-resistant or sun-friendly plants would be best to grow, as they are hardy and low-maintenance plants that do not need too much care to strive. Hence, perennials, which need a great deal of care, along with lavenders and other bushy plants, were regarded as not being suitable for planting in the Ruby Garden. Additionally, the gardener suggested azaleas, desert and/or bush roses, geranium, gardenia, hibiscus and a number of saplings as suitable fast-growing plants for planting in the Ruby Garden. He highlighted that azaleas, roses and gardenias were also appropriate to be planted in pots. Furthermore, he recommended growing colourful
flowers or plants as residents are generally attracted by the colours rather than the type of flowers. The gardener suggested a daily watering regime in the case of hot weather and every 2 or 3 days was adequate when the weather was around the mid-20s. The use of fertiliser every 3 to 6 months was also suggested.

**Participants**

Results of on-site observation by the researcher and the information gathered from the staff members revealed that only three to four residents visited the Ruby Garden sporadically throughout the day, which mainly depended on some specific situations such as suitable weather conditions, family visits or more infrequently, birthday celebration. According to the participants’ social biographies, eight out of ten (80%) participants indicated that they enjoyed spending time in gardens or parks regularly, while only two did not, except in some specific situations, including outdoor activities run by the RACF. As such, it was concluded that the provision of meaningful activities in the garden might encourage participants to visit more frequently.

Furthermore, staff members revealed that the Ruby Garden was mainly used for five types of activities by the participants: sitting and watching the plants, chatting with families, having tea or coffee, walking around and doing some minor gardening activities, such as picking flowers or watering (Figure 3.4).
The detailed results of social biographies showed that six out of ten participants were interested in sitting in the Ruby Garden while reading novels or solving puzzles. However, two out of ten participants preferred being more active in the Ruby Garden, such as doing art or craft, including painting, sketching and/or doing handicraft. Two of the participants were fond of picking and arranging flowers in the Ruby Garden as they had experience of gardening activities. These findings helped the researcher to consider several meaningful activities related to those participants’ favourite activities for an improved Ruby Garden.
A few favourite decorations were also reported by participants, such as different types of animal statues, religious sculptures, and Christmas trees. According to the participants’ social biographies, the range of favourite plants or flowers varied among the participants. The majority of the participants (8 out of 10) were fond of flowers, such as gardenia, geranium, marigolds, jasmine and roses, and interestingly two of them only referred to the flowers by their colour such as pink or bright coloured flowers. The rest of the participants (2 out of 10) preferred fruiting plants, namely pawpaw and passionfruit. Seven out of ten participants suggested the addition of more flowers to the Ruby Garden, including colourful ones, and three participants recommended a water fountain or birdbath. This aligns with most staff’s suggestions \((n = 5)\) to plant more colourful flowers as well as installing water features for residents in the new Ruby Garden. Two staff members also focused on the need for planting edible plants or vegetables in the Ruby Garden. More decorations \((n = 2)\), gardening activities \((n = 2)\) and physical activities \((n = 1)\) were other elements mentioned by the staff that could be undertaken in the Ruby Garden. All these show the importance of colourful flowers, water features and an edible garden, including herbs, vegetables and fruits, in the new design of the outdoor natural landscape.

**Dementia Friendly-Environment Characteristics**

As mentioned previously, the Dementia Therapeutic Garden Audit Tool (Alzheimer’s Australia WA, 2015) was employed to evaluate the Ruby Garden. In general, the Ruby Garden was originally assessed as a poor environment with more than half of the questions (39 out of 74 questions) scoring 0-1 (Refer to Table 3.1). The Ruby Garden was found to be successful in only 21 out of 74 questions (score of 3).
The six categories of the Dementia Therapeutic Garden Audit Tool (Alzheimer’s Australia WA, 2015) are associated with the main eight characteristics of a DFE. The Ruby Garden was found to be mostly successful (scores of 3) in the category of Orientation-Safety as well as Seating. The Sustainability and Location and Entry to garden are the categories identified as requiring improvement. The Ruby Garden also received poor scores in the other categories, namely Sensory Stimulation-Reminiscence and Meaningful Engagement.

The creation of social interaction among the residents of RACF is a significant characteristic of a DFE design, which was assessed via the Seating questions. The assessment of the main questions related to Seating showed that the Ruby Garden is mostly (6 out of 9 questions) in a moderately good or very good (scores of 2 and 3) condition. However, there are areas to be improved, such as providing seating along the pathways for resting and cushions for seats. Likewise, the Ruby Garden demonstrated a moderately good or very good condition in 7 out of 11 questions in providing standard and safe pathways to meet the needs of residents with different levels of mobility, while the availability of visual signage and landmarks scored as areas of development (i.e., in the category of Orientation-Safety).

Accessibility is another important characteristic in designing an outdoor natural landscape for people with dementia, which was assessed via the Location and Entry to garden questions. Within this category, 10 out of 19 questions received moderate or very good scores (scores of 2 and 3), while the rest received poor scores. The entry patio requires improvement, which could be achieved by providing more statues, colourful plants and artworks to enhance not only individuals’ interactions with the Ruby Garden, but also accessibility to the Ruby Garden. The self-sufficiency and longevity of a DFE design are dependent on its sustainability (Graham-Cochrane, 2010). Assessment of the
main questions related to Sustainability showed that within this category, only four and five questions (out of 16) received very good and moderately good scores, respectively. Although the lack of some equipment, such as trash bins or screening plants for fence serving as a natural framework, resulted in low scores of 0 or 1, having low maintenance plants and regular maintenance by a gardener are the advantages of the Ruby Garden from a sustainability point of view.

The poorest scores were noted in the categories of Meaningful Engagement and Sensory Stimulation-Reminiscence. Specifically, having easy access to gardening tools for doing gardening activities, raised garden beds for planting vegetables, and the existence of a garden shed, birdbath or bird aviary/bird feeder for increasing meaningful activities and engagement among people with dementia required further improvement. In addition, the Ruby Garden had a limited number of sensory provoking elements to stimulate the senses through the use of aromatic, textured and/or colourful plants, and also a limited number of elements to evoke memories of individuals. Table 3.1 presents the total number of recorded scores for each category.

### Table 3.1

*The Audit Tool Analysis*

<table>
<thead>
<tr>
<th>Categories</th>
<th>Score 0-1</th>
<th>Score 2</th>
<th>Score 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location and Entry to garden (out of 19)</td>
<td>9</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Orientation-Safety (out of 11)</td>
<td>4</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Meaningful Engagement (out of 7)</td>
<td>7</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Seating (out of 9)</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Sensory Stimulation-Reminiscence (out of 12)</td>
<td>9</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Sustainability (out of 16)</td>
<td>7</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Total scores</td>
<td>39</td>
<td>14</td>
<td>21</td>
</tr>
</tbody>
</table>

To make efficient design decisions based on the above-mentioned deficiencies, the results of the audit tool were illustrated in the zoning plan, which was created to show the areas of deficiency of different zones of the Ruby Garden in terms of DFE.
characteristics. Different zones of the Ruby Garden, such as the entry patio, pathways and garden beds, with deficiencies that were related to the eight DFE characteristics were shown on the plan via the DFE numbers and identified on the plan’s legend (Figure 3.5).

**Figure 3.5**

*The Zoning Plan with Deficiencies in Relation to DFE Characteristics*

A check of the zoning plan, found that the entry patio required improvement in terms of accessibility, providing meaningful engagement, socialisation, sensory stimulation and reminiscence. Likewise, both the northern and southern garden beds required enhancement in terms of sensory stimulation, reminiscence and providing
meaningful engagement, while the eastern garden beds needed more improvement in terms of better orientation, providing meaningful engagement, sensory stimulation, and sustainability. In addition, the main pathways needed more improvement in terms of safety.

Summary of this Chapter

This study used a case study design with embedded units, in which the outdoor natural landscape, namely the Ruby Garden was a unit that required assessment. This chapter reports on Phase One of the data collection procedure involving a comprehensive assessment of the environment, including site analysis, an interview with the gardener, and a collection of social biographies of the selected participants. The Ruby Garden was assessed from the perspectives of various physical and climatic attributes, existing plants, its uses, as well as DFE characteristics through various methods, including on-site observation by the researcher and the use of the Dementia Therapeutic Garden Audit Tool (Alzheimer’s Australia WA, 2015).

The existing status of the Ruby Garden was assessed from the perspectives of several attributes, including the wind, soil type, and sun/shade requirements, as a guide for the improvement of the Ruby Garden in the design phase. Findings of the audit tool revealed that the Ruby Garden is a potentially poor environment for people with dementia, and it has a significant need for improvement in several DFE characteristics, such as meaningful activities (engagement), sensory stimulation, and reminiscence, shown by the frequently recorded scores of 0-1 on the Dementia Therapeutic Garden Audit Tool (Alzheimer’s Australia WA, 2015). In its current set up, the Ruby Garden appears to not adequately support meaningful engagement in people with dementia. A bird aviary, garden shed, and gardening tools are among the elements which may
improve the level of resident engagement. Furthermore, the Ruby Garden was found to have few sensory provoking plants to stimulate visual, auditory, olfactory or tactile senses as well as few memory-evoking elements to evoke past memories in people with dementia. Inclusion of elements such as gardening equipment, a herb garden, a wheelbarrow statue or mailbox which are familiar or compatible with the individuals’ culture and lifestyle may be useful in evoking past memories.

Although the results showed that the Ruby Garden is not used by the residents very often, both staff and the participants focused on the need for planting more colourful flowers and edible plants, including herbs, vegetables and fruits, as well as installing water features, in the new design of the Ruby Garden.

In conclusion, an improvement of Ruby Garden in the direction of the assessed DFE characteristics might help people to visit and engage in the Ruby Garden more frequently. Improvement of the Ruby Garden based on the findings of Phase One, including the list of elements that were considered for the new outdoor natural landscape, are presented in the next chapter.
Chapter Four: Design Phase

Introduction

There is a large body of literature that focuses on the positive effects of outdoor natural landscapes on health and well-being. The efficacy of various components of outdoor natural landscapes, including blue or green spaces, on the physical, psychological and social well-being of individuals has been shown in a number of studies (e.g., Alcock et al., 2014; Finlay et al., 2015; Mokos, 2017; Mytton et al., 2012; Pasanen et al., 2019). Furthermore, several researchers have demonstrated the health-promoting effects of the outdoor natural landscape on older adults (e.g., Dahlkvist et al., 2016; Garrett et al., 2019; Sulander et al., 2016) and people with dementia (e.g., Hewitt et al., 2013; Whear et al., 2014).

Yet, little is known of the effect of outdoor natural landscapes on people with dementia living in residential aged care facilities (RACFs) (Motealleh et al., 2019) where individuals manifest a number of behavioural and psychological symptoms, such as agitation and apathy. The behavioural and psychological symptoms of dementia (BPSD) displayed by residents in RACFs may be due to the pathology of dementia, or it may be due to unmet biopsychosocial needs and frustrated goals, resulting from inappropriate environmental conditions, over or under environmental stimulation and a lack of engagement (Cohen-Mansfield, Dakheel-Ali, et al., 2015).

In recent years, there has been a trend to improve the design and environmental quality of RACFs through the creation of DFEs to address the comfort of people with dementia, and engage them in a meaningful way to improve their quality of life (Handley et al., 2015, 2017; Turner & Cannon, 2018; Waller & Masterson, 2015). The application of the principles of a DFE is important in both indoor and outdoor spaces of
RACFs. Gardens as a manifestation of outdoor natural landscapes may have different components of blue and green spaces and can improve the quality of life of people with dementia (Marcus & Sachs, 2014). Graham-Cochrane (2010) has reported that there are eight different DFE characteristics which should be considered in the design of gardens for people with dementia: accessibility, orientation, safety, socialisation, meaningful activities (engagement), sensory stimulation, reminiscence and sustainability.

This chapter presents Phase Two of the three phases of the data collection procedure, which aimed to improve the existing garden in Stretton Gardens RACF, named Ruby Garden in Brisbane, Queensland. This procedure was based on the findings from Phase One (i.e., environmental assessment), including the site analysis and participants’ social biographies. This process, Phase Two, which was conducted from April to September 2018, involved modelling of the new garden, preparing the site and incorporating the items consisting of softscapes and hardscapes with DFE characteristics into the Ruby Garden based on the model created. In total, it took 5 months for the Ruby Garden to be created. Findings from the assessment of Ruby Garden using the Dementia Therapeutic Garden Audit Tool (Alzheimer’s Australia WA, 2015) after the transformation are discussed. Finally, a conclusion of the chapter is presented.

Method

Modelling of the Ruby Garden

In Phase One, the existing condition of the Ruby Garden was assessed from the perspectives of the eight DFE characteristics through the Dementia Therapeutic Garden Audit Tool (Alzheimer’s Australia WA, 2015). The analysis of social biographies in Phase One also helped to identify the participants’ favourite plants or activities which
should be installed in the Ruby Garden. The results of the Dementia Therapeutic Garden Audit Tool (Alzheimer’s Australia WA, 2015) assessment and social biographies were employed to identify the required items for improving the Ruby Garden. In addition, several local and international guidelines with explicit recommendations on how to design gardens for people with dementia were utilised. The guidelines include recommendations outlined by Graham-Cochrane (2010), Health Building Notes (2015), Marcus and Sachs (2014) and Queensland Health (2018). For example, several local plants were recommended by Graham-Cochrane (2010) for designing these gardens, such as mat rush (i.e., lomandra), which can stimulate the auditory senses in people with dementia by the sound it makes when rustling in a breeze.

The physical requirements of the identified plants were determined using different horticultural references, namely Australian National Botanic Gardens (2015), Gardenia (2018), Gardening Australia (2018), Gardens Online (2000) and Stewart (2017). The physical requirements consist of sun or shade requirements, soil types, watering regime, growth rate, wind tolerance, as well as the choice of common planting locations inside gardens that can influence the growth or quality of plants (Gardiner et al., 2016; Hansen & Alvarez, 2016).

The site analysis of the Ruby Garden was performed in Phase One to identify the sunny or shaded areas in the garden and the direction of prevailing winds. The combination of the plants’ requirements, information in the horticultural references, and the site analysis allowed us to locate the best positions for the identified plants in the garden beds. Following this, the Ruby Garden with the identified items was 3D modelled based on the above-mentioned considerations. The proposed 3D model
layouts of the garden were prepared with the help of 3D max studio 2019 software (Autodesk Inc., 2019).

Since the researcher’s research budget was limited, after modelling the new garden, a donation letter request with an attachment listing the required items was drafted and sent to several local plant nurseries and landscape supply stores to explain the project and its significance for people with dementia in the RACF. An AU$200 gift card from Bunnings warehouse, Browns Plains was received in contribution to the purchase of required items. Similarly, several plants were donated by the RACF as well as plant nurseries, namely Daylilies Nursery, Oxley Nursery, Ibrox Park Nursery and Wallum Nursery in Brisbane. Funds from the researcher’s annual research budget were also used to purchase other items for the Ruby Garden from other shops, such as the Reject Shop, Stack Discounts, Daiso and eBay online. The items that were received for improving the garden and the detailed information on where and how they were acquired (purchased or donated) are tabulated in Table 4.1.

**Table 4.1**

*The Ruby Garden Items*

<table>
<thead>
<tr>
<th>Required items</th>
<th>Means of acquisition</th>
<th>Name of nurseries or stores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>African daisy (Osteospermum or Gazania)</td>
<td>Donation</td>
<td>Bunnings Warehouse, Browns Plains</td>
</tr>
<tr>
<td>Agapanthus</td>
<td>Donation</td>
<td>Daylilies Nursery</td>
</tr>
<tr>
<td>Alyssum</td>
<td>Donation</td>
<td>Oxley Nursery</td>
</tr>
<tr>
<td>Angelonia</td>
<td>Purchase</td>
<td>Bunnings Warehouse, Rocklea</td>
</tr>
<tr>
<td>Australian indigo (Indigofera australis)</td>
<td>Donation</td>
<td>Wallum Nursery</td>
</tr>
<tr>
<td>Azalea</td>
<td>Donation</td>
<td>Bunnings Warehouse, Browns Plains</td>
</tr>
<tr>
<td>Bottle Brush</td>
<td>Donation</td>
<td>Ibrox Park Nursery</td>
</tr>
<tr>
<td>Bush rose</td>
<td>Donation</td>
<td>Bunnings Warehouse, Browns Plains</td>
</tr>
<tr>
<td>Chrysanth</td>
<td>Purchase</td>
<td>Bunnings Warehouse, Rocklea</td>
</tr>
<tr>
<td>Clivia</td>
<td>Donation</td>
<td>Daylilies Nursery</td>
</tr>
<tr>
<td>Coastal rosemary (Westringia)</td>
<td>Donation</td>
<td>Wallum Nursery</td>
</tr>
<tr>
<td>Plant Name</td>
<td>Source</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>--------</td>
<td>-------------</td>
</tr>
<tr>
<td>Correa (Fuchsia)</td>
<td>Donation</td>
<td>Bunnings Warehouse, Logan Rd Mt Gravatt</td>
</tr>
<tr>
<td>Dahlia Tequila Sunrise</td>
<td>Purchase</td>
<td>Bunnings Warehouse, Logan Rd Mt Gravatt</td>
</tr>
<tr>
<td>Daylily</td>
<td>Donation</td>
<td>Daylilies Nursery</td>
</tr>
<tr>
<td>Dianthus</td>
<td>Purchase</td>
<td>Bunnings Warehouse, Rocklea</td>
</tr>
<tr>
<td>Fan flower (Scaevola aemula)</td>
<td>Donation</td>
<td>Wallum Nursery</td>
</tr>
<tr>
<td>Gerbera</td>
<td>Purchase</td>
<td>Bunnings warehouse, Rocklea</td>
</tr>
<tr>
<td>Goodenia</td>
<td>Donation</td>
<td>Wallum Nursery</td>
</tr>
<tr>
<td>Grevillea</td>
<td>Donation</td>
<td>Ibrox Park Nursery</td>
</tr>
<tr>
<td>Gypsophila</td>
<td>Purchase</td>
<td>Bunnings Warehouse, Logan Rd Mt Gravatt</td>
</tr>
<tr>
<td>Heath myrtle (Babingtonia Similis)</td>
<td>Donation</td>
<td>Wallum Nursery</td>
</tr>
<tr>
<td>Herb garden: mint, basil, parsley, rosemary, thyme, sage</td>
<td>Purchase</td>
<td>Daiso, Bunnings Warehouse, Logan Rd Mt Gravatt</td>
</tr>
<tr>
<td>Hydrangea</td>
<td>Donation</td>
<td>Stretton Gardens</td>
</tr>
<tr>
<td>Hibiscus</td>
<td>Donation</td>
<td>Bunnings Warehouse, Browns Plains</td>
</tr>
<tr>
<td>Impatiens walleriana</td>
<td>Donation</td>
<td>Stretton Gardens, eBay</td>
</tr>
<tr>
<td>Lambs ear</td>
<td>Purchase</td>
<td>eBay</td>
</tr>
<tr>
<td>Lobelia “Blue moern”</td>
<td>Donation</td>
<td>Bunnings Warehouse, Browns Plains</td>
</tr>
<tr>
<td>Jasmine/Star jasmine</td>
<td>Donation</td>
<td>Ibrox Park Nursery</td>
</tr>
<tr>
<td>Marguerite Daisy</td>
<td>Donation</td>
<td>Bunnings Warehouse, Browns Plains</td>
</tr>
<tr>
<td>Mat-rush</td>
<td>Purchase</td>
<td>eBay</td>
</tr>
<tr>
<td>Nasturtium</td>
<td>Donation</td>
<td>Stretton Gardens</td>
</tr>
<tr>
<td>Pansy</td>
<td>Donation</td>
<td>Oxley Nursery</td>
</tr>
<tr>
<td>Petunia</td>
<td>Donation</td>
<td>Oxley Nursery</td>
</tr>
<tr>
<td>Poppy</td>
<td>Donation</td>
<td>Oxley Nursery</td>
</tr>
<tr>
<td>Portulaca</td>
<td>Donation</td>
<td>Bunnings Warehouse, Browns Plains</td>
</tr>
<tr>
<td>Prickly tea tree (Leptospermum juniperinum)</td>
<td>Donation</td>
<td>Wallum Nursery</td>
</tr>
<tr>
<td>Rose (Heaven Scent)</td>
<td>Purchase</td>
<td>Bunnings Warehouse, Logan Rd Mt Gravatt</td>
</tr>
<tr>
<td>Stock</td>
<td>Donation</td>
<td>Oxley Nursery</td>
</tr>
<tr>
<td>Vegetable garden: tomato, peas, capsicum, sweet corn</td>
<td>Purchase</td>
<td>Daiso and Bunnings Warehouse, Logan Rd Mt Gravatt</td>
</tr>
<tr>
<td>White Kunzea</td>
<td>Donation</td>
<td>Wallum Nursery</td>
</tr>
<tr>
<td>Zinnia</td>
<td>Purchase</td>
<td>Bunnings Warehouse, Browns Plains</td>
</tr>
<tr>
<td><strong>Water features</strong></td>
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<td></td>
</tr>
<tr>
<td>Birdbath</td>
<td>Donation</td>
<td>A deceased resident from Stretton Gardens, eBay</td>
</tr>
<tr>
<td>Solar water fountain</td>
<td>Purchase</td>
<td>eBay</td>
</tr>
<tr>
<td><strong>Outdoor furniture and decorations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birdcage/bird feeder</td>
<td>Purchase</td>
<td>Reject Shop, eBay, Oxley Nursery</td>
</tr>
</tbody>
</table>
Site Preparation

Before applying the 3D model, the site needed to be prepared. This included the removal of materials such as gravel and weeds, and soil improvement through application of fertiliser, which were essential before planting. All the weeds and the

<table>
<thead>
<tr>
<th>Item</th>
<th>Source</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garden minimal decoration</td>
<td>Purchase</td>
<td>Reject shop</td>
</tr>
<tr>
<td>Christmas tree</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mailbox</td>
<td>Purchase</td>
<td>Bunnings Warehouse Logan Rd Mt Gravatt</td>
</tr>
<tr>
<td>Temple sculpture</td>
<td>Donation</td>
<td>Bunnings Warehouse, Browns Plains</td>
</tr>
<tr>
<td>Sign through entry (Entrance)</td>
<td>Purchase</td>
<td>eBay</td>
</tr>
<tr>
<td>Sign for walking slowly (Slow down)</td>
<td>Purchase</td>
<td>eBay</td>
</tr>
<tr>
<td>Trash bin and compost bin</td>
<td>Donation</td>
<td>Stretton Gardens</td>
</tr>
<tr>
<td>Tree decorations</td>
<td>Purchase</td>
<td>Stack Discount and Reject Shop</td>
</tr>
<tr>
<td>Colourful hanging planters for fence</td>
<td>Purchase</td>
<td>Stack Discount</td>
</tr>
<tr>
<td>Raised garden bed/planters</td>
<td>Purchase</td>
<td>Bunnings Warehouse, Logan Rd Mt Gravatt</td>
</tr>
<tr>
<td>Wall stickers</td>
<td>Purchase</td>
<td>eBay, Reject Shop and Stack Discount</td>
</tr>
<tr>
<td>Windchime</td>
<td>Donation</td>
<td>Oxley Nursery</td>
</tr>
<tr>
<td>Windmill</td>
<td>Purchase</td>
<td>Daiso</td>
</tr>
<tr>
<td>Wooden bench</td>
<td>Donation</td>
<td>Stretton Gardens</td>
</tr>
<tr>
<td><strong>Activity resources</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ribbon</td>
<td>Purchase</td>
<td>Stack Discount</td>
</tr>
<tr>
<td>Cellophane gift wrap</td>
<td>Purchase</td>
<td>Stack Discount</td>
</tr>
<tr>
<td>Colourful plastic pots</td>
<td>Purchase</td>
<td>Bunnings Warehouse Logan Rd Mt Gravatt</td>
</tr>
<tr>
<td>Edible seeds</td>
<td>Purchase</td>
<td>Daiso</td>
</tr>
<tr>
<td>Sun hat</td>
<td>Purchase</td>
<td>Daiso</td>
</tr>
<tr>
<td>Gloves</td>
<td>Purchase</td>
<td>Daiso</td>
</tr>
<tr>
<td>Broom</td>
<td>Donation</td>
<td>Stretton Gardens</td>
</tr>
<tr>
<td>Sketching book</td>
<td>Purchase</td>
<td>Kmart</td>
</tr>
<tr>
<td>Colouring notebook</td>
<td>Purchase</td>
<td>Kmart</td>
</tr>
<tr>
<td>pencils</td>
<td>Purchase</td>
<td>Kmart</td>
</tr>
<tr>
<td>Crayon</td>
<td>Purchase</td>
<td>Kmart</td>
</tr>
<tr>
<td>Cardboards</td>
<td>Purchase</td>
<td>Kmart</td>
</tr>
<tr>
<td>Glue</td>
<td>Purchase</td>
<td>Kmart</td>
</tr>
<tr>
<td>Scissor</td>
<td>Purchase</td>
<td>Kmart</td>
</tr>
<tr>
<td>Yarns</td>
<td>Purchase</td>
<td>Stack Discounts</td>
</tr>
<tr>
<td>Puzzle book</td>
<td>Purchase</td>
<td>Kmart</td>
</tr>
<tr>
<td>Crossword book</td>
<td>Purchase</td>
<td>Kmart</td>
</tr>
<tr>
<td>Novels</td>
<td>Purchase</td>
<td>Kmart</td>
</tr>
</tbody>
</table>
bushy plants in the garden beds were removed by the facility gardener first to prepare the beds to be ready for the sowing of the new plants. Then, the received items were installed by the researcher with the gardener’s assistance according to their location on the plan and 3D layouts. Figure 4.1 illustrates the garden bed’s status before and after the preparation and planting of the new plants.

**Figure 4.1**

*Status of the Garden Bed Before Preparation (a) and After Planting (b).*

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**Dementia Therapeutic Garden Audit Tool**

After incorporating all of the items into the Ruby Garden in Phase Two, the audit tool was used to assess whether the scores of the garden in each category of the audit tool were improved. All questions received scores ranging from 0-3, or ‘not applicable’ for questions which cannot be scored from 0 to 3 (Marcus, 2007a). The scores of 0-1, 2 and 3 indicate ‘poor’, ‘room for improvement’ (i.e., moderately good) and ‘successful environment’ (i.e., very good), respectively. A score of 0 was given
where an item was not improved due to a reason such as limited time or regulations of the RACF.

Results

Ruby Garden Design

The Ruby Garden with an area of 356.5 m² is approximately 20 metres long with a maximum width of 30 metres. The garden is surrounded by residents’ rooms and the main Ruby lobby. At the entry patio, there is a large fabric awning, providing shade to several seats and a table overlooking the garden. The garden has two main curved C and L shaped garden beds located on the southern and northern sides of the garden respectively. Another garden bed is located at the entrance to the garden, and one is positioned on the eastern side of the garden in front of the back fence. The garden has one main entry for the residents, while there are three other side entrances in the northeast, south and southeast, which are usually used by staff members supervising the residents in the garden.

As indicated previously on page 96, the audit tool assessment in Phase One showed that the Ruby Garden performed poorly in supporting sensory-provoking and memory-evoking elements (i.e., Sensory Stimulation-Reminiscence category), and also in the engagement of people with dementia (i.e., Meaningful Engagement category). These characteristics had the lowest scores when compared to other DFE characteristics. In addition, the results of the social biographies in Phase One (page 94) indicated the importance of several sensory-provoking elements, such as colourful flowers, edible plants and water features, for the participants. Thus, a greater focus in the design phase was required to increase the level of sensory stimulation, trigger old memories and improve meaningful engagement. The 3D model of the garden was created to reflect
several design changes to improve the DFE characteristics, which considered four main groups of items: plants, water features, decoration and outdoor furniture.

**Plants.** A great diversity of non-toxic, low-maintenance and sensory plants were included in the Ruby Garden model. The plants included bird or butterfly-attracting plants, seasonal plants as well as other sensory plants suggested by Brisbane City Council (2014), Graham-Cochrane (2010) and Health Building Notes (2015). These plants were correa, grevillea, mat rush, bottle brush, banksia, wattle and coastal rosemary. The location and distribution of the plants inside the garden beds were based on the findings of sun/shade simulation and the direction of the prevailing wind. For example, as mat rush and grevillea are flexible plants and can grow in partial sun, they were located in the northern garden beds. Correa, bottle brush, banksia, wattle, and coastal rosemary require more sunlight; hence, they were located in the southern and southeast garden beds. The majority of the identified plants have a medium or high wind tolerance and as a result were easily placed in the 3D model.

Several seasonal plants were included in the 3D model of the garden since these plants, with their seasonal change, can assist people with dementia in their orientation of time and place (Health.vic, 2018b). Ornamental pear, jacaranda, pawpaw, gardenia, camellia, and nasturtium were among the plants with a seasonal change included in the 3D model. Other sensory plants placed in the 3D model were those that can stimulate various senses in people with dementia due to their unique features, including colour, scent, texture, taste or their auditory features, including the creation of rustling sounds in the wind. These plants ranged from azalea, hibiscus, impatiens walleriana, jasmine, hydrangea, bush rose, desert rose, camellia and lamb’s ear. Several edible plants, such as herbs and vegetables, were also included in the 3D model. The scented raised herb garden was located in the entry patio where it receives the early morning sun and people
have easy access to view, touch and smell it. Since azaleas and herbs are not very wind tolerant, they were sheltered, and thus they were located inside the entry patio under the fabric awning.

A multi-planter stand filled with various vegetables, including peas, tomatoes, and sweet corn was located on the southern side of the garden. It was assumed that this would increase accessibility to the plants of people with dementia with different mobility levels (i.e., seated or walking). Several hanging baskets and hanging planters were included in the model. Hanging baskets were located next to the side entry (i.e., southeast) and were filled with lots of aromatic purple and pink impatiens walleriana flowers since there were a limited number of sensory plants on this side of the garden. Similarly, hanging planters with sensory plants, including desert rose and nasturtium, along with several jasmines (i.e., climber plant), were located along the fence to create a natural framework for the garden. The plants covering the fence were targeted to reduce noise generated from the agriculture machinery and the cars passing by.

**Water Features.** Other important items included in the 3D model of the Ruby Garden were water features. Beyond the aesthetic characteristic of water features, they can stimulate auditory senses, evoke past memories (i.e., a means of reminiscence) and are a means of helping people with dementia to navigate (Graham-Cochrane, 2010; Marcus & Sachs, 2014). One birdbath and a small lion head water fountain were located inside the entry patio for people sitting under the fabric awning to enjoy the soothing sound of water, and a larger one was located at the intersection of the pathways for those walking through the garden. This water feature also serves as a landmark to orient people with dementia as a wayfinding decision point.

**Decorations.** The decorations included in the Ruby Garden model consisted of different groups, including garden ornaments, statues and sculptures. Decorations were
selected from familiar ones described by the study participants in order to evoke pleasurable memories or memories of home, as suggested by Graham-Cochrane (2010), Health Building Notes (2015) and Marcus and Sachs (2014). Accordingly, a combination of familiar statues, such as a wheelbarrow, an angel, a giraffe and a kangaroo sculpture, were included in the 3D model, as well as a few garden ornaments, such as animal stakes (e.g., worm stake) and a windchime. The decorations were located in the model based on the use of the garden by participants in Phase One. For example, the windchime was hung from the ceiling because the findings of the Ruby Garden use in Phase One showed that residents with dementia usually spend time in the entry patio and sit at the table located in the left corner of the entry patio while viewing the garden. Other decorations were included in the model where there were a limited number of decorations, and for the residents to view while walking through the garden pathways.

**Outdoor Furniture.** The final category included in the model was outdoor furniture. A variety of outdoor furniture was modelled for the garden. In line with the sustainability features, a rubbish bin and a compost bin were located in the southern side of the Ruby Garden. Due to its shade, the southern side of the garden was mostly supplied with items including outdoor furniture, while the plants were mostly distributed in the garden beds located on the other sides of the garden.

In addition, a sturdy wooden bench as suggested by the guidelines of Alzheimer’s Australia WA (2015) and Graham-Cochrane (2010) was located along the main pathway at almost 12 metres from the entry as a resting point for the participants while taking a walk. The timber table and seats existing under the fabric awning, as well as the wooden bench located in the southern side of the Ruby Garden, were supplied with several comfortable cushions to provide an opportunity to bring more people together for chatting and socialising (Brawley, 2007; Ferdous & Moore, 2015).
A few handrails of appropriate height (i.e., 70 cm) and a length of 1.5 to 2 metres were placed intermittently along the walking pathways on the model to ensure safety and accessibility of the garden for people with dementia. In addition, signage to help to navigate people with dementia through the entry to the garden and back to their rooms as a means of spatial orientation was included in the model. The signs were located at a height of 1.4 metres from the ground, at the end of the main pathway where people need to decide where to go. Another sign was located above the entry in the visibility axis of the residents for their navigation. The letters of the signs incorporated a contrasting colour to the background for readability for the residents. Additionally, in order to provide clearly defined routes, yellow contrasting edges of 0.1 metres wide were created along the smaller pathways.

The items that encourage people with dementia to take part in the care of the garden, gardening activities or engaging in some other outdoor activities, including filling the birdfeeders, were incorporated into the Ruby Garden model. A garden shed with lots of gardening tools was provided to encourage gardening and was located on the southern side of the garden. A birdcage and birdfeeder were also included in the Ruby Garden model for the participants to fill the bird feeder to encourage birds, which could encourage further engagement and daily interaction for people with dementia (Marcus & Sachs, 2014). The birdcage was included inside the entry patio, and the birdfeeder was located inside the melaleuca tree existing in the garden because of its bird attracting features (Gardening Australia, 2018). A summary of the DFE characteristics and their application in the Ruby Garden model is presented in Table 4.2.
Table 4.2

*The Ruby Garden Model Items with Their DFE Characteristics*

<table>
<thead>
<tr>
<th>Items</th>
<th>Sustainability</th>
<th>Accessibility</th>
<th>Orientation</th>
<th>Safety</th>
<th>Sensory-Stimulation</th>
<th>Meaningful Activities (Meaningful Engagement)</th>
<th>Socialisation</th>
<th>Reminiscence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plants</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Azalea</td>
<td>√</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Banksia</td>
<td>√</td>
<td></td>
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<td></td>
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<tr>
<td>Bottle</td>
<td>√</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Brush</td>
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<td></td>
</tr>
<tr>
<td>Brisbane wattle</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Bush rose</td>
<td>√</td>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td>Coastal rosemary</td>
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<tr>
<td>Desert rose</td>
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<td></td>
</tr>
<tr>
<td>Gardenia</td>
<td>√</td>
<td></td>
<td>√</td>
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<td></td>
<td></td>
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<tr>
<td>Grevillea</td>
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<tr>
<td>Herb garden</td>
<td>√</td>
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<td></td>
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<tr>
<td>Hydrangea</td>
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<tr>
<td>Hibiscus</td>
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<td></td>
</tr>
<tr>
<td>Impatiens</td>
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<td></td>
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<tr>
<td>Walleriana</td>
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<td>Jacaranda tree</td>
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<td></td>
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<td>Lambs ear</td>
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<td></td>
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<tr>
<td>Star jasmine</td>
<td>√</td>
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<td></td>
<td></td>
<td>√</td>
<td></td>
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<td></td>
</tr>
<tr>
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</tr>
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<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ornamental Pear</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td>√</td>
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<td></td>
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<td></td>
<td></td>
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<td>√</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Vegetable garden</td>
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<td>√</td>
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**Water Features**

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<tbody>
<tr>
<td>Bird bath</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Solar water fountain</td>
<td>√</td>
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**Decorations**

<table>
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<tr>
<td>Ornaments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Sculpture/statues</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</table>

**Outdoor furniture**

<table>
<thead>
<tr>
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<th></th>
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</thead>
<tbody>
<tr>
<td>Bird cage/bird feeder</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Cushion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Garden shed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Sign</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Trash bins</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Colourful hanging</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>planters for fence</td>
<td>√</td>
<td></td>
<td>√</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 4.2, 4.3 and 4.4 show 3D layouts from different parts of the entry patio as examples of the Ruby Garden 3D model. Other layouts of the Ruby Garden with the names of included items are presented in Appendix G-M.
Figure 4.2

Changes to the Entry Patio (Western Side of the Ruby Garden)

1. Bird Cage
   As a Means of Increasing Social Interaction in People with Dementia

2. Table and Chairs with Cushions
   As an Important Factor in Increasing Socialisation in People with Dementia

3. Windchime
   A Sensory-Provoking and Memory-Evoking Element

4. Raised Herb Garden
   For Increasing Meaningful Engagement in People with Dementia

   Rosemary  Thyme  Sage
Figure 4.3

*Changes to the Entry Patio (Western Side of the Ruby Garden)*
Figure 4.4

Changes to the Entry Patio (Western Side of the Ruby Garden)

9. Lion Head Water Fountain
   - Sound-Provoking and Memory-Evoking Element
   - A Means of Orientation

10. Birdfeeder
    - A Means of Meaningful Engagement

11. Water Feature
    - Sound-Provoking Element
    - A Means of Orientation

12. Gardenia
    - Aromatic Flower
The Ruby Garden Design Limitations

The new 3D design of the Ruby Garden displayed the ideal model for people with dementia. However, there were several constraints at this stage, namely time, unavailability of several items, regulations of the RACF and the gardener’s comments in relation to time of planting and cost, which resulted in the final garden being slightly different from the ideal 3D modelled one.

The first constraint, concerned with the design phase, was the limited time of the data collection procedure. Installing several items included in the model of the Ruby Garden was time-consuming, and the intervention phase (i.e., Phase Three) was constrained by the time taken in getting the garden ready. For example, providing handrails at regular intervals along the pathways and the edging borders of the pathways with contrasting edges was considered to be too time-consuming to be able to be implemented. Therefore, an alternative option was implemented where contrasting edges along the borders were created by planting several plants, including coastal rosemary bushes, to create borders.

Next, items prepared for the Ruby Garden were not always the ones specified in the ideal model due to the unavailability of specific products for purchase in stores or via online stores. Instead, similar decorations with the same DEF characteristics were used. For example, a wheelbarrow statue as a memory-evoking element could not be found in the stores, and this was replaced with a mailbox decoration, triggering memories based on the guidelines of Marcus and Sachs (2014). Additionally, in some cases, donated plants were not necessarily those that were identified by the researcher since the nurseries either did not sell or grow the specific plants. When plants were out of season at the time of purchase, they were replaced with similar plants with similar
physical requirements, such as sun or soil type. Flowers that could not be found were replaced with brightly coloured and pink flowers, such as impatiens walleriana, as the participants showed they were interested in pink and colourful flowers.

In addition, the installation of some items was against the regulations of the RACF because of participants’ safety. For example, two hanging baskets and one birdcage were omitted despite conforming to the guidelines of Health.vic (2018b) and Alzheimer’s Australia WA (2015) as they were considered by the RACF manager to be probable hazards for the residents.

The location of some plants was changed based on recommendations from the gardener. For example, the gardener suggested growing of plants in pots initially and only transferring them to their exact location according to the 3D model after they had grown to a certain size, to allow for the growth of stronger roots or the production of earlier blooms.

Furthermore, as the planting season of some seeds (e.g., lambs’ ear) was a few months later than the time of incorporating items into the Ruby Garden, the gardener asked to keep the seeds and to sow them in the appropriate season. Lastly, the researcher had to manage the design on the limited available budget she had to spend on the garden. Figure 4.5 shows some of the areas and items of the Ruby Garden after early application of the model in the Ruby Garden.
Dementia-Friendly Environment Characteristics

The condition of the Ruby Garden after the changes was assessed using the Dementia Therapeutic Garden Audit Tool (Alzheimer’s Australia WA, 2015) to evaluate whether the garden was improved. The results showed an improvement in the garden design as a supportive environment for people with dementia. In total, the assessment showed an increase in the total number of questions scoring very good (score of 3), from 21 for the environmental assessment phase (i.e., Phase One), to 36 for the post-design assessment (i.e., Phase Two). In addition, the total number of questions
receiving poor scores (0-1) fell by 29 from 39 for the environmental assessment phase, to 10 in the design phase.

The results of the assessment following the changes to the Ruby Garden demonstrated overall improvements in six categories of the Dementia Therapeutic Garden Audit Tool (Alzheimer’s Australia WA, 2015), namely Location and Entry to garden, Orientation-Safety, Meaningful Engagement, Seating, Sensory Stimulation-Reminiscence, and Sustainability, showing that the Ruby Garden had improved in the characteristics of DFE. Table 4.3 presents the total number of the recorded scores for each category in both Phase One and Two.

Table 4.3

The Total Number of the Recorded Scores for Each Category

<table>
<thead>
<tr>
<th>Categories</th>
<th>Score 0-1</th>
<th>Score 2</th>
<th>Score 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ph1</td>
<td>Ph2</td>
<td>Ph1</td>
</tr>
<tr>
<td>Location and Entry to garden (out of 19)</td>
<td>9</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Orientation-Safety (out of 11)</td>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Meaningful Engagement (out of 7)</td>
<td>7</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Seating (out of 9)</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Sensory Stimulation-Reminiscence (out of 12)</td>
<td>9</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Sustainability (out of 16)</td>
<td>7</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Total scores</td>
<td>39</td>
<td>10</td>
<td>14</td>
</tr>
</tbody>
</table>

*Note. Ph1= Phase One; Ph2= Phase Two*

Lack of sensory-provoking and memory-evoking elements was noted in the environmental assessment phase, and the categories of Meaningful Engagement and Sensory Stimulation-Reminiscence were assessed as the categories with the greater number of poor scores, (i.e., 100% and 75% of questions received poor scores,
respectively). In the design phase, the results of the assessment showed improvement in both categories of Meaningful Engagement and Sensory Stimulation-Reminiscence.

Improvement in the Sensory Stimulation-Reminiscence category was shown as an increase in the number of questions scoring 2 or 3 (moderately or very good) from 3 to 12 (out of 12) in the environmental assessment and design phases, respectively. The results of the audit tool in Phase One showed that the garden had a limited number of sensory-provoking elements for people with dementia. Following this, 34 sensory-provoking plants and 29 memory-evoking elements were incorporated into the garden. Likewise, improvement in the Meaningful Engagement scores of the garden was demonstrated by an increase in the number of questions that scored 2 or 3 (moderately or very good), from 0 to 4 (out of 7) in the environmental assessment and design phases, respectively. The results of the Dementia Therapeutic Garden Audit Tool (Alzheimer’s Australia WA, 2015) in the environmental assessment phase revealed that the garden had a limited number of items that encouraged engagement and prompted participants to take part in meaningful activities. Such items were provided for the Ruby Garden; that included the provision of a garden shed filled with several gardening tools, such as pots, trowels, watering cans, sunhats, and gloves, and also the inclusion of a birdbath and bird feeder. In addition, meaningful activities as identified from participants’ social biographies were accommodated in the garden. For those who were fond of art, colouring notebooks, sketchbooks and other essential tools for drawing were provided. Cardboard, glue and other essential tools for preparing simple handicrafts were prepared for those interested in craft. Novels and puzzle books were other activity resources that were offered to participants in the garden.

Moreover, the results of the Dementia Therapeutic Garden Audit Tool (Alzheimer’s Australia WA, 2015) assessment demonstrated an improvement in the
Location and Entry to garden category. The findings demonstrated improvement by an increase in the number of questions scoring moderately or very good (2 or 3), from 10 to 18 (out of 19 questions) in the environmental assessment and the design phase, respectively. In the environmental assessment phase, the Dementia Therapeutic Garden Audit Tool (Alzheimer’s Australia WA, 2015) showed the entry patio lacked some elements, including artworks, decoration and colourful flowers. Thus, several decorations and a combination of several seasonal and colourful flowers were provided for the entry patio.

The Ruby Garden previously had acceptable conditions in the Orientation-Safety category (i.e., 7 out of 11 questions received a score of 2 or 3), and in providing suitable seating and furnishings for residents (i.e., 6 out of 9 questions received a score of 2 or 3 in the Seating category). However, the results revealed an improvement in both areas. In the Orientation-Safety category there was a decrease in the number of questions scoring 0-1 from 4 to 1 in the environmental assessment and design phases, respectively. In the environmental assessment phase, the Dementia Therapeutic Garden Audit Tool (Alzheimer’s Australia WA, 2015) showed the garden lacked landmarks or visual signage for orientating people with dementia. Several elements were provided for navigating and spatial orientation of people with dementia in the Ruby Garden, including visual signage, water features and several plants reflecting seasonal changes. Likewise, the results showed improvement in the Seating category by a decrease in the number of questions scoring 0-1 from 3 to 1 (out of 9 questions) in the environmental assessment and design phase, respectively. The required elements identified through the audit tool in Phase One in the Seating category which the garden lacked were provided for the garden. This can be summarised as the provision of comfortable cushions for all
chairs and the inclusion of a wooden bench along the pathway for individuals to rest in the sun while walking.

The Ruby Garden demonstrated a slight improvement from the perspective of sustainability in the design phase. The results showed improvement in the Sustainability category by an increase in the number of questions scoring 2 or 3 from 9 to 12 (out of 16 questions) in the environmental assessment and design phases, respectively. A few measures were taken in line with the sustainability characteristic. A rubbish bin was provided for the residents’ use inside the garden as it was identified as missing in the audit tool assessment. The majority of plants that were selected for planting in the Ruby Garden were low-maintenance, which was an important factor in creating a sustainable garden for people with dementia (Brisbane City Council, 2014; Graham-Cochrane, 2010). In addition, more seedlings were planted in both the garden beds and over the fence to create a screen for the fence as a natural framework. The plants were planted along the fence (both inside and outside) to disguise the fence and to serve as a means of privacy for the Ruby Garden. Figure 4.6 shows the difference between the total number of questions scoring 2 or 3 (i.e., moderately or very good) for each category in Phases One and Two.
The use of the Dementia Therapeutic Garden Audit Tool (Alzheimer’s Australia WA, 2015) for assessment after the design of the Ruby Garden could be considered as an investigator bias. However, this bias is minimised by the utilisation of a number of methodological approaches. For example, if different methodological approaches were applied for the same issue, and they represent similar results, the results can be interpreted with more confidence, and this will also increase the validity of results (Taswell et al., 2019).

In the case study, diverse collection methods were used for the assessment of the garden’s environment. The environment of the Ruby Garden was assessed with the Person-Environment Apathy Rating scale (PEAR) (i.e., assessment of environment and apathy) in Phase Three, and also interviews with a purposive sample of 10 staff members and 10 participants with dementia were conducted to seek their views on the
new design of the Ruby Garden. In addition, the engagement of people with dementia was assessed in Phase Three using the Engagement of a Person with Dementia Scale (EPWDS). This was likely to increase the reliability of the results in this phase. The results of the assessment will be presented in Phase Three, which is outlined in Chapter Five.

Summary of this Chapter

The Ruby Garden was developed based on the findings of Phase One of the study, including the site analysis, participants’ social biographies and following guidelines for identifying items (e.g., plants) with their main features in terms of DFE characteristics (Graham-Cochrane, 2010; Health Building Notes, 2015; Marcus & Sachs, 2014). The physical requirements of the plants were identified as per the horticultural references, namely Australian National Botanic Gardens (2015), Gardenia (2018), Gardening Australia (2018), Gardens Online (2000) and Stewart (2017) were adjusted with sun/shade simulation and other climatic analyses conducted in Phase One. Next, the Ruby Garden with all the identified items was modelled three-dimensionally with Autodesk 3D max 2019 software. After all the required elements were provided, the garden beds were prepared for incorporating the new items identified in the model for the residents to experience the new garden.

Assessment of the Ruby Garden with the Dementia Therapeutic Garden Audit Tool (Alzheimer’s Australia WA, 2015) after the changes revealed that it had improved as a supportive environment for people with dementia. The detailed results of the Dementia Therapeutic Garden Audit Tool (Alzheimer’s Australia WA, 2015) revealed improvements in all categories of the tool, especially in those with the greater number of poor scores before the design phase, namely the Sensory Stimulation-Reminiscence
category and the Meaningful Engagement category. Although all categories of the audit tool showed improvements, there are still areas requiring enhancement, since the preparation of some elements was constrained. The considerable amount of time concerned with providing some items, the unavailability of some of the items in the stores, the regulations of the facility, the gardener’s comments on the location of some items, and the limited budget available made the actual Ruby Garden slightly different from the 3D modelled one.

The following chapter focuses on the intervention phase in which participants were taken into the improved Ruby Garden. First, the intervention protocol and the data collection procedure are described. Then, the results and findings of the quantitative and qualitative data analysis are presented.
Chapter Five: Intervention

Introduction

This chapter presents Phase Three of the three phases of the data collection procedure which examines the effect of the improved Ruby Garden on agitation, apathy and engagement of 10 participants with dementia. Phase Three was conducted from October 2018 to February 2019. First, demographic data, sensory perceptions and cognitive function of participants with dementia are presented. Next, the intervention procedure, instruments used, and results from the assessment of agitation, apathy and engagement are reported. Following this, the findings from the interviews with participants and staff members along with an overview of the participants’ activities in the garden are described. Finally, a conclusion of the chapter is presented.

Methods

Study Design

Phase Three utilised a case study design, as previously described in Chapter Three, where people with dementia in a residential aged care facility (RACF) and the garden itself are each considered as a unit of analysis. A mixed-method approach, which consisted of outcome measurement tools, semi-structured interviews and on-site observations, was used to collect various data on the two units of the case study.

Participants

All 10 participants recruited in Phase One, as reported in Chapter Three, were slated to continue to be involved in Phase Three. They were assigned an identification (ID) number ranging from 1 to 10. However, one participant (ID 5) was unable to take
part in the Phase Three intervention due to a swollen ankle. An additional participant was recruited (ID 11).

**Intervention**

The intervention consisted of an outdoor natural landscape, named Ruby Garden, incorporating characteristics of a DFE where participants were exposed to and actively engaged in features within it, including several meaningful activities elicited from the participants’ social biographies, such as colouring books, novels and gardening tools for planting edible plants in pots.

A review of similar past interventions revealed that in studies with significant results regarding agitation, sleep, engagement, affect and well-being, the average total intervention duration and frequency was approximately 20 hours at an average of 30 to 60 minutes per session, and had taken place over a period of weeks to months (Cohen-Mansfield & Werner, 1998; Connell et al., 2007; Gigliotti & Jarrott, 2005; Gigliotti et al., 2004; Hall et al., 2018; Jarrott & Gigliotti, 2010; Lee & Kim, 2008; Thelander et al., 2008). Hence, the intervention phase in this study involved five 60-minutes sessions Monday to Friday for 4 weeks totalling 20 hours of intervention. Two rounds of a 4-week intervention period were conducted in this study (Figure 5.1). The first round with the first five participants (i.e., ID numbers 1-6) started in October 2018, while the second round with the remaining five participants (ID numbers 7-11) was conducted in December 2018.
**Overview of the Intervention**

![Overview Diagram]

**Intervention Protocol**

Having installed all the items in Phase Two (refer to Chapter Four), the Ruby Garden was ready for the commencement of the intervention stage, and participants were taken individually into the garden to experience the new environment. The timing of visits to the Ruby Garden was randomised for participants to counteract the effects of a potential increase in agitated behaviours during the afternoon period (Dementia Australia, 2017). Research team members prepared a randomisation schedule via an online random number generator prior to the commencement of the intervention.

Every Monday to Friday during the 4-week intervention period, the researcher accompanied each individual participant from their bedroom or lounge into the Ruby Garden for their daily 60-minute session. The protocol aimed to allow the participants to freely explore the garden by themselves unless they had any special condition such as physical disability that impeded an activity or they required assistance to walk. In this case, partial facilitation of the session was required, whereby participants were assisted where they wanted to go along the pathway without guiding or encouraging them with
where to go or what to engage with. In addition, no conversation about garden features was initiated by the researcher in order to see the participants’ reaction or attitudes toward the garden features.

Visits were arranged between 9 a.m. after residents had finished their breakfast to 12 p.m. and from 1:30 p.m. to 3:30 p.m. This allowed a break for lunch. The researcher strictly followed the randomisation schedule for participant visits to the Ruby Garden. When a participant was unwilling to go to the Ruby Garden, the researcher tried again at a later time during the day and in the meantime approached the next participant on the randomised list. The researcher tried a maximum of two times to take a participant into the garden and when a participant refused a second time, this was considered as missing the session. The researcher kept a record to facilitate data analysis.

**Intervention Schedule.** The first week of the intervention was the introductory sessions in which the researcher introduced the DFE characteristics of the garden to the participants. On each day, in the first week of the intervention period in each round, the researcher introduced different elements of the garden, including orientation cues, pictorial signage, landmarks, furnishings, sensory-provoking and memory-evoking items, as well as other implemented meaningful activities in the Ruby Garden. After a 5-minute introduction, participants were partially assisted by the researcher with what they wanted to do in the garden. There was no introductory session during the second to fourth weeks of the intervention, and at the start of each day during this period (i.e., Week 2 to Week 4) the researcher asked the participants to choose their favourite activities (e.g., gardening, painting or reading) or to explore the Ruby Garden (e.g., to walk, sit, observe the garden features). They were offered the opportunities of viewing the garden features, listening to nature-based sounds (e.g., bird songs and water sound)
and smelling or touching various garden elements. In addition, during the intervention phase, the door of the Ruby Garden remained open to other residents in order to increase opportunities for social interaction.

The participants informed the researcher when they intended to return to their rooms or lounge, and they asked her to take them back. When a participant did not wish to stay for the full period of 60 minutes in the garden, the researcher would at first gently attempt to encourage them to remain and engage with the garden features or activities, but if they still expressed their intention to leave, then their wishes were respected. A record was kept of the length of time per session that participants spent in the Ruby Garden. At the end of each session or when participants wished to leave the garden, they were accompanied back to their bedroom or lounge by the researcher.

Intervention Specific Situations. The intervention might have been affected by specific conditions, including the weather, participants’ desires or their other related issues that could cause the intervention session to be disturbed or cancelled. These issues were predicted, and a plan was devised before the commencement of the intervention.

It was planned that during the intervention period, if it was drizzling, participants would be taken under the cloth shaded area in the entry patio to stay dry and safe. If it was raining moderately or heavy, the session would be cancelled. If a session was cancelled, makeup sessions would be conducted during the weekend. If it rained for 3 or more days, the week would be cancelled, and the intervention would be extended by a week.

When the participants wanted to return to the garden after finishing their session, they would be allowed to, as long as staff members were available to check that their safety was not compromised. On the other hand, if participants wished to go into the
garden before their scheduled time for the day, the staff would be asked by the researcher to engage them with other activities to avoid the effects of a premature visit on the results of the study. Additionally, participants would be allowed to go in the garden with their friends or family members during their scheduled time of visit if they wished. A record would be kept on the length of time they spent together and the activities they engaged in the garden. A record would be kept if a participant fell asleep during the session. The researcher would let them sleep and note how long they had slept.
Data Collection

Demographic data, cognitive function and sensory perceptions of participants were collected in Phase One of the data collection procedure (refer to Chapter Three). Intervention outcome measurements in Phase Three included the Cohen-Mansfield Agitation Inventory (CMAI-SF) (Werner et al., 1994) together with the on-site observations of apathy and engagement via the Person-Environment Apathy Rating Scale (PEAR) (Jao et al., 2016) and the Engagement of a Person with Dementia Scale (EPWDS) (Jones et al., 2018), respectively. Assessment of agitation was conducted pre- (Week 0) and post-intervention (Week 5), while on-site observation of engagement and apathy was conducted pre-intervention (Week 0) and once a week during the 4-week intervention period except for Week 1 when two assessments took place (i.e., beginning (Week 1-1) and end (Week 1-2) of the week). At Week 8, a follow-up assessment was undertaken to determine whether the intervention effects on agitation, engagement and apathy were sustained over time. Additionally, participants’ activities in the garden were also observed every day at 10-minute intervals from the time they entered the garden until they left over the 4-week intervention period. Post-intervention qualitative interviews with 10 residents with dementia and 10 staff were conducted to ascertain their attitudes toward the improved Ruby Garden. An overview of the data collection schedule for the study is presented in Table 5.1.
Table 5.1

Data Collection and Instruments Schedule

<table>
<thead>
<tr>
<th>Measurement - Assessment tools</th>
<th>Data collector - Time</th>
<th>Phase One</th>
<th>Phase Three</th>
</tr>
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<tr>
<td></td>
<td></td>
<td>Pre- intervention</td>
<td>Intervention</td>
</tr>
<tr>
<td></td>
<td></td>
<td>W0-</td>
<td>W1-1 W1-2 W2 W3 W4</td>
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<td></td>
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<td>Wherever</td>
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<td></td>
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<td>participants</td>
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<td>RACF</td>
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<tr>
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</tr>
<tr>
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<tr>
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<tr>
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<tr>
<td></td>
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<td>Auditory and visual perception-</td>
<td>Researcher-</td>
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<td>nursing records</td>
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<tr>
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135
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<th></th>
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<tr>
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<tr>
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<tr>
<td>Attitudes toward Ruby Garden</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Note. a Two rounds of intervention were conducted. b Participants’ activities were observed at every 10 minutes intervals from the time they entered the garden until they left over the 4 weeks intervention period. PAS= Psychogeriatric Assessment Scale; Q-SIT= The Quick Smell Identification; CMAI-SF= Agitation Cohen-Mansfield Agitation Inventory; EPWDS= Engagement of People with Dementia Scale; PEAR= Person-Environment Apathy Rating Scale Test; min = minutes; W1-1= First day of the first week; W1-2= Fifth day of the first week; W2= Week 2; W3= Week 3; W4= Week 4</td>
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</table>
Demographic Data

Demographic characteristics of the participants in terms of their age, gender, education level and marital status, and also their history of agitated behaviours, visual and auditory functions as well as their cognitive functions were collected from their medical and nursing records.

Cognitive Function

The level of cognitive function of the participants were collected from their Psychogeriatric Assessment Scale (PAS) score (Jorm et al., 1995) from their nursing records. This was necessary as two out of 10 participants were unable to answer or comprehend the questions related to the Mini-Mental State Examination (MMSE) scale (Folstein et al., 1975); one due to stroke, and another due to a language barrier (i.e., she was Bosnian and could not speak English).

The Psychogeriatric Assessment Scale (PAS) is a scale which gives information on specific psychogeriatric disorders, including dementia and depression in older adults (Jorm & Mackinnon, 2016). This scale is simple to administer and provides information similar to other cognition assessment scales, such as the MMSE scale (Folstein et al., 1975) or Questionnaire on Cognitive Decline in the Elderly (IQCODE) (Jorm & Jacomb, 1989). The scale has two different sections: an interview with the subject (i.e., client or patient) and an interview with an informant such as a carer who is sufficiently familiar with the subject (Jorm & Mackinnon, 2016). The subject interview comprises nine questions, while the informant interview is made up of 10 questions regarding cognitive functioning. The given score can be either 0 for correct answers or 1 for incorrect answers or refusals, and higher scores demonstrate greater cognitive impairment in individuals (Jorm & Mackinnon, 2016).
The reliability of PAS was established in a Canberra general population sample as well as in two samples from clinics composed of 76 geriatric and psychogeriatric patients in Sydney and 60 patients in Geneva (Jorm et al., 1995). In addition, PAS was found to have a correlation of 0.80 with the MMSE and 0.45 with the IQCODE, which demonstrates good validity (Jorm & Mackinnon, 2016).

**Screening Measures**

**The Quick Smell Identification Test (Q-SIT).** The Quick Smell Identification Test (Q-SIT) (Sensonics International, 2001) is a test for identification of olfactory dysfunction (Jackman & Doty, 2005). This test is more cost-effective, convenient and less confusing for people with dementia compared to other types of smell tests (Jackman & Doty, 2005). This test encompasses several cards that have three microencapsulated odorant strips along with multiple-choice questions where people with dementia should guess the most similar choice to the odour they smell through the odorant strips (see Appendix N). The multiple-choice questions have five options including banana, peanut, rose, paint thinner and none/other smell. Its score ranges from 0 to 3. The higher the score is, the better the olfactory function is. According to this scale, a person with a normal olfactory system can distinguish all odours, while people with an impaired sense of smell cannot identify one or more odours. This test was validated in a study conducted by Jackman and Doty (2005) in which the test-retest reliability was 0.87. This scale, which takes less than 5 minutes to administer, was conducted by the researcher with each participant to determine their smell function.
**Intervention Outcome Measurements**

**Cohen-Mansfield Agitation Inventory.** The Cohen-Mansfield Agitation Inventory-Short Form (CMAI-SF) (see Appendix O) is a shortened form of the longer 29-item CMAI (Cohen-Mansfield et al., 1989). The shortened form is a 5-point scale questionnaire examining 14 agitated behaviours in people with dementia over the last 2 weeks (Werner et al., 1994). It is categorised into three groups of behaviours consisting of aggressive behaviour, physically nonaggressive behaviour and verbally agitated behaviours (Werner et al., 1994). Each item is scored on a 5-point scale (1 = never and 5 = several times in an hour or continuous for half an hour or more). Higher scores show greater levels of agitated behaviours. The inter-reliability of this scale based on the agreement of three raters (i.e., three units of a nursing home) was 0.82, indicating high reliability. This instrument was conducted by two nurses in the Stretton Gardens at the time points as shown in Table 5.1.

**On-Site Observation of Apathy and Engagement.** Apathy and engagement of participants were observed on-site at various points of the data collection procedure (see Table 5.1) based on the valid and psychometrically sound Person-Environment Apathy Rating Scale (PEAR) (Jao et al., 2016) and the Engagement of a Person with Dementia Scale (EPWDS) (Jones et al., 2018).

The PEAR is a 12-item scale that assesses environmental stimulation and apathy concurrently. Environmental stimulation was evaluated by observing stimulation clarity, stimulation strength, stimulation specificity, interaction involvement, physical accessibility and environmental feedback (See Appendix P). Apathy was assessed by observing facial expressions, eye contact, physical engagement, purposeful activity, verbal tone and verbal expression (See Appendix P). Each subscale consists of six items rated on a 1–4 scale. Higher scores on each subscale indicate a higher level of apathy.
and environmental stimulation. The inter-rater reliability of both the PEAR-Environment subscale and the PEAR-Apathy subscale, evaluated by percent agreement, was 74.0% to 89.6% and 63.5% to 85.4%, respectively, and reflects good to excellent reliability (Jao et al., 2016).

The EPWDS consists of 10 items to examine whether an individual with dementia exhibits an emotional or behavioural expression/response of engagement with a psychosocial activity. It assesses five dimensions of engagement: affective, visual, verbal, behavioural, and social on a five-point Likert scale (1 = strongly disagree and 5 = strongly agree and ‘not applicable’). A higher total score reflects higher levels of positive engagement exhibited by the person with dementia. The content validity of this scale has been supported by experts in a Delphi study with established psychometric properties (Jones et al., 2018) (see Appendix Q).

Participants’ Activities. A site plan (scale of 1/50cm) of the outdoor natural landscape, Ruby Garden, was developed. Using this site plan, the researcher observed and documented each participant’s activities in terms of where they were, what they were doing, or who they were interacting with while they were in the garden at 10 minute intervals from the time they entered the garden until they left for each session over the 4-week intervention period. The data collected provided an insight on how the participants behaved in the garden.

The movement of participants along the pathways was documented on the site plans by drawing lines showing the movement of the participants in the garden. In total, 20 different individual maps were created for each participant over the 4-week intervention period, and imported into AutoCAD software (Autodesk Inc., 2018) to determine the distance walked by a participant for each session.
Using a similar method undertaken in studies by Hernandez (2007), Reynolds (2016) and Smith et al. (2010) to gain an in-depth understanding of spatial behaviours and the engagement of people with dementia inside dementia care facilities, participants’ engagement with the features of the garden was coded and illustrated on the site plan using symbols. A bold red circle was employed to show when participants engaged with or actively paid attention to a particular feature of the garden either verbally (e.g., enquiring or commenting on the water fountain), behaviourally (e.g., touching, smelling or picking a flower) or affectively (smiling to garden features). The recorded red circles, which showed participants’ engagement with the garden features, were combined into a single composite map in AutoCAD software (Autodesk Inc., 2018). The composite map provided an overview of the 10 participants’ behaviours over the 4-week intervention period via the distribution of red circles. Clustering or aggregation of circles on a garden feature denotes the participants’ attention or engagement with that particular feature or area. Likewise, the features or areas of the garden with few or no symbols showed participants had paid little to no attention to or engaged with them. Additionally, an excel spreadsheet table was created by the researcher at the end of each session categorising the different kinds of activities that participants took part in while they were in the garden during each observation session over the 4-week intervention period.

**Interview Protocol**

Post-intervention individual semi-structured interviews were conducted in-person with all of the participants. Open-ended questions were asked to seek an understanding of participants’ perceptions of the improved Ruby Garden. Similarly, a purposive sample of 10 staff who cared for the participants was recruited to seek their
views on the effect of the new outdoor natural landscape on the participants. These staff were identified by the facility manager as having experience working with residents in the Ruby wing and they were considered as being familiar with the care of the 10 participants.

Residents or their guardians and staff were asked to complete a written informed consent form prior to their participation in the interviews (See Appendix R-S and U-V). Participants were assured that their participation was voluntary and that all received information would remain confidential. If they consented but decided to withdraw before the interview or during the interview itself, they could withdraw from the study at any time without penalty.

Each interview took approximately 5 to 15 minutes. Individual interviews were digitally recorded and transcribed verbatim. Following this, the transcriptions were coded and analysed using thematic analysis (Braun & Clarke, 2019), which is a popular method for analysing qualitative data through recognising and reporting the patterns existing in a dataset (Braun & Clarke, 2019).

The interview questions for participants with dementia focused on their views of their daily visits to the Ruby Garden, as well as the positive or negative effects the garden had on them (See Appendix T). Likewise, staff were asked both if the Ruby Garden had any positive or negative effects on the group of participants or other residents, and what the participants’ feedback or attitudes towards the garden were (see Appendix W).

**Quantitative Data Analysis**

All collected data was entered into the IBM Statistical Package for the Social Sciences (SPSS) software version 25 (SPSS, Inc., Chicago, IL). A 10% random check
of data entry was undertaken to ensure accuracy, consistency and completeness prior to data analysis. Missing data was reported as some participants did not attend intervention sessions due to sickness or pain, and one participant passed away before follow-up data was collected. During data analyses, missing data was imputed for those participants using mean replacement, which is a more valid approach to handling the missing data compared to the case deletion of variables due to the preservation of the sample size and statistical power (Gemici et al., 2011).

Besides descriptive statistics (i.e., frequency, percentages, range, means and standard deviations), multiple individual non-parametric Friedman (Friedman, 1937) with/without Wilcoxon Signed-Ranked test (Wilcoxon, 1945) were undertaken to assess changes in outcome variables in response to the intervention. Due to the exploratory nature of this study, small sample size and abnormal distribution of data, the use of multiple individual Friedman tests is recommended rather than other tests such as multivariate analysis of variance (MANOVA) (Huberty & Morris, 1992). An alpha significant level of 0.05 was set.

**Qualitative Data Analysis**

Interview data (audio files) was transcribed, coded and analysed using thematic analysis with a combination of both deductive (concept-driven) and inductive (data-driven) approaches (Fereday & Muir-Cochrane, 2006; Graneheim et al., 2017). The thematic qualitative data in this study was analysed adopting the six steps offered by Fereday and Muir-Cochrane (2006), MacQueen et al. (1998) and Roberts et al. (2019): (a) developing an a priori code template based on the literature reviewed, a theory or a conceptual framework; (b) checking the reliability of the template; (c) applying the code template to the whole data set and adding additional codes from the raw data; (d)
clustering and connecting similar codes and categories to identify themes; (e) confirming the identified themes and producing the report.

First, codes were produced deductively based on the DFE concept with its eight characteristics in designing garden environments (Graham-Cochrane, 2010; Marcus & Sachs, 2014) as the pre-existing framework to form codes. During this process, a code template for each DFE characteristic: accessibility, orientation, safety, socialisation, meaningful activities, sensory stimulation, reminiscence and sustainability (Alzheimer's WA, 2019; Graham-Cochrane, 2010) was drafted with the brief definition of the characteristic and its different categories along with a guideline to know when to use the code in the dataset. The categories were extracted from reading the literature and immersion in the whole dataset. The example of the code template format and categories taken from the literature is highlighted in Table 5.2.

Table 5.2
The Example of Code Template

<table>
<thead>
<tr>
<th>Code label</th>
<th>Definition</th>
<th>Example of categories</th>
<th>When to use the code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meaningful</td>
<td>“Any kinds of activities and interests, hobbies, likes and dislikes, skills and talents, that give our life structure and meaning and provide a sense of worth. These activities whether recreational or activities related to ordinary household tasks, establish a routine, provide opportunities for socialisation, and help define who we are.” (Brawley, 2007, p. 266).</td>
<td>Doing physical activities, engaging with gardening activities or garden features, socialising/chatting with others.</td>
<td>Apply this code to all sections of the transcriptions which involve doing or being involved with different types of activities related to the garden environment either individually or in a group.</td>
</tr>
</tbody>
</table>
The code template helps researchers to incorporate the concepts or features that were already distinctive in the literature as a framework to develop the codes (Bradley et al., 2007; Roberts et al., 2019). Then, in the next step, the code template was consulted by an independent researcher (KL) who checked the overall descriptions of codes and categories by reading the literature, the code template and the whole dataset to ensure their consistency. Then, the defined categories were applied to the whole dataset (i.e., transcriptions of the interviews with both staff and people with dementia). That is, each transcription was read thoroughly and the sections which could be coded according to the template categories were highlighted, coded and drafted in the table. In addition, since there was some valuable data which could not be categorised according to the deductive code template, we additionally developed codes inductively through the extraction of codes from the raw data by thoroughly reading transcriptions and coding line by line. After generating the codes with both approaches, they were reviewed by the independent researcher once more and other research team members (WM, CJ, and KD) to ensure accuracy of the generated codes. Disagreement among coders was resolved through discussion.

Next, all the identified codes with both approaches were clustered and connected based on the similarities or differences among the quotations to identify themes using the headings related to the DFE literature and its characteristics by the iterative process of checking and regrouping the identified themes through re-reading the whole data set. The last step involved the confirmation and corroboration of the developed themes for producing the report, which was checked by all research team members to ensure that all the themes were related to the initial data and code template. After discussion, a
consensus was achieved among researchers and the themes were finalised for writing the report.

**Ethical Considerations**

Ethical approval for this study was obtained from Griffith University Human Research Ethics Committee (HREC) (GU Ref No: 2018/085) and approval for the conduct of this research was sought from the management of Stretton Gardens RACF. The study was conducted according to the guidelines of the *National Statement on Ethical Conduct in Human Research* (2018). These guidelines emphasise several principles, including beneficence, respect and justice as well as privacy and confidentiality. The key considerations in relation to the defined principles were applied in the proposed study as follows.

**Beneficence.** As per the principles of beneficence, the probable risk of the study for participants should be identified, minimised and managed, and the benefits of the study should justify the potential risks or harm to participants *(National Statement on Ethical Conduct in Human Research, 2018)*. Following the principles of beneficence, no foreseeable risks were envisaged for the participants, and participants might have gained benefits from the study as the aim of the study was to alleviate the signs and symptoms of dementia in residents and also to improve the status of the Ruby Garden based on the DFE characteristics. The participants might benefit from their daily connection with the garden in reducing some symptoms of dementia, such as a reduction in their level of agitation and apathy, as well as an improvement in their level of engagement. The information about the expected benefits of the garden was outlined in their received information sheet and consent form documents. They were also assured that there would
be no risk associated with participation in the study and they had the right to freedom from any kind of physical, emotional, social and financial harm and inconvenience.

To ensure there was no risk for the participants, the garden was designed based on the principles of DFEs to avoid any harm. Selected items of the Ruby Garden were also provided with consultation of the gardener and mangers of the facility. In addition, during the intervention, the researcher practically facilitated the session to ensure participants’ safety, especially for those who had a physical disability. In terms of the potential burden of the interviews both for people with dementia and staff members, the interviews were kept to a maximum of 15 minutes and participants were informed that they could choose to stop or leave at any time if they wished. Similarly, they were assured that they could leave the garden during intervention sessions if they wished.

**Respect.** Respect involves accepting participants’ values, beliefs, welfare and privacy and giving them the right and autonomy to make their own decisions (National Statement on Ethical Conduct in Human Research, 2018). In line with the principles of respect, information sheets with a detailed description of the study were given to the residents or their guardians in order to familiarise them with the aims of the study. In addition, a flyer which provided an overview of the study along with the study’s inclusion criteria was posted in the RACF in order to inform residents about the study. Prior to the commencement of the study, during the regular meetings of the RACF, residents were informed about the objectives and benefits of the study. Furthermore, signed consent forms were obtained from all participants of the study or their guardians before conducting the research. They were assured that their participation was voluntary and without any obligation, and they could withdraw from the study at any time without any explanations or penalty and with no impact on their current or future care in the RACF.
Justice. Justice “involves a regard for the human sameness that each person shares with every other” which involves a fair process in every stage of the study for all participants such as a fair recruitment process, treatment and fair access to the benefits of the study (National Statement on Ethical Conduct in Human Research, 2018, p. 9). All participants were recruited with the same process, that of the manager of the RACF sending an email to the potential participants’ families. All participants received the same intervention in the same length of time period, and because the time of the garden visit was randomised for all participants, they all had the opportunity to experience the garden environment both in the morning and afternoon.

Privacy and Confidentiality. All collected data in different phases of the study were preserved in the strictest confidence, participants’ rights of privacy were maintained, and only authorised research team members (i.e., PM, WM, CJ and KD) had access to the data.

To ensure the confidentiality of participants, all demographic information, data collection questionnaires, on-site observation data, recordings of interviews, and the transcripts were de-identified. All questionnaires related to the participants, as well as the interviews’ transcriptions, were designated with a unique identification number to ensure their anonymity during both data collection and data analysis and saved in the password-protected researcher’s computer. All interview recordings were destroyed after the transcriptions had been finalised, and all collected data including consent forms, transcriptions, questionnaires and on-site observation data which were transferred into SPSS or Excel spreadsheets are to be stored in a locked filing cabinet at the Menzies Health Institute, Queensland, Griffith University for 5 years. Any reports or publications resulting from the study were reported in general terms and did not include any identifying features.
Quantitative Results

Participants’ Characteristics

The demographic characteristics of the 10 participants and their levels of cognitive impairment and sensory perception are presented in Table 5.3. The majority of participants were women ($n = 9$). The mean age of participants was 81.7 years ($SD = 10.1$) ranging from 66 to 93 years. Only three participants were married, while seven participants were either divorced ($n = 3$) or widowed ($n = 4$). Four participants had attended either high school or college, while the level of education of the remaining participants was undisclosed. All participants were diagnosed with dementia, with eight having mild or moderate cognitive impairments, while two had severe cognitive impairments as per their PAS scores. Those with severe cognitive impairments were not excluded from the study as their low PAS scores (Jorm & Mackinnon, 2016) were associated with being a non-English speaker from Bosnia and being unable to speak due to a stroke, resulting in them being unable to answer the questions in the PAS (Jorm & Mackinnon, 2016).

In terms of sensory perception, only one participant had good eyesight, while the majority had fair ($n = 7$) or poor eyesight ($n = 2$). As regards hearing ability, four participants had good hearing ability, while the remaining participants had either poor ($n = 3$) or fair ($n = 3$) hearing ability. In addition, most of the participants had an impaired sense of smell ($n = 7$), and the remaining three participants had a normal sense of smell.
Table 5.3

Participants’ Demographic Characteristics (n = 10)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
</tr>
<tr>
<td>65-75</td>
<td>3 (30%)</td>
</tr>
<tr>
<td>76-86</td>
<td>2 (20%)</td>
</tr>
<tr>
<td>87-97</td>
<td>5 (50%)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1 (10%)</td>
</tr>
<tr>
<td>Female</td>
<td>9 (90%)</td>
</tr>
<tr>
<td><strong>Pass Score</strong></td>
<td></td>
</tr>
<tr>
<td>Mild impairment</td>
<td>2 (20%)</td>
</tr>
<tr>
<td>Moderate impairment</td>
<td>6 (60%)</td>
</tr>
<tr>
<td>Severe impairment</td>
<td>2 (20%)</td>
</tr>
<tr>
<td><strong>Highest Education</strong></td>
<td></td>
</tr>
<tr>
<td>College</td>
<td>2 (20%)</td>
</tr>
<tr>
<td>High school</td>
<td>2 (20%)</td>
</tr>
<tr>
<td>Undisclosed</td>
<td>6 (60%)</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>3 (30%)</td>
</tr>
<tr>
<td>Divorced</td>
<td>3 (30%)</td>
</tr>
<tr>
<td>Widowed</td>
<td>4 (40%)</td>
</tr>
<tr>
<td><strong>Vision</strong></td>
<td></td>
</tr>
<tr>
<td>Poor</td>
<td>2 (20%)</td>
</tr>
<tr>
<td>Fair</td>
<td>7 (70%)</td>
</tr>
<tr>
<td>Good</td>
<td>1 (10%)</td>
</tr>
<tr>
<td><strong>Hearing</strong></td>
<td></td>
</tr>
<tr>
<td>Poor</td>
<td>3 (30%)</td>
</tr>
<tr>
<td>Fair</td>
<td>3 (30%)</td>
</tr>
<tr>
<td>Good</td>
<td>4 (40%)</td>
</tr>
<tr>
<td><strong>Smell</strong></td>
<td></td>
</tr>
<tr>
<td>Impaired</td>
<td>7 (70%)</td>
</tr>
<tr>
<td>Normal</td>
<td>3 (30%)</td>
</tr>
</tbody>
</table>
**Intervention Outcomes**

**Agitation.** The results of the Friedman’s test showed that the agitation level of participants did not vary significantly between the three time points of the assessment (i.e., before intervention (Week 0), after intervention (Week 5) and at follow-up (Week 8) ($\chi^2(2) = 5.167, p = .076$). The CMAI-SF scores for the agitation level of participants before and after the intervention as well as at follow-up showed mean values of 25.90 ($SD \pm 10.08$), 24.50 ($SD \pm 10.66$) and 23.03 ($SD \pm 9.73$), respectively.

**Engagement.** Friedman’s test reported a significant difference in participants’ level of engagement between the weeks of assessment ($\chi^2(6) = 27.167, p < .0001$). The statistical analysis using Wilcoxon Signed-Rank tests showed a significant difference in participants’ level of engagement between Week 0 (before intervention) and during the intervention (Week 1-1, $p < .01$; Week 1-2, $p < .01$; Week 2, $p < .01$; Week 3, $p < .05$; Week 4, $p < .05$), where the level of engagement was higher during the intervention than before intervention (refer to Figure 5.2). No significant difference was found in the level of engagement between the 4 weeks of intervention ($p > .05$). The assessment of participants’ level of engagement at follow-up (Week 8) demonstrated a significantly lower level of engagement when compared to the 4 weeks of intervention (Week 1-1, $p < .01$; Week 1-2, $p < .05$; Week 2, $p < .05$; Week 3, $p < .05$; Week 4, $p < .05$) (refer to Table 5.4). Participants’ level of engagement at follow-up was similar to what it was prior to the start of the intervention, with no statistically significant difference between these 2 weeks ($p > .05$).
Figure 5.2

Variation of Participants’ Level of Engagement Over Time. Mean ± Standard Deviations
**Table 5.4**

*Post-Hoc Analysis of Engagement, Apathy and Environmental Stimulus Over Time Using Wilcoxon Signed-Rank Test (n = 10)*

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Engagement Z</th>
<th>Engagement P values</th>
<th>Apathy Z</th>
<th>Apathy P values</th>
<th>Environment Z</th>
<th>Environment P values</th>
</tr>
</thead>
<tbody>
<tr>
<td>W0 vs W1-1</td>
<td>-2.668&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.008</td>
<td>-2.454&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.014</td>
<td>-2.670&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.008</td>
</tr>
<tr>
<td>W0 vs W1-2</td>
<td>-2.666&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.008</td>
<td>-2.703&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.007</td>
<td>-2.608&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.009</td>
</tr>
<tr>
<td>W0 vs W2</td>
<td>-2.666&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.008</td>
<td>-2.314&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.021</td>
<td>-2.402&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.016</td>
</tr>
<tr>
<td>W0 vs W3</td>
<td>-2.397&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.017</td>
<td>-2.703&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.007</td>
<td>-2.502&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.012</td>
</tr>
<tr>
<td>W0 vs W4</td>
<td>-2.429&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.015</td>
<td>-2.599&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.009</td>
<td>-2.402&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.016</td>
</tr>
<tr>
<td>W0 vs W8</td>
<td>-1.021&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.307</td>
<td>-0.950&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.342</td>
<td>0.000&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.000</td>
</tr>
<tr>
<td>W1-1 vs W1-2</td>
<td>-0.169&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.866</td>
<td>-1.129&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.259</td>
<td>-0.702&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.483</td>
</tr>
<tr>
<td>W1-1 vs W2</td>
<td>-0.845&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.398</td>
<td>-0.631&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.528</td>
<td>-2.552&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.011</td>
</tr>
<tr>
<td>W1-1 vs W3</td>
<td>-0.931&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.352</td>
<td>-1.943&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.052</td>
<td>-1.166&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.244</td>
</tr>
<tr>
<td>W1-1 vs W4</td>
<td>-1.270&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.204</td>
<td>-1.381&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.167</td>
<td>-2.384&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.017</td>
</tr>
<tr>
<td>W1-1 vs W8</td>
<td>-2.666&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.008</td>
<td>-1.837&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.066</td>
<td>-2.805&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.005</td>
</tr>
<tr>
<td>W1-2 vs W2</td>
<td>-0.631&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.528</td>
<td>-0.491&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.624</td>
<td>-1.898&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.058</td>
</tr>
<tr>
<td>W1-2 vs W3</td>
<td>-0.975&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.329</td>
<td>-1.125&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.261</td>
<td>-0.284&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.777</td>
</tr>
<tr>
<td>W1-2 vs W4</td>
<td>-1.820&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.069</td>
<td>-0.350&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.726</td>
<td>-1.521&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.128</td>
</tr>
<tr>
<td>W1-2 vs W8</td>
<td>-2.547&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.011</td>
<td>-2.393&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.017</td>
<td>-2.807&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.005</td>
</tr>
<tr>
<td>W2 vs W3</td>
<td>-0.140&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.889</td>
<td>-1.733&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.083</td>
<td>-2.201&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.028</td>
</tr>
<tr>
<td>W2 vs W4</td>
<td>-0.831&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.406</td>
<td>-0.543&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.587</td>
<td>-1.368&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.171</td>
</tr>
<tr>
<td>W2 vs W8</td>
<td>-2.398&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.016</td>
<td>-2.194&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.028</td>
<td>-2.809&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.005</td>
</tr>
<tr>
<td>W3 vs W4</td>
<td>-0.178&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.858</td>
<td>-1.266&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.205</td>
<td>-1.577&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.115</td>
</tr>
<tr>
<td>W3 vs W8</td>
<td>-2.397&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.017</td>
<td>-2.705&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.007</td>
<td>-2.807&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.005</td>
</tr>
<tr>
<td>W4 vs W8</td>
<td>-2.191&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.028</td>
<td>-2.499&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.012</td>
<td>-2.807&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.005</td>
</tr>
</tbody>
</table>

*Note.*<sup>a</sup> Based on negative ranks;<sup>b</sup> Based on positive ranks;<sup>c</sup> The sum of negative ranks equals the sum of positive ranks; W1-1 = First day of the first week; W1-2 = Fifth day of the first week; W2 = Week 2; W3 = Week 3; W4 = Week 4
Apathy. The results of Friedman’s test revealed that there was an overall significant difference between participants’ level of apathy before, during and at follow-up ($\chi^2 (6) = 25.414, p < .0001$). Wilcoxon Signed-Rank tests found a statistically higher level of apathy in participants at Week 0 (before intervention) when compared to during the intervention (Week 1-1, $p < .05$; Week 1-2, $p < .01$; Week 2, $p < .05$; Week 3, $p < .01$; Week 4, $p < .01$) (refer to Table 5.4). A significant difference was found in participants’ level of apathy when comparing Week 8 (follow-up) and during Week 1-2 ($p < .05$), Week 2 ($p < .05$), Week 3 ($p < .01$) and Week 4 of the intervention ($p < .05$), where the level of apathy was higher at follow-up than during the intervention (refer to Figure 5.3). In addition, there was no statistically significant difference in the level of participants’ apathy between the 4 weeks of the intervention period (Week 1-1 to Week 4) ($p > .05$).
Figure 5.3

Variation of Participants’ Level of Apathy Over Time. Mean ± Standard Deviations
**Environment.** Friedman’s test reported a significant difference in the environment subscales of PEAR between the weeks of assessment ($\chi^2 (6) = 36.686, p < .0001$). The statistical analysis using Wilcoxon Signed-Rank tests showed a significant difference in environment subscales of PEAR between Week 0 (before intervention) and during the intervention (Week 1-1, $p < .01$; Week 1-2, $p < .01$; Week 2, $p < .01$; Week 3, $p < .05$; Week 4, $p < .05$) where scores of the environmental stimulus were higher during the intervention than before the intervention (refer to Figure 5.4).

Furthermore, assessment of the score for environmental stimulus at follow-up (Week 8) was significantly lower when compared to the 4 weeks of intervention (Week 1-1, $p < .01$; Week 1-2, $p < .01$; Week 2, $p < .01$; Week 3, $p < .01$; Week 4, $p < .01$) (refer to Table 5.4). There were no significant differences between the scores for environmental stimulus during intervention weeks except for between Week 1-1 and Week 2 ($p < .05$), Week 1-1 and Week 4 ($p < .05$) and Week 2 and Week 3 ($p < .05$) (refer to Table 5.4).
Variation of the Level of Environmental Stimulus Over Time. Mean ± Standard Deviations

Participants' Attendance and Activities

The number of intervention sessions that participants attended in the garden varied. On average, participants attended 14 sessions ranging from a minimum of 5 sessions to a maximum of 20 sessions and on average, spent 11.55 (SD = 11.42) minutes per session in the garden, ranging from a maximum of 55 minutes to a minimum of five minutes. No heavy rain was recorded during the intervention periods, and therefore no session was cancelled. However, light rain occurred on three occasions when participants sat or walked under the fabric awning, but it did not interfere with the intervention sessions.
The range of activities participants engaged with in the garden varied, and they were categorised under the different types of engagement, namely visual, verbal, social and behavioural engagement. Table 5.5 reflects the activities observed in the garden and the number of times (i.e., frequency) the 10 participants participated in the activities during the 4-week intervention period.

**Table 5.5**

*Frequency of Activities Undertaken by Participants During the 4-Week Intervention*

<table>
<thead>
<tr>
<th>Engagement</th>
<th>Frequency</th>
<th>W 1</th>
<th>W 2</th>
<th>W 3</th>
<th>W 4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Visual engagement</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Viewing different garden features (e.g., plants, water features, decorations) either seated or standing</td>
<td>183</td>
<td>54</td>
<td>45</td>
<td>41</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td><strong>Verbal engagement</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asking questions or talking about different garden features</td>
<td>82</td>
<td>24</td>
<td>22</td>
<td>14</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Singing a song about garden</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td><strong>Social engagement</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chatting with other residents or family members</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Behavioural engagement</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Picking flowers, vegetables and herbs</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Watering flowers, vegetables and herbs</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Tasting herbs</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Smelling plants</td>
<td>9</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Touching garden features (i.e., plants, water features, decorations, outdoor furniture)</td>
<td>25</td>
<td>5</td>
<td>7</td>
<td>6</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Filling the birdfeeder</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Sleeping</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Walking along the pathways either unassisted or with aid (i.e., walker, wheelchair)</td>
<td>7721</td>
<td>1960.5</td>
<td>1916.5</td>
<td>1797.8</td>
<td>2046.2</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* m = metres

The most frequent activities undertaken by participants in the garden were walking along the pathways, viewing and talking about different garden features. In
total, participants walked 7,721 m through the garden over the 4-week intervention period. The average distance walked by each participant over the 4-week intervention period is outlined in Table 5.6. The average walking distance among participants ranged from 18.59 m (ID 4) to 71.58 m (ID 6).

Table 5.6

<table>
<thead>
<tr>
<th>ID Number</th>
<th>W1</th>
<th>W2</th>
<th>W3</th>
<th>W4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>46.8 m</td>
<td>60.8 m</td>
<td>53.9 m</td>
<td>56.7 m</td>
</tr>
<tr>
<td>2</td>
<td>49.1 m</td>
<td>47.0 m</td>
<td>52.2 m</td>
<td>47.8 m</td>
</tr>
<tr>
<td>3</td>
<td>65.0 m</td>
<td>56.5 m</td>
<td>71.1 m</td>
<td>58.2 m</td>
</tr>
<tr>
<td>4</td>
<td>17.4 m</td>
<td>19.8 m</td>
<td>19.5 m</td>
<td>19.1 m</td>
</tr>
<tr>
<td>6</td>
<td>44.2 m</td>
<td>87.8 m</td>
<td>80.5 m</td>
<td>80.6 m</td>
</tr>
<tr>
<td>7</td>
<td>73.0 m</td>
<td>72.9 m</td>
<td>65.6 m</td>
<td>69.5 m</td>
</tr>
<tr>
<td>8</td>
<td>66.1 m</td>
<td>59.0 m</td>
<td>68.2 m</td>
<td>70.9 m</td>
</tr>
<tr>
<td>9</td>
<td>39.6 m</td>
<td>46.9 m</td>
<td>20.5 m</td>
<td>42.2 m</td>
</tr>
<tr>
<td>10</td>
<td>46.7 m</td>
<td>66.4 m</td>
<td>38.2 m</td>
<td>67.1 m</td>
</tr>
<tr>
<td>11</td>
<td>26.4 m</td>
<td>17.9 m</td>
<td>53.6 m</td>
<td>39.7 m</td>
</tr>
</tbody>
</table>

Note. m = metres; W1= First week; W2= Week 2; W3= Week 3; W4= Week 4

A few activities were observed only on a limited number of occasions or only undertaken by one participant, such as singing a song (ID 6), tasting herbs (ID 6), or sleeping (ID 2). The length of time that the participant slept in the garden was 4 minutes out of the 55 minutes spent in the garden. One participant (ID 4) was obese and had trouble walking. Although the use of a wheelchair was recommended to her, she refused, and she only attended five sessions. Due to weight-related walking difficulties, she simply chose to sit under the fabric awning and look at the garden.

The number of times that participants talked with or interacted with other individuals, including families or other residents was recorded six times (i.e., took place on six different occasions). On these occasions, other residents or families came out into the garden through the unlocked doors and interacted with the participants. The
interaction ranged from greeting and sitting to having a conversation about the garden features to walking together for a short period of time. The maximum time participants spent talking with other individuals in the garden was 10 minutes. As per the guidelines (Ferdous & Moore, 2015; Marcus & Sachs, 2014), the opportunities provided for people with dementia to talk to other residents were created by the provision of some interactive garden features, such as the herb garden and the birdfeeder, which facilitated conversation among the residents. In addition, the garden furniture was improved by adding several cushions to all chairs and locating a wooden bench adjacent to the pathway as a means of improving the opportunities for residents to sit and communicate.

A few gardening activities took place during the 4 weeks of the intervention, such as picking flowers and watering the plants. Other meaningful activities which were provided in the garden based on participants’ social biographies collected in Phase One, such as reading novels and sketching, were not undertaken by participants. Touching garden features, including the water feature and plants, was another type of activity observed. Touching the water features was recorded, including touching the water in the basin (i.e., dipping hands), washing hands in the water features and filling a glass from the water features. Touching plants included touching the plants or putting flowers in the hair. The latter was recorded in only one participant (ID 8).
Garden Features with the Maximum Engagement. The distribution of circles on the composite plan revealed the high aggregation of circles on a few garden features, for example, the raised herb garden and the water feature, which had the most aggregation of circles (Figure 5.5). Participants mostly engaged behaviourally with the water feature by touching the water. Other garden features that participants mostly engaged with were near the entry patio where the edible plants (i.e., found in the raised herb and vegetable gardens), the flowers, such as correa and azalea, the birdbath and the windchime were located. Other garden features that participants frequently paid attention to or engaged with were two sensory plants, namely coastal rosemary and the jasmine planted along the pathway (i.e., on the fence) on the eastern side of the Ruby Garden. (Figure 5.5).

Figure 5.5

Elements with the Maximum Engagement of Participants

Note. Red circles indicate the level of engagement.
Qualitative Results

Five themes emerged from the thematic qualitative data analysis using both concept-driven and data-driven approaches, which were the presence of sensory-provoking elements in the garden, meaningful engagement in the garden, accessibility of the garden, garden impacts and garden experiences. Table 5.7 shows the themes with their main categories.

Table 5.7

*The Developed Themes and Categories*

<table>
<thead>
<tr>
<th>No.</th>
<th>Themes</th>
<th>Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The presence of sensory-provoking elements in the garden</td>
<td>Sensory stimulation: Visual stimulating elements of the garden Auditory stimulating elements of the garden Taste stimulating elements of the garden</td>
</tr>
<tr>
<td>2</td>
<td>Meaningful engagement in the garden</td>
<td>Meaningful activities in the garden: Doing physical activities in the garden (i.e., walking) Doing gardening activities in the garden Socialising and having a chat with other people in the garden (i.e., residents and families)</td>
</tr>
<tr>
<td>3</td>
<td>Accessibility of the garden</td>
<td>Visually accessible garden: Accessibility of the garden through windows Physically accessible garden: Safe garden environment Opportunity for walking in the garden Noticing specific details of the garden (navigating element)</td>
</tr>
<tr>
<td>4</td>
<td>Garden impacts</td>
<td>Garden impacts on residents: Positive impacts on the mood of the residents Positive impacts on the behaviour of the residents Neutral/no impacts on the residents Garden impacts on other people (i.e., staff and families): Positive impacts on the mood of the staff Positive impacts on the mood of the families</td>
</tr>
</tbody>
</table>
5 Garden experiences

Opinions and attitudes of the residents towards the garden:
Positive opinion of the residents on the garden
Opinions and attitudes of other people (i.e., staff and families) towards the garden:
Positive opinion of the staff on the garden
Neutral opinion of the staff on the garden
Positive opinion of the families on the garden
Recommendations on the garden:
Flexibility with residents’ needs/wishes in the garden
Need for another/more gardens
Requirements of the garden
Challenges/barriers regarding the use of the garden:
Physical problems

Some representative quotes from the transcriptions were used to support the themes using each interviewee’s ID number along with letters to represent either staff (S) or people with dementia (P).

Theme One: The Presence of Sensory-Provoking Elements in the Garden

One theme that emerged from both people with dementia and staff interviews was focused on the presence of different sensory-provoking elements or sensory stimulation in the Ruby Garden, including visual, auditory and taste stimulation. The sensory experiences of people with dementia were reported through their description of flowers of different sizes and edible plants, as well as features creating sounds in the garden. The vast majority of people with dementia and staff showed a positive response to the variety of garden features, and they highlighted the new outlook of the garden environment with its variety of colours. This is demonstrated by several quotations from staff members, including “There’s vibrancy. There’s colour. They’ve got lots to see like the water fountain and the signs that’s [sic] up there and the colours of course” (ID 3, S), and “I think they can spend a little bit of time there [garden], and they can see the
difference in the colours” (ID 2, S). People with dementia also placed value on the variety of plants and colours in the garden:

I like the plants. It’s different. I mean, all the colours of nature, I suppose are there … It’s just interesting to look at flowers. It’s just interesting to look at them because of their different sizes and colours. Usually, these are a beautiful pink and they’re that size. You know? (ID 3, P)

However, one person with dementia (ID 2, P) reported the necessity of more visual stimulation or colours in the garden by adding plants with seasonal colour change:

I like to see colour in the garden, a change like maybe different flowers that come at a different time, rather than all the flowers blooming at the same time. If you can get flowers that follow on in a way so that they’re not all flowering at the same time, so that you’ve always got some colour in the garden. (ID 2, P)

Several people with dementia also noticed a number of sound provoking elements of the garden, such as birds and the windchime, when they were asked about the most attractive elements of the garden, and one staff member highlighted the improvement of the garden with some new sensory plants grown in the garden, including edible plants, “The garden has improved a lot with flowers and some other trees like pawpaw” (ID 10, S).

**Theme Two: Meaningful Engagement in the Garden**

Another theme that developed from the interviews with both the staff and people with dementia centred on meaningful engagement in the garden. Meaningful
engagement means being occupied with the external stimulus or the purposeful activities that give individuals’ lives meaning and a sense of worth and belonging (Alzheimer’s Australia Vic, 2020; Cohen-Mansfield et al., 2011). Doing several meaningful activities, including gardening, walking, and socialising with other individuals, in the Ruby Garden was highlighted by the interviewees.

Some interviewees reported the opportunity of doing gardening activities or their interests in interaction with garden features, such as, “They’ve got different areas they can plant there [garden]” (ID 3, S); “I think it [the garden] should be good for all of them [residents], but some of the residents who like gardening more, they benefited more” (ID 10, S); and “I would love to just sit among the flowers and just take my time” (ID 10, P).

A number of interviewees focused on engagement in some physical activities, such as walking in the garden. Both staff and people with dementia talked about the residents’ interest in walking around the garden environment, such as, “I reckon it’s a nice place for walking” (ID 1, P); and “It’s very nice to be able to walk through there … it’s pleasant to walk; it’s pleasant to be there” (ID 2, P). Staff also believed that the garden encouraged the residents to go and spend time in the improved garden even in hot weather, and not only residents from the Ruby wing visited the garden, but also several residents from Sapphire (i.e., another wing) went to visit the garden. This is revealed by the quotations from three staff members: “…like X, I saw him lots of time going out and sitting outside, and when I ask, ‘Is it too hot?’ he said, ‘No, it’s really good to see the garden’” (ID 9, S); “Even one of the residents of Sapphire comes here to walk, just to walk around the garden” (ID 4, S); and “The residents so far are actually going down to look at that garden down there” (ID 8, S).
In addition, staff members highlighted another aspect of meaningful engagement and the opportunity that the garden provided for talking and socialisation of residents and families, “…they [residents] can sit and talk and relax. I think some of the residents’ families are sitting there as well; they’re chatting, relaxing while they’re visiting the residents” (ID 3, S); and “I’m glad that these other ladies have been there [garden]” (ID 4, P).

**Theme Three: Accessibility of the Garden**

Another theme that emerged from the qualitative data analysis concerns the accessibility of the garden both physically and visually. The staff reported that more residents visit the improved garden than in the past. This is evident in a number of quotations, such as, “I think we have noticed a lot more residents using that space [garden], which is nice” (ID 8, S); “… I think I did hear one of the families said [sic] that they were happy because the residents can be more out in the garden now” (ID 2, S); and “… the garden is accessible anytime, they [residents] can walk around anytime” (ID 4, S).

Visual access to the garden through windows was also highlighted by people with dementia and staff members. This is demonstrated by the following quotations: “It’s good to see the garden upfront” (ID 9, P); and “A few of them [residents] are standing at the window and look at the garden and they say, ‘It’s beautiful’” (ID 7, S). Although the garden was accessible both visually or physically for a number of people with dementia, residents of another wing (i.e., Sapphire) did not have an attractive garden or easy access to the Ruby Garden. These aspects made some residents experience negative feelings. This is evident in several quotes by staff members including, “They [residents from another wing] even have jealousy…. We’re trying to
explain to them that that garden is on a project, but in the future, we’re developing on that side (Sapphire wing)” (ID 4, S).

**Theme Four: Garden Impacts**

The garden impacts involve outcomes of the garden for people with dementia and other individuals, including staff members and families. During the interviews, most interviewees reported the beneficial effects of the garden on people with dementia, staff and even family members. Only two people with dementia stated the garden had neutral or no outcomes for them. However, the majority of staff and people with dementia emphasised the positive effects of the garden on the mood and behaviours of the residents. This can be demonstrated by the following representative quotations from both the staff and people with dementia: “When I’m in the garden all my cares go away. All my worries go away. I’m very much at home” (ID 10, P); “… when you’re feeling a bit low, I think it [garden] gives you a bit of a pickup” (ID 2, P); and “I think overall everybody has benefited but mostly our dementia residents or [those] with anxiety, depression they found calm, peace and happiness out there” (ID 3, S).

The positive effects of the garden on the behaviours of people with dementia were mentioned by some staff as they believed that the garden reduces several residents’ agitated behaviours or restlessness by calming them down, “It’s [garden] a good relaxation for (ID 8, S), especially when she’s agitated; if we are taking her outside, her mood is okay” (ID 9, S); and “It’s calming. It helps people calm down. For example, we often take (ID 2, P) out there in the afternoons when she’s really unsettled, and there are other residents like that” (ID 3, S).

Two staff members also reported the positive effects of the garden on the mood and happiness of families and the staff members, “The families who are coming to see
the facility, they’re happy about it [garden] as well” (ID 10, S); and “… all residents are happy. Even the staff are happy about it [garden]. Good job” (ID 5, S).

**Theme Five: Garden Experiences**

Garden experiences involved the perception and opinions of different individuals (i.e., staff, people with dementia) on the garden; recommendations on the garden and the challenges or barriers that people with dementia faced while spending time in the garden. Positive comments were made about the garden from the majority of interviewees. Although some staff members had a neutral opinion of the Ruby Garden, the majority of staff reported that residents have a positive opinion on the garden: “We have had a lot of people at the residents’ meetings saying how lovely it is” (ID 8, S). In addition, most people with dementia had a positive opinion of the Ruby Garden to the extent that they did not suggest any changes to the garden environment: “There’s nothing I couldn’t like about it [garden]. Like I said, there’s [sic] no flies. I don’t want to change anything; I do think it looks nice. The way it’s done is really nice and I’m pretty sure the other ladies and gentlemen would like that” (ID 4, P).

However, several recommendations were made by some staff and residents concerning: (a) additional requirements for the Ruby Garden; (b) the need for another garden for the other wing (Sapphire); (c) being more flexible with individual’s needs/wishes in the garden, such as flexibility with the time of visits to the garden. Some requirements of the garden were pointed out by staff members and people with dementia. They emphasised the need for additional requirements or facilities to improve the Ruby Garden condition including a shade cloth and removal of weeds: “No, just a bit more shade. I wish I could get a shade cloth for you” (ID 10, P); and “Weeds. I’d love to get out there and pull up all these [laughter]” (ID 1, P). Additionally, the need
for another garden to be used for the residents of another wing was reported by staff including the manager, “I would love to have the same; I would love to have something like that for the other side because there are some residents over there ...” (ID 3, S).

From the perspective of the time of visits to the garden, several staff members believed that the time spent in the garden by participants should not be against their preference and there is a need to be flexible with residents’ wishes, “I think you can’t force [them]. They can stay for 10 minutes. You can’t force them to stay for 10 minutes, for example” (ID 4, S). One staff member also believed that a 1-hour session for visiting the garden might be boring and make people tired:

I think if the residents sit there for one hour, they may get bored. Instead of taking them for one hour, you can actually probably split it into half sessions because you’re here all day, you could probably take them on one in the morning and then later in the afternoon, something like that. (ID 2, S)

However, some people with dementia wished to spend more time in the garden, as several quotations demonstrate: “No, I’d like to do more if I could”; “I want to go and spend more time there” (ID 10, P); and “It [time of visits] was okay, but it should be longer” (ID 9, P).

People with dementia experienced some challenges and barriers when they spent time in the garden, including physical problems. Physical problems were related to the specific condition of the people with dementia, such as the lack of ability to make changes in the garden, walking unassisted or knee pain, which were the main barriers mentioned by several participants. “Because I have sore knees, I can’t walk around. It’s just when I’m tired, I can feel it more, but when I’m not tired, I don’t mind going down
there as well” (ID 4, P); and “… I have to have my wheelchair to walk around. That’s the only reason that I don’t like the garden” (ID 11, P).

Having considered the results of the thematic analysis in this study, the improved garden was shown to be successful in providing several DFE characteristics: sensory stimulation; meaningful engagement comprising meaningful activities along with socialisation with other individuals; and accessibility to the garden for people with dementia living in the RACF. Nevertheless, the garden still requires more improvement concerning accessibility for people with physical disabilities or in wheelchairs to provide more opportunities for them to make changes in the garden or to undertake activities. In addition, the application and adoption of DFE characteristics in RACFs is validated through both perceived positive outcomes of the garden on the mood and behaviour of people with dementia and the mood of other individuals as well as their positive experiences in the garden, which were elicited from the qualitative data analysis.

**Summary of this Chapter**

This chapter reported on the conduct and outcomes of an intervention that assessed the efficacy of a dementia-friendly garden on agitation, apathy and engagement of 10 residents with dementia in a RACF. The findings from the quantitative data analysis of the study using Friedman test (Friedman, 1937) revealed that while the intervention did not have any significant effects on the 10 participants’ level of agitation, it had significant effects on their engagement and apathy. The results of the post-hoc analysis using the Wilcoxon Signed-Rank test (Wilcoxon, 1945) showed that the level of engagement of participants was higher during the intervention than before intervention and the level of apathy was lower during the intervention than before the
intervention. However, there was no statistically significant difference in the level of participants’ engagement and apathy during the 4 weeks of the intervention.

The results of the on-site observation of participants in the garden during the 4-week intervention period showed that participants were involved in several activities while spending time in the garden. Whereas some activities, such as walking along the garden, were undertaken more frequently by participants, some other activities were undertaken only a few times or noted in only one participant, including singing a song or sleeping. On-site observations also revealed that the water feature and the raised herb garden inside the entry patio were two garden features that people were mostly engaged with while spending time in the garden, which might be related due to their sensory-provoking characteristic.

Ten participants and 10 staff members who were selected purposively participated in individual face-to-face interviews with the researcher for approximately 5 to 15 minutes in order to seek their views on the improved Ruby Garden. The results of the thematic qualitative data analysis consisting of both concept-driven and data-driven approaches developed five themes: the presence of sensory-provoking elements in the garden, meaningful engagement in the garden, accessibility of the garden, garden impacts and garden experiences. The extracted themes revealed that the Ruby Garden not only appeared to be successful in increasing the level of sensory stimulation through providing several sensory-provoking elements, but also successful in improving engagement in participants by providing some meaningful activities and opportunities for socialisation. Additionally, the majority of both residents and staff had positive attitudes towards the improved garden as they experienced an enjoyable time there. The results of the thematic analysis also showed the positive impact of the garden on the mood and behaviours of the residents as well as the mood of both the staff and families.
by giving them a sense of happiness, relaxation and calmness. The following chapter, the Discussion chapter will discuss the key findings and results of this current study in comparison with the previous studies reviewed in Chapter Two. Finally, the strengths, challenges and limitations of the study will be described.
Chapter Six: Discussion

Introduction

This case study, undertaken in a residential aged care facility (RACF) using a mixed-method approach, examined the impact of an outdoor natural landscape that was improved using dementia-friendly environment (DFE) characteristics on the level of agitation, apathy and engagement of 10 people with dementia. This study aimed to answer the three main questions presented in Chapter One: Does the outdoor natural landscape (e.g., garden) incorporating DFE characteristics (a) decrease agitation, (b) decrease apathy and (c) increase engagement in people with dementia?

The purpose of this chapter is first to provide a summary of the main findings of this study and then to present a critical discussion of the findings. Furthermore, the challenges, strengths and limitations of the study are described, and the conclusions of the chapter are presented.

Main Findings

Assessment of Ruby Garden using the Dementia Therapeutic Garden Audit Tool (Alzheimer’s Australia WA, 2015) after its design improvement revealed the garden as a supportive environment for people with dementia in terms of the eight DFE characteristics. Following improvement to the Ruby Garden design and the participants’ visits to the garden over the 4-week period, a positive increase in the level of the environmental stimulus and a decrease in participants’ level of apathy, measured by the Person-Environment Apathy Rating scale (PEAR) (Jao et al., 2016), as well as an increase in the level of engagement, measured by the Engagement of a Person with Dementia Scale EPWDS (Jones et al., 2018), were found. However, there were no significant changes in the agitation levels of the participating residents, measured by
Cohen-Mansfield Agitation Inventory (CMAI-SF) (Cohen-Mansfield, 1991), while the qualitative findings showed a reduction of agitation of a few people with dementia.

A combination of concept-driven and data-driven thematic analysis was used to analyse the qualitative data. The findings of the concept-driven and data-driven thematic analysis demonstrated five themes: meaningful engagement in the garden, the presence of sensory-provoking elements in the garden, accessibility of the garden, garden impacts and garden experiences. The concept-driven data analysis revealed that the garden enhanced the sensory stimulation of the environment and increased the level of meaningful engagement and socialisation of people with dementia. In addition, the garden was shown to be both visually and physically accessible to a number of people with dementia and other residents within the facility. The data-driven data analysis revealed that the garden benefited people with dementia and other individuals, including staff members and families through improving their mood status. Another theme which emerged from the data-driven analysis was garden experiences consisting of the mainly positive attitudes and perceptions of people with dementia and staff members on the improved garden and the challenges that the participants faced while spending time in the garden. Recommendations to improve the garden status or the intervention were also provided by several participants.

The findings of the on-site observations of people with dementia over the 4-week intervention period also revealed that participants were visually, verbally, socially and behaviourally engaged with the garden and took part in several meaningful activities while spending time in the garden. These activities included walking, picking flowers, viewing the garden features and touching or smelling plants. Moreover, the results of the on-site observation showed that the water feature located at the intersection of pathways and the raised herb garden located in the entry patio were
elements which participants had the most engagement with. In the following section, the potential effects of spending time in the improved garden on people with dementia in the context of the proposed research questions are critically discussed.

**Effects of the Garden Design on Agitation**

The quantitative results of this current study revealed no significant effect of the improved garden on the agitation levels of participants. However, the qualitative findings from interviews with staff and participants suggested the effectiveness of the garden in reducing agitation and restlessness of several participants with dementia.

The reviewed literature showed the impact of two types of outdoor natural landscape intervention on the level of agitated behaviours of people with dementia, that is, gardening (Calkins et al., 2007; Connell et al., 2007; Luk et al., 2011) and therapeutic gardens that include DFE characteristics (Anderson et al., 2011; Detweiler et al., 2008; Edwards et al., 2013; Ford Murphy et al., 2010). The effectiveness of outdoor natural landscape interventions in reducing the level of agitated behaviours varied between studies. Although the Ruby Garden in this study was designed to be fully compatible with DFE characteristics and incorporating optional gardening activities, no significant improvement on agitation was found in our participants. This may be explained by the differences in the intervention characteristics, the physical or health status of participants and the physical layouts of the RACF between studies in the literature and this current study.

The CMAI (Cohen-Mansfield et al., 1989; Werner et al., 1994) tool is the most common assessment tool used in the literature to measure the level of agitation of people with dementia. Most of the previous studies used the CMAI (Cohen-Mansfield et al., 1989) or CMAI-SF (Cohen-Mansfield, 1991) over two time point measurements at
either baseline and during the intervention or baseline and post-intervention (Calkins et al., 2007; Connell et al., 2007; Edwards et al., 2013; Luk et al., 2011). Of those, only two studies showed the effectiveness of the intervention on reducing agitation of the participants (Connell et al., 2007; Edwards et al., 2013). In the current study, the level of agitation was tested at three time points at baseline (Week 0), post-intervention (Week 5) and follow-up (Week 8) using the CMAI-SF. Our study is the only study we identified that assessed the sustained effect of an improved garden through a follow-up measurement, although no significant impact on the level of agitation was detected.

The total duration of the interventions, frequency and the length of each intervention session, varied significantly in the literature. The total duration of interventions varied between 1 week (Calkins et al., 2007) and 12 months (Detweiler et al., 2008; Ford Murphy et al., 2010). Studies with less than 10 hours of a total intervention duration demonstrated no significant impact on the level of agitation of people with dementia (Anderson et al., 2011; Calkins et al., 2007; Luk et al., 2011). Although the intervention in our study was designed for a total of 20 hours over 4 weeks (i.e., 60-minute session per day, 5 days per week), the average duration and frequency of garden visits were recorded as 11.55 minutes per session and 14 sessions of attendance. The lower than intended dose of duration and attendance rates of participants may explain the ineffectiveness of the improved garden on reducing the agitation of participants.

Two studies on therapeutic gardens continuously assessed the agitation level of 34 people with dementia using CMAI every single month over the total duration time of 12 months (Detweiler et al., 2008; Ford Murphy et al., 2010). They showed that visiting the garden over a long intervention period of 12 months reduced the agitation level of people with dementia. Our study was for a much shorter duration than these two
previous studies. However, the reduction of agitation level can vary in individuals according to specific conditions, such as the frequency of the garden visits (Detweiler et al., 2008). That is, people who used the garden more frequently over the 12 months showed fewer agitated behaviours compared to those who visited the garden less frequently. It can be presumed that the higher frequency and longer duration of interventions as well as continuous recording of agitation with CMAI might be required to detect any changes (i.e., reduction) in the agitation levels of people with dementia. However, further investigation is needed to ascertain the appropriate intervention dose, including the duration of individuals’ garden visits, that is required to reduce their agitation level. It should also be noted that in general, the recorded scores of CMAI-SF pertained to 2 weeks prior to the administration. This would limit the time point measurements to a minimum of two-week intervals. Therefore, another assessment tool for measuring the agitation levels for shorter intervention periods can be considered in future investigations.

**Physical and Health Status**

The physical and health status of participants can influence the effectiveness of the garden on the agitation level of people with dementia in RACFs (Ford Murphy et al. (2010). For example, the results of our study might have been affected by the participants’ mobility status. Six out of the 10 participants had a form of mobility problem and used a walker or wheelchair due to physical impairments or obesity limiting their mobility. These people were taken into the garden by the researcher, and they were partially assisted with where they wanted to go in the garden. The dependency on another individual (i.e., the researcher) might have negatively impacted participant’s self-esteem and sense of independence and created a feeling of
helplessness, which may have consequently made them agitated. The reduced independence of individuals affects their identity and sense of usefulness and can lead to agitated behaviours (Thomas, 1996). This was also supported by the qualitative findings of this current study in which being in a wheelchair and the lack of individual access to the garden was reported as a reason for the lack of interest in the garden.

In a longitudinal study over the period of a 12-month intervention, Ford Murphy et al. (2010) showed that the reduction in the level of agitation of people with dementia is related to their degree of mobility. High frequency of garden visits did not lessen the agitation level of people who cannot walk without assistance. Ford Murphy et al. (2010) reported that people’s need for staff assistance to visit the garden and the lack of a punctual response from staff members caused frustration and agitation. In this current study, it is presumed that the dependency of participants on another individual to use the garden may have negatively affected the independence of participants and maintained their agitation level despite the potential benefits of garden visits. Further research could consider controlling for this factor as a covariate (Salkind, 2010) in the analysis.

The health status of participants, such as feeling pain, might be another reason for the unchanged agitation level of participants during the intervention period. Several participants reported back or knee pain, and this prevented them from attending their scheduled sessions. Literature shows that agitation can be caused or worsened by untreated pain or physical illness (Ahn & Horgas, 2013; Richardson & Board, 2018). It is possible that the pain felt by some people with dementia made them frustrated, which interfered with the potential effectiveness of the garden in reducing their level of agitation. This study was not designed to investigate the impact of the participants’ pain on agitation; however, the results may indicate that the physical and health status of people with dementia may play a role in their agitation level. Thus, it remains unclear to
what degree the garden can reduce agitation in those people with dementia who feel significant pain or physical ill health. Further research could consider controlling for this factor as a covariate (Salkind, 2010) in the analysis.

The Physical Layout of the RACF

This study was conducted on pre-designed garden space, in which the location and configuration of indoor space, such as the residents’ rooms in relation to the garden, were predetermined. The design changes only concerned the external garden. The qualitative findings indicated participants’ views on the visual and physical access of the garden, and a number of challenges in relation to the position of the garden were reported. For example, some participants complained about the difficulty of access to the garden due to the distance they had to walk from their rooms to enter the garden. This is corroborated by several studies that concluded that there are facilitators and barriers to garden use, such as the existing indoor design or the physical layouts of the building (Evans et al., 2019; Lovering et al., 2002; Shi et al., 2019). For example, the proximity of the toilets and residents’ rooms to the garden can affect the residents’ use of the garden environment (Lovering et al., 2002). It is assumed that if the garden was located closer to participants’ rooms with good visual access to the garden, this would have motivated them to visit the garden more frequently, and hence impact on the study outcomes. In this current study, the garden was located a distance from several participants’ room which might have been a hindrance to their frequent use of the garden, and in turn, might have moderated the efficacy of the garden on their level of agitation.

The results of this study indicated that the garden designed with DFE characteristics might be effective in reducing the agitation of people with dementia if
participants had spent more time in the garden. In spite of the agitation of some people being reported to be reduced based on the qualitative findings, the fluctuating and complex nature of the agitation might not have guaranteed any present, sustained and long-term reduced agitation in people with dementia. Agitation is recognised as the most challenging of the BPSD, and despite optimal management, it cannot be entirely eliminated (Tible et al., 2017). The reduction of such BPSD is mainly dependent on the treatment of the underlying causes in individuals (Brodaty et al., 2012; Tible et al., 2017). This implies that a higher attendance rate or longer intervention period might not necessarily guarantee any present, sustained and long-term reduced agitation in people with dementia. Future studies can focus on a longer intervention dose, while improving accessibility to the garden for people with dementia and particularly for those who have physical and mobility problems. To reach this aim, several design considerations might be taken into account, such as a direct visual and physical access from residents’ room to the garden. Designers need to consider both the juxtaposition and visibility of indoor spaces, such as residents’ rooms and common areas to the gardens, in the initial architectural plan of the RACFs and consider an integrated design of both indoor and outdoor spaces.

Effects of the Garden Design on Apathy

The results of this study showed a decrease in the level of apathy of participants and an improvement in the environmental stimulation of the garden at the start of the intervention compared to the baseline. A high level of apathy and low level of environmental stimulation were recorded 4 weeks after finishing the intervention at follow-up, which were similar to prior to the start of the intervention at baseline.
In this study, reduction of apathy in people with dementia during the intervention was associated with enhanced sensory stimulations from the improved garden. The association of apathy and environmental stimulus, including sensory stimulations, has been well reported in literature (Jao et al., 2015; Moyle et al., 2016). In general, the lack of sufficient environmental stimulation can cause individuals to feel a lack of control over the environment, which reduces the individuals’ tendency and enthusiasm to engage in social activities (Peck, 2007). The gradual decline in socialisation and withdrawal from social activities leads to a lack of motivation, helplessness and apathy (Peck, 2007). Jao et al. (2015) demonstrated that settings that consist of clear and adequate environmental stimulations would lead to lower levels of apathy in people with dementia compared to those with chaotic and insufficient environmental stimulations. In this current study, it is likely that the designed sensory-provoking elements for the garden contributed to an increase in the level of sensory stimulation of the garden, and in turn, reduced the level of apathy in participants.

A wide range of sensory-provoking elements (e.g., jasmine, coastal rosemary, azaleas, herbs, impatiens walleriana and a windchime) were incorporated into the improved Ruby Garden design to stimulate visual, olfactory, tactile and auditory senses of people with dementia through colours, sizes, scents, textures and natural sounds. This created a variety in the resident’s environment which might have contributed to a reduction in feelings of boredom. This was collaborated in interviews with the participants and staff where interests of the participants, particularly in the water features, plants such as impatiens walleriana, the windchime and statues were elaborated. Thomas (1996) reported that creation of variety in the resident’s living environment through various elements of outdoor natural landscape (e.g., a garden) can
reduce boredom and apathetic symptoms. Moyle et al. (2016) examined the influence of a stimulating environment on the level of apathy in participants using a virtual reality forest (VRF) consisting of relaxing natural sounds, such as bird sounds. Although this study was not conducted in an actual garden, the virtual environment with different sensory stimulations was shown to be effective in reducing the level of apathy. In this study it is assumed that the interaction of participants with the sensory-provoking elements of the Ruby Garden had positive effects on decreasing their level of apathy.

On-site observations further highlighted the interaction of participants with several garden features in the form of viewing, touching and smelling plants, watering and tasting herbs, filling the birdfeeder and picking flowers. Having interaction with these features and undertaking such meaningful activities as contributing to or caring for something in individuals promotes a sense of independence, and people feel they are productive and valued, which maintains their sense of identity and self-worth (Phinney et al., 2007; Rappe & Topo, 2007; Roland & Chappell, 2015). Based on the Eden Alternative philosophy, the theoretical framework underpinning this study, older people in RACFs feel valued when they are involved in meaningful and purposeful activities, such as garden-related activities or caring for animals, such as birds (Thomas, 1996). The improved sense of identity and worth and the value resulting from such activities, in turn, can reduce the feeling of helplessness as a precursor of apathetic behaviours (Bould, 2017; McClellan, 2018).

In this study, the apathy of participants decreased significantly throughout the 4 weeks of the interaction with the sensory-provoking garden features and being occupied in meaningful activities. However, after finishing the intervention period, participants had no further exposure to the sensory stimulation of the garden, and to the meaningful activities. Consequently, the level of apathy, tested 4 weeks after the finish of the
intervention, in participants rose again and reached the level of that prior to the intervention. Therefore, it is presumed that the enhanced sensory stimulation in the improved garden and the positive feeling of being valued and productive elicited from participating in meaningful activities lessened the apathetic behaviours in the participants with dementia while they had access to it.

This study was the first study that we know of that investigated the effects of a garden design based on DFE characteristics on the level of apathy. The results of this current study showed the significant potential of a garden design based on DFE characteristics, specifically sensory stimulations and meaningful activities, in reducing the level of apathy of people with dementia. Despite the effectiveness of such gardens, there is limited available research in the literature, which limits the comparison of our study results with those of others. Thus, it is imperative that future studies focus on apathy as an outcome measure when introducing gardens into studies involving people with dementia.

**Effects of the Garden Design on Engagement**

The results of this study showed an increase in the level of engagement of participants at the start of the intervention compared to the baseline. However, a low level of engagement was recorded 4 weeks after finishing the intervention at follow-up, which was similar to what was prior to the start of the intervention at baseline. Different tools have been used in the literature to evaluate the engagement of people with dementia, including the Menorah Park Engagement Scale (MPES) (Jarrott & Gagliotti, 2010), Maastricht Electronic Daily Life Observation Tool (MEDLOT) (de Boer, Hamers, Zwakhalen, Tan, Beerens, et al., 2017), surveys (Evans et al., 2019; Gonzalez & Kirkevold, 2015) and interviews (Evans et al., 2019). Literature to date suggests that
outdoor natural landscape interventions can increase the level of engagement of people with dementia as a result of improved socialisation (Evans et al., 2019; Gonzalez & Kirkevold, 2015; Prolo & Sassi, 2017) or increased involvement in meaningful activities, such as gardening or farming (de Boer, Hamers, Zwikhalen, Tan, Beerens, et al., 2017; Jarrott & Gigliotti, 2010).

**Verbalisation and Socialisation**

In response to site analysis and the social biographies of participants, several features were included in Ruby Garden to improve the verbalisation and socialisation of individuals through evoking their memories. The on-site observation showed that participants viewed the garden features and willingly commented on them. The novelty and new outlook of the garden with its new features possibly triggered participants’ memories and encouraged them to comment on the features or communicate with others. The garden features not only facilitated conversation in the participants, but also created pleasure and positive feelings in individuals. This was corroborated by the results of the on-site observations of participants, in which the active engagement of the participants (i.e., verbally, affectively and behaviourally) with several garden features were illustrated on the composite plan, shown in Figure 5.5. In general, softscape features, such as green and blue spaces, have the potential to improve the mood status of people with dementia (Evans et al., 2019; Rappe & Topo, 2007).

The availability of seats is a promoting factor of socialisation, and the majority of communication and social activities of people with dementia occur near furniture (Ferdous & Moore, 2015). Giving opportunity for people with dementia to sit and rest through the provision of ample sitting areas makes it probable that they will visit the garden more frequently (Brawley, 2007). The presence of movable seats, while sturdy
and stable, can help people move seats beside interesting features of the garden and have interaction with the features, which enables enjoyment of the garden (Alzheimer’s Australia WA, 2015; Van den Berg et al., 2020). The furniture which is located where there is an attractive view to the features, such as sculptures, birdfeeders or colourful flowers, was highlighted as a means of having interaction with such appealing garden features (Alzheimer’s Australia WA, 2015; Brawley, 2007). In this current study, a wooden bench was placed adjacent to the main walking pathways to give people the opportunity to interact with nearby garden features, such as the birdfeeder. It was observed that participants sat on the wooden bench or the entry patio seats. They expressed their ideas about the plants or related stories about what they used to grow in their gardens. It appears that the features of the garden evoked their memories and produced pleasurable feelings and happiness, which also encouraged participants to talk about them.

**Meaningful Activities**

The involvement of participants in meaningful activities in the garden, such as gardening or walking, might be another possible explanation for the improvement of engagement in people with dementia during the intervention (Cohen-Mansfield et al., 2010). The interests of participants in gardening activities and the meaning that garden carried for them motivated participants to become involved in those activities. Indeed, the garden-related activities established a familiar link with the past experience of people with dementia, which prompted them to recollect their past memories (Bengtsson & Carlsson, 2013; Chu et al., 2019; Cipriani et al., 2018). Their previous experience of gardening, which may include connections to their childhood memories, may have encouraged participants to engage in gardening activities.
Appropriate environmental conditions, for example, safety, orientation and aesthetic features, are influential in enhancement of the walkability of an environment (Adkins et al., 2012; Appolloni et al., 2019; Zayed, 2016; Zuniga-Teran et al., 2016). Safe pathways with navigation signage, and the presence of green and blue spaces are among these environmental conditions. Blue spaces and green spaces also have been identified as improving the mood of individuals as they have a calming effect (Volker & Kistemann, 2011; White et al., 2010). The presence of attractive elements along the pathway, such as flowers and green spaces, possibly encouraged people to walk more and experience a feeling of relaxation and calmness.

The presence of navigation signs along the pathways and the water feature at the intersection of pathways as an orientation landmark might have also assisted people with wayfinding. Navigational cues increase the control of individuals over the environment, reduce their confusion and assist them to orient themselves and walk easily in the environment (Ann et al., 2016; Davis et al., 2017). Thus, it is presumed that the previous experience of the individuals, and the aesthetic features of the sensory-provoking elements and their orientation, encouraged participants to engage with the activities.

Four weeks after finishing the intervention period, the participants had not been further exposed to the designed garden, and the quantitative results showed a significant decrease in the engagement of participants with the garden environment. This can be explained by the lack of arrangements for the residents to go into the garden and be involved in different daily meaningful activities or to have interaction with the sensory features existing in the garden or other residents after the intervention period. In general, the results of the quantitative measurement of engagement of participants, the
qualitative findings, and the on-site observations, all supported the efficacy of the
garden on increasing the engagement level of people with dementia.

This current study is the first known study which used a combination of a
variety of methods, including qualitative interviews, on-site observations as well as
quantitative measurement tools, to show an improvement of engagement of individuals.
Overall, the results of this current study substantiate the findings of the reviewed
studies, demonstrating the positive effects of outdoor natural landscapes on improving
engagement of people with dementia.

Discussion of the Findings Concerning the Eden Alternative Philosophy

The theoretical framework underpinning this study was the Eden Alternative
philosophy as a psychosocial model for the transformation of RACFs through the
integration of animated elements, including plants. Overall, there is a limited body of
evidence regarding the implementation of the Eden Alternative philosophy in RACFs
aimed at reducing agitation and apathy and increasing the engagement of the residents
with dementia. Of the studies focusing on outcomes after implementation of the Eden
Alternative in the literature, several studies showed that the implementation of the Eden
Alternative philosophy in RACFs is associated with a range of benefits including
improved satisfaction (Kane et al., 2007), quality of life (Kane et al., 2007) and hope in
residents (Kubsch et al., 2018). A reduced feeling of boredom and helplessness in
residents of RACFs was also reported in studies, including Bergman-Evans (2004) and
Brownie (2011). Several studies in the literature failed to show that the implementation
of the Eden Alternative philosophy provided any positive outcomes for the residents or
their carers of RACFs (Andersen & Spiers, 2014; Coleman et al., 2002).
In this current study, the reduction of apathy and restlessness, as well as improvement in the engagement of people with dementia during the intervention were associated with the opportunities that were provided for close contact with plants, animals (e.g., birds, butterflies) and other individuals (e.g., residents and families) in the garden. The engagement of participants in the care of plants (e.g., planting, picking and watering) and birds (e.g., feeding) was influential in the reduction of apathy and restlessness within the framework of the Eden Alternative philosophy (Thomas, 1996).

This current study implemented the Eden Alternative philosophy into practice under the widely accepted DFE principles which have had their efficacy for people with dementia scientifically proved. These principles have provided practical solutions by allowing residents to have close contact and meaningful engagement in the gardens with plants, animals and other residents. Studies in the literature did not report how, and the extent to which, the principles of the Eden Alternative philosophy had been applied in RACFs. The adoption of the Eden Alternative philosophy in the literature was mostly simplified in practice to the introduction of animals or plants without providing opportunities for the meaningful care of and companionship with such elements in RACFs. It is important to note that superficial aesthetic environmental transformation of facilities without consideration of any close and constant relationships and meaningful engagement for the residents with these elements is not likely to improve the residents’ quality of life or influence their behavioural problems (Brownie & Nancarrow, 2013). The findings of our qualitative data analysis and on-site observations determined the interaction and close contact of participants with sensory plants, birds and other residents in the garden. Companionship and engagement with animated elements, such as plants and the care of these elements, can reduce the feeling of loneliness, boredom and helplessness, which in turn, alleviates apathy and the agitated behaviours of people.
with dementia (Thomas, 1996). Thus, the results of this current study can validate the adoption of the Eden Alternative philosophy to transform the environment of the RACFs in order to alleviate agitated and apathetic behaviours if the opportunities for such meaningful activities are provided using definite principles of DFE.

**Challenges in the Creation of Garden Based on DFE Characteristics**

In this current study, the total cost of re-creation of the dementia-friendly garden within an area of 356.5 m² was approximately AU$1,500 of which AU$550 was from donations. The cost of the creation of large gardens in RACFs with high-tech design and lightings was discussed in a study by Reynolds (2016). Reynolds (2016), in personal communication with Smith (2015), reported that large gardens could cost US$968.4 per square metre. However, creating small gardens with basic features such as greenspaces is more reasonable for RACFs since they could reduce costs to a range of US$172.16 - US$279.76 per square metres. In general, the creation of each garden involves three different costs: planning and designing, construction of the garden and long-term management and maintenance. The latter was identified as the key for the success and active use of the gardens by residents of RACFs (Gonzalez & Kirkevold, 2016; Lovering et al., 2002). However, there is no consensus on the exact cost of gardens (Marcus & Sachs, 2014), and the majority of designers believed that garden cost rates fluctuate based on different variables, for example, location and size of the garden, required features (e.g., softscapes and hardscapes) and the complexity of the design style (Marcus & Sachs, 2014). In this current study, it is important to remember that Ruby Garden was improved from its basic site and the funding was used to add DFE characteristics to an existing garden. The cost would have been much higher if a basic garden had also to be established. Several cost-effective design solutions to modify the
environment can be used to reduce the cost associated with the creation of such environments, including planting hardy and low-maintenance plants, growing vegetable and herb gardens to produce kitchen products, producing compost and organic mulch from the garden scraps, repurposing and reusing objects or materials in the garden, installing solar water features for storing energy and storing rainwater for watering the gardens (Alzheimer’s Australia WA, 2015; Graham-Cochrane, 2010). These solutions are based on the sustainability characteristics of DFE and make the gardens relatively self-sufficient (Alzheimer’s Australia WA, 2015; Graham-Cochrane, 2010).

The creation of dementia-friendly gardens in RACFs not only requires design principles that align with the eight DFE characteristics, but it also requires long-term management and consistent maintenance, which are associated with financial costs. However, the creation of DFEs is economically advantageous for RACFs due to the wide range of positive outcomes on the health and well-being of people with dementia (Health Building Notes, 2015). Detweiler et al. (2008) reported that the construction of a therapeutic garden in a RACF would also reduce the use of medication and, in turn, its associated costs. In this current study, the small amount of money spent on improvement of the garden resulted in a significant reduction in the level of apathy and enhancement in the level of engagement. Although a cost-effectiveness analysis was not part of this study, the positive outcomes may demonstrate the effectiveness of improvement within even a low budget.

The limited financial resources of RACFs and the uncertainty of stakeholders and managers about the efficacy of environmental modifications based on DFE characteristics might prevent the establishment of dementia-friendly gardens. Evans et al. (2019), in qualitative interviews with managers and staff of several RACFs, showed that the lack of sufficient financial resources is a concern for RACFs and a barrier to the
establishment of these gardens. The uncertainty of stakeholders about the efficacy of these gardens may originate from limited knowledge about the DFE design principles, and from poor negotiation and communication barriers among RACFs’ administrators and the designers. Studies showed that sufficient knowledge and support of staff members about the benefits of dementia-friendly gardens is necessary for the success of these gardens (Chapman et al., 2007; Lovering et al., 2002; Shi et al., 2019). In addition, negotiation and communication between architects and RACFs’ administrators or the healthcare professionals, as well as shared decision making, are essential to have a high-quality design of the environment (Elf et al., 2015). It is assumed that this may reduce concerns and uncertainty about the creation and use of the garden by residents. Otherwise, even if the garden is constructed, the managers and staff members have concerns about the safety of the residents in the gardens, which limits the permission of staff for the residents to use such gardens (Evans et al., 2019; Hernandez, 2007). Thus, architects, stakeholders and managers of RACFs need to be educated about the DFE characteristics and their potential benefits to ensure the health and well-being of people with dementia.

Besides challenges in the creation and implementation of the garden design based on DFE, another challenge was related to the participants’ frailty or disability. Although all of these participants took part in the study and experienced an improved garden environment during the intervention period, their disabilities made exploring the garden or doing activities relatively challenging. Three used wheelchairs, one was obese with walking problems, one had neck problems, and two were non-verbal. In addition, this was also considered a challenge for the researcher, who is an architect and not a health professional, to learn how to manage their disabilities if staff were not in the immediate environment, to avoid inflicting any harm to the participants. Some of these
disabilities, such as being non-verbal, created challenges during the assessment of the level of cognitive impairment in those participants and as mentioned in the previous chapter, that was the main reason for referring to individuals’ level of cognitive impairment reported in their nursing records rather than utilising the MMSE (Folstein et al., 1975). Lastly, conducting interviews with people with dementia was a challenging process. Participants, at times, had difficulty remembering the garden environment during the interviews due to their memory problems. Hence, hints were given to them about the garden features to assist them in recalling the garden environment.

**Strengths of the Study**

Little attention has previously been given to investigating the positive effects of dementia-friendly outdoor natural landscapes (e.g., gardens) on agitation, apathy and the engagement of people with dementia living in a RACF. The number of studies which incorporate the design characteristics in a RACF as a psychosocial way to improve engagement and alleviate agitation and apathy is limited. This study is the only study we know of that put DFE characteristics into practice, and therefore has contributed to the existing knowledge in relation to the creation of DFEs both in theory and practice.

This case study has several key methodological strengths as follows:

First, this case study with embedded units integrated both qualitative and quantitative methodological approaches, which helped the conduct of a comprehensive analysis of two units of the case study, namely the garden environment and the people with dementia, and to improve the validity of the study. In terms of the study sample, all participants of the study were selected purposively to provide the richest data about the phenomenon (Johnson et al., 2014).
Triangulation of data was undertaken in several stages of the study. In Phase One, the assessment of the garden environment was not only conducted with the Dementia Therapeutic Garden Audit Tool, but it was also completed by the assessment of the environmental stimulus via PEAR in Phase Three. Additionally, to improve the garden design, data from the social biographies of participants were accompanied by a comprehensive site analysis to obtain an understanding of how to design the garden environment. In Phase Three, the assessment of people with dementia in terms of their level of agitation, apathy and engagement was combined with open-ended interviews with people with dementia and staff to obtain a more holistic perception of the participants’ experience of the garden and the intervention effects.

Overall, the current study filled the gaps and limitations of the previously reviewed studies. The environmental assessment, as a phase lacking in the previous studies, was conducted through a reliable tool for evaluating the garden environment. To our knowledge, this is the first study of the creation of a dementia-friendly garden using architectural plans which considered the sun/shade requirements, soil types and other attributes for growing plants or installing other garden features. In addition, to improve the validity of the study, the dementia-friendly characteristics, including well-known and widely accepted features, were used in the improvement stage of the garden design to ensure the validity of the design solutions. The intervention in Phase Three of the study adopted a flexible approach that valued the participants’ desires, needs and abilities while taking part in the intervention, and it was performed under a comprehensive protocol prepared in advance. Furthermore, for assessment of the intervention outcomes over time in people with dementia, a repeated measure design was applied, which is an inexpensive, feasible and robust approach for conducting an experiment (Seltman, 2012). The intervention outcomes were also assessed using
reliable and valid instruments to prevent any measurement biases (Smith & Noble, 2014)

**Limitations of the Study**

This study, as a new investigation on the effect of the garden design based on DFE characteristics on people with dementia, has several limitations where the results should be interpreted with caution. Study limitations are related to the study design and methodological approaches while others are related to some variables, such as physical and health status of participants and the physical layout of the facility, that might have influenced the results of the study. These limitations are addressed in this section.

This single case study design with a small sample size consisting of 10 people with dementia was conducted in one Queensland RACF. The use of a case study design as a robust research method for research with an explorative nature in its preliminary stage was justifiable for this study. Multiple case study design represents a more comprehensive understanding of the phenomenon (Yin, 2009). However, the high cost and time required for the recruitment of groups of people with dementia in other settings hindered the conduct of multiple case studies. Thus, the small sample size in one setting might limit the generalisation of the results to other groups or other settings. A larger sample size with the inclusion of multiple RACFs might provide a richer understanding of the phenomenon. In addition, although the quantitative results of this current study concerning the level of engagement and apathy were statistically significant, the clinical significance of the results could not be determined due to the small sample size of this single case study. The clinical significance of results focuses on four aspects: whether the results make a real difference to individuals’ (e.g., participants’) lives; whether the effects on participants are sustainable, whether the
intervention is cost-effective and whether the intervention is easily implemented, which require a comprehensive study with a large sample size (Page, 2014; Ranganathan et al., 2015). This study provided some initial insight into the potential clinical significance of the garden design based on DFE characteristics. Future large-scale studies with a larger sample size might provide a richer understanding of the phenomenon and address whether the results of such interventions are clinically meaningful for the residents. Moreover, the design of this study does not involve a control group to evaluate and compare the changes in the level of agitation, apathy and engagement within the two groups and as a result, a cause and effect relationship cannot be established. A randomised control trial (RCT) design in future studies might contribute to a more thorough examination of the effects of a garden design based on DFE characteristics.

The findings of this study also showed that the functional disabilities of participants, as well as the architectural design of the RACFs, can hinder the garden visits and, in turn, influence the positive outcomes, including agitation. Therefore, the future design of gardens for people with dementia in RACFs should be adapted to the needs of people with physical impairments, such as immobility. For instance, more raised garden beds of different heights, containers with wheels, adaptive tools, wheelchair accessible tables for potting and planting and easily accessible toilets should be provided. These elements could potentially make the garden more practical and accessible for the use of residents with disabilities, and this aspect might increase the use or duration of time spent in such gardens by the residents. Moreover, the findings of this study were presented without the commentary from the two participants with dementia (ID 7 and ID 8), who were unable to verbalise. To address this issue, a staff member who was familiar with the needs of those two participants was interviewed to give an account of the effect of the garden on these two participants. However, we are
conscious that this was a secondary view and not necessarily the views of the two participants.

As regards the seasonal timing of the study, the intervention and observation of the participants occurred during late spring and summer. There is not enough evidence showing the effect of the intense sunlight or hot weather on the duration of time participants spent in the garden. We do know that no one left the garden because of the hot weather. However, based on the qualitative findings, an additional shade cloth was recommended by some participants as a required element for the garden, and this implies that by installing such structures the accessibility of the garden and visits by people with dementia might be increased. Therefore, future studies can control for some variables which the design of this study hindered us from controlling, such as the microclimatic factors (e.g., weather, season), the physical (e.g., mobility) and health (e.g., feeling pain) status of people with dementia, and consider controlling for these factors as covariates (Salkind, 2010) in the analysis.

In addition, the partial facilitation of the intervention sessions by the researcher is subject to bias and might have influenced the participants’ behaviour or the activities they undertook in the garden. Even though the researcher did not initiate conversation with the participants, the participants’ social contact with her, such as asking questions or commenting on plants, might have influenced the results obtained in terms of the level of engagement. Future studies may control for the confounding factor of social contact with the researcher.

Additionally, the intervention facilitator in the RACF can play a crucial role in the use of the garden by the residents. The facilitator role involves enabling the implementation of the intervention into practice by providing supports to individuals for a purposeful engagement and participation (Cranley et al., 2017; Fritz, 2014). In this
study, the 4-week intervention period was facilitated by the researcher as the residents were taken to the garden daily by the researcher, and they were partially assisted with their activities. The presence of the facilitator directly impacts the effectiveness of any intervention (Shaw et al., 2010). In this current study, once the study was finished, the researcher was not present in the RACF to accompany the residents to the garden and support the residents, and in turn, the residents might not have profited from the garden environment and its potential benefits.

Graham-Cochrane (2010) reported that the usage of the garden is mainly dependent on support from staff members as facilitators of garden visits at RACFs and their understanding of the purpose of the garden-based intervention. By recognising the different elements of such gardens as well as their functions and use, staff will feel more empowered to develop activities that encourage the use of the gardens (Graham-Cochrane, 2010). Without ongoing staff support, there seems to be no significant use of the garden by the residents, even though the garden is designed with attractive elements, including green and blue spaces. It appears essential that visiting such gardens be incorporated into the daily practice of RACFs and equally essential that the staff members, as facilitators, accompany the residents to the garden regularly. Hence, in the care program of RACFs, consideration should be given to rostering staff members to take residents to the garden and to coordinate garden-based activities on a scheduled basis.

The regular facilitation of garden visits by the staff members, as an ongoing care program, allow residents opportunities to take advantage of the garden environment even without the presence of any researcher, and this might sustain the intervention effects over time. To reach this aim, research team members (i.e., intervention facilitators) should assist staff members or healthcare providers in implementing the
intervention by the end of the intervention period. This assistance involves the researchers’ information sharing with staff members by giving them clear guidelines of the intervention (Cranley et al., 2017). Follow-up visits by the researcher or an expert nurse are useful approaches to monitor the intervention process, reinforce guideline implementation and to ensure that there is an ongoing practice (Cranley et al., 2017). In future studies, the researchers should share the guidelines related to the intervention process to RACFs’ staff members and health care providers by organising meetings before the end of the intervention period. The studies should also record how the garden is used when the researcher is not present to facilitate the garden visits sessions and how the garden is used with the presence of staff member facilitators.

The above issues could be addressed in future studies in order to gain a more comprehensive insight into the area of creating gardens based on DFE characteristics and their potential impacts on people with dementia. Despite the limitations presented above, this case study with its utilisation of multiple data sources provided a rich understanding of the potential effects of the dementia-friendly garden on individuals and contributed to the body of knowledge.

**Summary of this Chapter**

This chapter presented a detailed discussion of the results of the study. In general, there were inconsistent results in terms of the potential effects of the outdoor natural landscape interventions on the agitation level of people with dementia. This discrepancy between the results of this study and the studies in the literature might have been related to multiple variables, such as the intervention characteristics, the participants’ physical or health status or the physical layout of the RACF, in the original design.
There was no study focusing on apathy as an outcome measure in the literature on outdoor natural landscapes, and this made the comparison of the results of this current study with other studies difficult. This current study showed the positive effects of the improved garden on the five domains of engagement. However, the majority of the studies reviewed indicated the effectiveness of the outdoor natural landscape interventions, including therapeutic gardens, gardening and green care farms, on promoting the level of socialisation and engagement with meaningful activities in people with dementia. In general, the results of this current study clarified the potential benefits of exposure to a garden design based on DFE characteristics for people with dementia. However, the positive outcomes of this study were limited by multiple factors, which should be considered in future investigations to give more insight into this area of knowledge. In the following chapter, a conclusion of the thesis will be presented, and several recommendations for both practice and future studies will be outlined.
Chapter Seven: Conclusions and Recommendations

Introduction

The primary objective of this 12-month case study design with a mixed-method approach was to improve the current status of the Ruby Garden in Stretton Gardens residential aged care facility (RACF) through incorporation of the characteristics of DFEs described by Graham-Cochrane (2010). The second objective was to explore the efficacy of the improved garden on the reduction of agitation and apathy and also on increasing the level of engagement of 10 people with dementia living in Stretton Gardens.

The study outcomes provided valuable information on the effectiveness of the garden improved with the DFE characteristics for people with dementia living in the RACF. Four key conclusions can be drawn from the outcomes of the study. The garden design based on DFE (1) promoted engagement of people with dementia living in the RACF, (2) decreased the level of apathy of people with dementia living in the RACF, (3) improved the level of environmental stimulation and (4) may contribute to reducing the level of agitation of people with dementia. These inferences are in line with the findings of the narrative review outlined in Chapter Two, where outdoor natural landscape interventions can potentially improve some behavioural symptoms of dementia of people living in RACFs (Motealleh et al., 2019).

The results of this study support the incorporation of DFE characteristics in the design of gardens in RACFs and lay a foundation for future studies concerning the creation of DFEs. Based on the results and limitations of this study, recommendations concerning the design, use and application of garden design, which are congruent with
DFE characteristics, are outlined for future studies, clinical practice and designers as detailed below.

**Recommendations for Future Studies**

As discussed in Chapter Six, further studies using more robust study designs, such as a randomised control trial (RCT) where residents are not exposed to the dementia-friendly garden as a comparison group, may be useful to examine the effects of these gardens. The studies might utilise a larger number of participants to ensure greater statistical power and improve generalisability of the results.

To date, there is a paucity of studies focusing on the efficacy of gardens in reducing the level of apathy of people with dementia. Since there is no definite drug treatment for relieving apathy in people with dementia, and psychosocial interventions have been shown to alleviate the apathetic behaviours of people with dementia (Brodaty & Burns, 2012), it is recommended that such psychosocial interventions, including garden design based on DFE characteristics, be conducted to explore their efficacy in reducing apathy in people with dementia living in RACFs.

The main focus of this study was on agitation, apathy and engagement of people with dementia as outcome measures. However, the findings of the study also showed perceived mood improvements reported by staff members in interviews. Future research may focus on mood as an outcome measure. Furthermore, although the interviews with people with dementia were challenging, they provided good sources of information on the garden and the experiences of the participants. Staff members also gave the researchers valuable information on the requirements of the improved garden for people with dementia. Future studies may also interview family members of the residents in the RACF. Family members can provide additional information on interests, culture and
other aspects of the residents’ life, which were not reported in the nursing records or expressed by the residents. Such information can be incorporated in order to enrich the design of gardens.

This study also identified some barriers and problems, including individuals’ physical disabilities and microclimatic factors (e.g., weather), which impeded the optimum use of the garden for people with dementia. As the dementia-friendly garden is a new type of intervention, many of these barriers are not fully understood. Future studies should seek a deeper understanding of the potential barriers and the effects of these barriers on the use of such gardens by people with dementia.

**Recommendations for Policy and Practice**

The evidence from this study suggests that DFE characteristics should be incorporated into the design of gardens in RACFs and aged care policy should allocate funding for the creation and development of DFEs in community clinics and healthcare settings. Even though several previous studies reported the overall effectiveness of gardens on the signs and symptoms of dementia and the importance of the application of this type of intervention in healthcare or clinical settings (Connell et al., 2007; Edwards et al., 2013; Evans et al., 2019; Hernandez, 2007; Liao et al., 2018), the adoption of DFE characteristics in such settings is not common. The application of DFE characteristics in clinical settings’ gardens can optimise the care of people with dementia due to the potential benefits they can bring. It is recommended that regular visits to such gardens be incorporated into the care programs of the RACFs for the people with dementia to take advantage of both the calming environment of gardens and engagement in garden-related activities. For instance, RACFs with the assistance of staff members can coordinate volunteer gardening groups with the inclusion of residents
in order to encourage them to actively engage in gardening activities or participate in the maintenance of the garden. Nevertheless, according to Hassink et al. (2019), the lack of volunteers with sufficient information about gardening and maintenance of the gardens in nursing homes is considered to be a major challenge. Regular care and maintenance of the garden should be incorporated into the RACFs activities since, as stated in the previous chapter, the success and sustainability of the garden, and thereby its positive impact is mainly dependent on the maintenance program of the gardens.

**Education.** Since there is a need to encourage people with dementia to engage with features and meaningful activities of the garden, it is essential for stakeholders and clinicians to gain a more in-depth insight into the different residents’ needs, desires and interests while providing such activities. In general, obtaining adequate knowledge about the DFE concept and becoming familiar with its characteristics for improving the gardens of RACFs based on the needs of people with dementia is necessary. This can occur through staff education, where short learning modules are delivered by a group of experts (e.g., healthcare professionals, researchers and designers) in the area of creating DFEs. The focus of education could be placed on how to move towards DFEs in outdoor spaces of RACFs, specifically the gardens, and what the effects of such gardens on people with dementia are. Furthermore, conducting more intervention studies in RACFs with respect to the creation of such gardens and their potential benefits might also be another source to inform education and can be a means of increasing knowledge on the benefits of such gardens. Not only should clinicians and staff be educated about these concepts, but they should encourage residents to use these gardens more frequently to help people with dementia to be included, accepted and connected with other individuals.
Design. Excessive or insufficient levels of stimulation and lack of engagement experienced by people with dementia living in RACFs is a major problem (Cohen-Mansfield, Dakheel-Ali, et al., 2015). Furthermore, the short-term memory problems associated with dementia lead to difficulty in spatial perception of the RACFs as well as orientation (Health Building Notes, 2015; McLean, 2007; O'Malley et al., 2017). These challenges for people with dementia, necessitate a high-quality DFE design to meet the growing demands of people with dementia in RACFs. Thus, it is highly recommended for designers to actively involve people with dementia as well as healthcare professionals in the design process through identifying people’s demands, needs and preferences in the creation of a DFE. This approach can increase individuals’ independence and control over the environment as well as assist designers and architects in achieving practical design solutions.

Moreover, the findings of this study highlighted that it is important to conduct a site analysis (i.e., environmental assessment phase) before modifying a garden in order to identify any deficiencies and to avoid the creation of an environment which is impractical for people with dementia. In addition, the findings of this study supported the importance of DFE characteristics, including accessibility, sensory stimulation and meaningful activities in improving the behaviours, socialisation and engagement of people with dementia, and this suggests that designers should focus on these characteristics in the design of gardens in RACFs.

Conclusion

This chapter presented a concluding overview of the thesis in relation to the associated results and findings of the study. This study is the first known case study incorporating the DFE characteristics in garden design for people with dementia in
RACFs, which found that such gardens had promising effects on the level of apathy and engagement of people with dementia living in a RACF. Several recommendations were made for future researchers, clinicians and designers which might be helpful and practical for the design, implementation and adoption of garden design based on DFE in RACFs. In order to facilitate a dementia-friendly design approach in RACFs, collaboration among stakeholders, clinicians in clinical settings and designers is required to bring about potential benefits and outcomes of these gardens for people with dementia living in RACFs.
Appendices

Appendix A: Ethical Approval

7/8/2020

Your Human Ethics Protocol 2018/085 has been Fully approved

RIMS Griffith <rims@griffith.edu.au>

Thu 22/02/2018 8:22 AM

To: Cindy Jones <C.Jones@griffith.edu.au>; Parinaz Motealleh <parinaz.motealleh@griffithuni.edu.au>; Wendy Moyle <w.moyle@griffith.edu.au>

Cc: research-ethics <research-ethics@griffith.edu.au>; Rick Williams <rick.williams@griffith.edu.au>

GRIFFITH UNIVERSITY HUMAN RESEARCH ETHICS COMMITTEE

Dear Dr Cindy Jones

I write in relation to your application for ethical clearance for your project “Creating a Dementia-Friendly Environment in Australian RACFs Through the Use of a Therapeutic Landscape” (GU Ref No: 2018/085). The research ethics reviewers resolved to grant your application a clearance status of “Fully Approved”.

This is to confirm receipt of the remaining required information, assurances or amendments to this protocol.

Consequently, I reconfirm my earlier advice that you are authorised to immediately commence this research on this basis.

The standard conditions of approval attached to our previous correspondence about this protocol continue to apply.

Regards

Rick Williams
Manager Research Ethics and Integrity
Office for Research
Griffith University
Nathan
Brisbane QLD 4111
Tel: (07) 373 54375
Mob: 0418 638 911
Email: Rick.Williams@Griffith.edu.au
Appendix B: The Dementia Therapeutic Garden Audit Tool

ALZHEIMER’S AUSTRALIA WA
DEMENTIA THERAPEUTIC GARDEN AUDIT TOOL

Date

Name of auditor

Name of day centre/nursing home

Address

Scoring System
0 = Feature not present (e.g., no entry patio, quality missing, not familiar or home like
1 = Poor - fair
2 = Moderately good - could be improved
3 = Very good - Successful
NA = Not applicable

Score the garden according to each of the following issues and add notes where appropriate.

Contact person

KEY DESIGN PRINCIPLES
- Accessibility
- Orientation
- Meaningful Activity
- Socialisation
- Sustainability
- Reminiscence
- Sensory Stimulation
- Safety

LOCATION AND ENTRY TO GARDEN
Accessibility  Orientation  Sensory Stimulation  Socialisation  Safety

Score

1. Visibly accessible from inside the building so people can see the garden when going about their daily activities inside.

2. The door/s to the garden is easy to see and locate. The door contrasts easily against the wall and the pathway to the door is clear of obstacles.

3. The door/s into the garden are easy to operate. (Light weight and easy to pull / push to allow time for people with walking frames/wheelchairs to go through).

4. Door handles are contrasting colour to the door.
Scoring System

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NA = Not applicable

5. The door/s is unlocked each day to allow people to go outside to the garden.

6. The threshold of the entry door is flat and smooth.

7. There is a shaded seating patio area just outside the door for people who want to go outside but cannot venture further.

8. There is an attractive garden view from this exit/entry patio to the garden as this space may get used more than the garden.

9. The exit/entry patio is large enough to accommodate 4-6 people in wheelchairs with a table and chairs to suit 3-4 people all seated with a clear view to garden area with easy access to entry/exit door.

10. In areas with significant fly/mosquito problems, the entry patio is screened and lit at night.

11. The entry patio receives late afternoon sunshine, avoiding long shadows that may increase agitation at this time of day.

12. The entry patio is an area people can enjoy a semi outdoor experience all year round having bright natural light beneficial to health.

13. Entry patio - one point for each:

   Birds in cage  
   Bird bath  
   Water feature  
   Statue  
   Colourful plants  
   Art work  
   Butterfly/bird attracting plants  
   Other

Comments:

www.enablingenvironments.com.au
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Comments:

ORIENTATION - SAFETY: PROVIDE FOR SAFE WALKING & UNOBTUSIVELY REDUCE RISKS - LAYOUT AND PATHWAYS

14. The entry patio is designed as a landmark so that those using the garden can easily see where they have to navigate to return to the indoor area.

15. Staff can view the whole garden area from inside the building when going about daily activities.

   100% (score 3)  50% (score 2)  25% view (score 1)  < 25% (score 0)

16. Signage in and around the garden clearly indicates users to entry points and key locations (E.g. Toilet).

17. The pathway is a simple looped continuous well defined pathway. It has no “dead ends” or confusing choices whether to turn right or left to return where they started.

18. The pathway guides people past points of interest linking to small and large garden areas.

19. The pathway has destination points such as: a gazebo, shaded seating areas, large shaded tree (with seating underneath), providing opportunities for social interaction.

www.enablInenvironments.com.au
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20. The pathway is level and well maintained; free of mould, broken pavers, loose gravel and obstacles such as overhanging tree branches.

21. The path surface is non-reflective and well defined, consistent in colour with a contrasting border to support way finding and define the edge from paving to garden.

22. The main pathways are a minimum of 1.8m wide to allow for wheelchairs to pass. Smaller pathways are 1.2 - 1.5m wide, allowing for individual journeys.

23. There is an appropriate pathway surface for wheelchairs, walkers, shuffling feet etc. Brushed concrete or asphalt provide appropriate traction.

24. Hand rails are placed intermittently along the pathway for people for people to rest against, or balance themselves as they move through the garden.

Comments:

SUPPORT MEANINGFUL ENGAGEMENT - MEANINGFUL ACTIVITY

25. There are raised garden beds of different heights for easy access (wheelchairs, walkers and seating) allowing people to grow vegetables, herbs and/or flowers.

26. There is easy access to garden tools such as hand trowels, watering can (water tap nearby which is clearly identified) and garden broom to sweep leaves (if shed is not available). Tools are available for those with limited strength and mobility.

www.enableenvironments.com.au
27. Seating is available at garden beds for people to sit and enjoy gardening activities without having to stand.

28. A bird aviary or fish pond is available for people to interact with daily.

Comments:

THE GARDEN SHED

29. The garden shed is easily accessible for people – sun hats, garden tools, brooms and rake are within easy reach. Storage containers have labels or are seen through for easy identification. *There are NO chemicals/paint/pesticides or electrical items stored here* - the maintenance shed is separate.

30. A table is positioned next to the shed with ample shade for seating.

31. The shed for maintenance staff is subtly disguised with planting. This maintenance shed is locked at all times.

Comments:
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SEATING: PROVIDE OPPORTUNITY TO BE ALONE OR WITH OTHERS - SOCIALISATION

☐ 32. There are shady areas to relax, sit or read a book.
☐ 33. There are seating options for a person to sit alone, as a couple, or with others.
☐ 34. Sheltered, all year round outdoor entertaining area for celebrations, family visits and outdoor group activities.
☐ 35. Appropriate seating design – backrest and armrest for ease when transferring from sitting to standing position.
☐ 36. Comfortable seating: timber or hard plastic material preferable. Seat cushions available for additional comfort.
☐ 37. Choice of seating available in the sun/shade throughout most of the year.
☐ 38. Seating at frequent intervals along main pathway, every 15ft or 4.57m to provide an opportunity for people to sit quietly and rest when walking along the path.
☐ 39. When seated, the view is interesting and attractive. Views to a bird feeder or plants that attract birds, colourful flower beds, varied plant shapes colours and textures, sculpture, watching people walking by or children playing from the local school.
☐ 40. There is some portable seating available which is easy to move but sturdy and stable to prevent trip hazard.

Comments:

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SENSORY STIMULATION

Reininiscence • Sensory: Smell • Touch • Sound • Taste • Vision - Safety

41. Provision of features that evoke memories for people: These might include garden shed, vegetable garden, wheelbarrows, barbecue, pottery, bicycle or pieces of farm equipment (*Consider safety measures - fix pieces to the ground)

42. Small scale design changes so that a person walking slowly would have a variety of visual experiences e.g. varied plants, open/sunny/shaded/walking under trellis/ pergola.

43. Avoidance of structures (e.g. trellis/pergola) that cast slatted shadows which may be interpreted as depth changes by people with perception issues.

44. Opportunity to sit, listen and observe wildlife: plants that attract birds, butterflies, a bird feeder and bird bath.

45. Opportunity to sit, listen to watch and touch interesting water features, which also act as orientation points around the garden.

46. Opportunity to see and touch different textured plants such as grasses and trees with soft leafy branches that rustle in the wind.

47. Bright colourful contrasting seasonal flowers and succulents arranged and planted at different heights providing a colourful garden colour all year round.

48. Aromatic plants such as jasmine, frangipani, lavender, roses; these plants often promote conversation and reminiscence.

49. Edible plants: lemon/orange fruit trees, herbs such as mint parsley, basil, a vegetable patch with carrots, lettuce and tomatoes (positioned at a height that is easy to access e.g. raised garden bed)

50. Colourful hanging baskets/interesting mosaics on blank large wall areas, bright coloured pots and planters.

51. The garden area has adequate lighting so the area can be accessed for walking and sitting on warm evenings or viewed from inside when dark.

52. All plants are non-toxic, without thorns or spikes (these may cause skin tears).
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Comments:

SUSTAINABILITY

53. Plants are predominantly low maintenance except in interactive garden beds, and suitable for the geographical placement of the garden in Australia. E.g. drought tolerant and water-wise in W.A.

54. A gardening group of residents, volunteers, or a regular gardener maintaining the garden area.

55. A rainwater tank is available for use in the garden, easily accessible with watering can nearby.

56. Quality of plants - overall the plants look healthy.

57. Litter receptacles and ash trays available (in appropriate areas) The shed for maintenance staff is subtly disguised with planting.

58. Signage leading to outside toilets.

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59. Trees that drop leaves are well pruned and maintained and are set back from pathways avoiding walk areas becoming a slip hazard.

Comments:

60. Garden receives at least half a day of full sunlight.

61. Good diversity of plants selected for seasonal interest, variety, shade qualities, screening and plants that attract the wildlife.

62. Flat lawn area large enough for informal grouping of portable chairs, ball games or for people to sit or lie on.

63. Blue sky vista (clear overall view to sky).

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<td>64.</td>
<td>Gate into garden for maintenance staff and/or serving as an emergency exit is subtly disguised with planting or has a hidden panel in the fence.</td>
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<tr>
<td>65.</td>
<td>Outdoor space is free from unpleasant sounds such as loading dock, loud air conditioners etc.</td>
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<td>66.</td>
<td>Outdoor space has views of interest for people to sit and watch from the garden such as local school, people walking by to local shops.</td>
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<td>67.</td>
<td>Perimeter of the building surrounds the garden as much as possible, so the degree to which the garden has to be fenced is minimised.</td>
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<tr>
<td>68.</td>
<td>There is a degree of privacy from resident rooms/windows looking out onto the garden space.</td>
</tr>
<tr>
<td>69.</td>
<td>Opportunity for staff to sit in a private space away from their work, out of sight of residents to enjoy a break.</td>
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<tr>
<td>70.</td>
<td>Trees and tall shrubs act as a screen to the boundary fence and form a natural framework to the garden.</td>
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<tr>
<td>71.</td>
<td>Provision of outdoor smoking area in the garden or elsewhere.</td>
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<tr>
<td>72.</td>
<td>An area for visiting children to play.</td>
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Add up the total number of 0-1, total number of 2's, and total number of 3's

- Mostly 0-1 Poor environment
- Mostly 2's Room for improvement
- Mostly 3's A successful garden that is supportive
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### IDENTIFIED HAZARDS - TRIP HAZARDS/FALLS/SKIN TEARS

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<td>1</td>
<td>Lawn/garden bed sprinklers are set above ground level</td>
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<td>2</td>
<td>Plants with thorns/spikes</td>
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<td>3</td>
<td>Garden furniture in need of repair</td>
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<td>4</td>
<td>Hose/garden tools left out</td>
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<td>5</td>
<td>Entry/exit blocked</td>
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<td>6</td>
<td>Pathway blocked</td>
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<td>7</td>
<td>Uneven paving</td>
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<td>8</td>
<td>Steep paths</td>
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<tr>
<td>9</td>
<td>Sunken pavers</td>
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Highlight identified hazards for immediate attention.

List the audit question numbers that need most attention:

Comments:
The garden's success is very much dependent upon staff's understanding of the therapeutic value and design of the area. By recognising the different elements and their functions and use, staff will feel more empowered to develop activities that encourage the use of the garden.

**STAFF COMMENTS**

How many residents currently use the garden area each day?

What is the garden used for on a regular basis?

- Meals
- Reminiscence
- Gardening groups
- Other activities

Do family and friends of residents use the garden when visiting?

Do staff enjoy going into the garden with residents? If not, why not?

What changes/additions would the staff like to see to encourage people to go outside?

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**Scoring System**

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**Other comments:**

*Note. From Alzheimer’s Australia WA, 2015*

Appendix C: Information Sheet for the Gardener

Creating a dementia-friendly environment in Australian residential aged care facilities through the use of a therapeutic landscape

INFORMATION SHEET

Gardener

GU Reference Number: 2018/085

Research Team

Prof. Wendy Moyle
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School of Engineering and Built Environment
Griffith University
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Ms. Parinaz Motealleh (Researcher)
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Griffith University
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parinaz.motealleh@griffithuni.edu.au

Background
There are more than 413,106 people living with dementia in Australia and it is estimated that this will increase to 1,100,890 by the year 2056. Agitation and apathy in people with dementia are often due to excessive or insufficient levels of stimulation in the environment; inappropriate environmental conditions; as well as the lack of engagement or socialisation with others. Therapeutic landscapes, which include hardscapes (e.g., walkway, gazebos and water features, softscapes (e.g., plants, flowers and tree) and different scents, colours, textures and sounds, have been shown to have beneficial impacts on health and well-being of people with dementia by reducing agitation, as well as improve apathy and social engagement. To date, little attention has been placed on the characteristics of friendly and stimulating environments for people with dementia while designing these therapeutic landscapes. The aim of this study, which is a PhD research project, is to examine the effect of a newly designed therapeutic landscape (i.e., garden) that is aligned with the characteristics of a friendly stimulating environment on agitation, apathy, and engagement in people with dementia living in residential aged care facility.

**What the research will involve**

You are being asked to participate in a face-to-face interview with Ms. Motealleh. The interview aims to seek your gardening experiences in relation to Stretton Gardens and to investigate the ideal plants and flowers you may suggest for planting in the garden. The interview will last approximately 30 minutes and will be conducted in the care facility at a date and time that is convenient to you. Interviews will be digitally recorded so that the interview can be accurately transcribed. The digital audiotape will be erased following the transcription of the interview.

**Why you have been chosen to participate**
You have been chosen to participate in this study as you have the experience of growing various types of flowers and plants in this garden.

**Risks**

Participation in this study poses no foreseeable risks as the study will only seek your views about gardening in Stretton Gardens. You will only be asked to reveal to the researcher what you feel comfortable to discuss. It is recommended that you stop the interview immediately and discuss with the researcher any concerns that may arise during the interview.

**Confidentiality**

All information collected in this project will be kept confidential, and only the named investigators will have access to the data collected. All data will be de-identified prior to transcription, and an ID code will be assigned to you. Hard copies of all data collected, processed, and analysed during the project will be held for five years in secure storage at Griffith University. The audio-recording of interviews will be destroyed after transcription. Electronic files will be stored on a Griffith University secure research drive, with access restricted to the listed CIs. You will NOT be named or identifiable in any research publications arising from the study.

**Voluntary Participation**

Your participation in this study is entirely voluntarily, and non-participation will not involve any penalty or impact on your relationship with the facility/organisation. If you decide to take part and later withdraw from this project, you are free to do so at any stage. No explanations need to be given and there will be no penalty for withdrawal from the project.

**Ethical Conduct**
Griffith University conducts research in accordance with the *National Statement on Ethical Conduct in Research Involving Humans*. If you have any concerns or complaints about the ethical conduct of the research project, please contact the Manager, Research Ethics, Office for Research, Bray Centre, Nathan Campus, Griffith University (Tel: 07 3735 4375 or research-ethics@griffith.edu.au).

**Privacy Statement**

The conduct of this research involves the collection, access and/or use of your identified personal information. The information collected is confidential and will not be disclosed to third parties without your consent, except to meet government, legal or other regulatory authority requirements. A de-identified copy of this data may be used for other research purposes including publishing openly (e.g., in an open access repository). However, anonymity will at all times be safeguarded. For further information consult the University’s Privacy Plan at [http://www.griffith.edu.au/about-griffith/plans-publications/griffith-university-privacy-plan](http://www.griffith.edu.au/about-griffith/plans-publications/griffith-university-privacy-plan) or telephone (07) 3735 4375.

**Feedback**

You will receive a summary of the results at the end of the study period.

**THANK YOU FOR CONSIDERING PARTICIPATION IN THIS STUDY.**
Appendix D: Consent Form for the Gardener

Creating a dementia-friendly environment in Australian residential aged care facilities through the use of a therapeutic landscape

CONSENT FORM

Gardener

GU Reference Number: 2018/085

Research Team

Prof. Wendy Moyle
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School of Engineering and Built Environment
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Ms. Parinaz Motealleh (Researcher)
Menzies Health Institute Queensland
School of Nursing & Midwifery
Griffith University
04 7870 9042 / 04 9065 8345
parinaz.motealleh@griffithuni.edu.au

By signing below, I confirm that I have read and understood the information package and in particular:
I understand that once my interview is completed and has been transcribed and the transcriptions checked for accuracy, the digital recordings will be destroyed.

I have had any questions answered to my satisfaction.

I understand the risks involved.

I understand that my participation in this research is voluntary.

I understand that I am free to withdraw consent at any time, without explanation or penalty.

I understand that my name and other personal information that could identify me will be removed or de-identified in publications or presentations resulting from this research.

I understand that a summary of the general findings from the study will be made available to me.

I understand that I can contact the Manager, Research Ethics, at Griffith University Human Research Ethics Committee on 3735 4375 (or research-ethics@griffith.edu.au) if I have any concerns about the ethical conduct of the project.

☐ I agree to participate in the project.

<table>
<thead>
<tr>
<th>Name of participant (gardener)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Signature of participant (gardener)</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td></td>
</tr>
</tbody>
</table>
Appendix E: Interview Schedule for the Gardener

INTERVIEW SCHEDULE

Gardener

GU Reference Number: 2018/085

Gardener Preamble: This research project is investigating the effect of a friendly and stimulating environment through the use of a therapeutic landscape (i.e., garden) on people with dementia who live in the residential aged care facility (RACF). The purpose of this interview is to explore your gardening experience in the RACF, which will give an insight into the project design for the garden.

I would like to digitally record the interview. Once the interview is completed and has been transcribed and the transcriptions checked for accuracy, the digital recordings will be destroyed. Is this okay with you?

All information collected in this project will be kept confidential. Only the investigators will have access to the data collected. Your name and other personal information will be removed or de-identified in publications or presentations resulting from this research.

The interview is expected to take about 30 minutes, but you are free to stop at any point. Do you have any questions before we begin?

Please state your full name?

Tell me a little about yourself and your gardening experience?

What are you growing in this garden right now?

Probe: Does it grow well?

Probe: How often do you recommend fertilising?

Probe: How often do you recommend watering?

Do you know what the type of soil is in the garden?

Probe: Is it suitable for a particular type of plant?

What plants/flowers grow fast in this type of soil?

Probe: How many days does it take for growing?
How often does it need water?

Do you water it regularly?

What are the most challenging plants/flowers to plant in this type of soil?

Probe: Why are they challenging to grow?

Have you ever planted edible plants in this garden? Did they grow well?

Probe: Which edible plants have you planted?

Have you ever planted perennials here? Did they grow well?

Probe: Which perennials have you planted?

What plants work in pots?

How often do you water the pots?

Do you know which plants/flowers the residents like the most?

Probe: Why do they like these plants/flowers the most?

Can you recommend some low-maintenance plants or flowers for planting in this garden?

Do you have any ideas for keeping the garden plants within a small budget?
Appendix F: Sun/Shade Simulation

Note. Sun/shade Simulation. Sun path photos were adapted from Suncalc, 2019 (https://www.suncalc.org/#/-27.6404,153.0556,16/2020.07.04/11:01/1/0).
Appendix G: Changes to the Southwest Pathway in Ruby Garden

1. Angel Sculpture
   A Means of Reminiscence

2. Wheelbarrow Sculpture
   A Means of Reminiscence

3. Multistand Planter
   Residents’ Access to the Plants

4. Garden Shed with Gardening Tools
   A Means of Meaningful Engagement

5. Bins (Rubbish and compost)
   A Means of Sustainability
Appendix H: Changes to the Northern Side of Ruby Garden

1. Mat Rush
   Sensory-Provoking Plant

2. Bush Rose
   Sensory-Provoking Plant

3. Hibiscus
   Sensory-Provoking Plant

4. Grevillea
   Sensory-Provoking Plant
Appendix I: Changes to the Intersection of Pathways

1. Worm Stake
   Sensory-Evoking Element
2. Giraffe Statue
   Sensory-Evoking Element
3. Coastal Rosemary
   Sensory-Provoking and Sensory-Evoking Plant
4. Water Feature
   A Means of Orientation
Appendix J: Changes to the Southern Side of the Ruby Garden

1. Raised Garden Bed
   Filled with Jasmine
   Sensory-Provoking and
   Memory-Evoking Plant

2. Raised Garden Bed
   Filled with Camelia
   Sensory-Provoking and
   Memory-Evoking Plant

3. Bench with Cushion
   Comfortable Seating as a Means of Socialisation

4. Sign for Navigation
   As a Means of Orientation
Appendix J: Changes to the Southern Side of the Ruby Garden

<table>
<thead>
<tr>
<th>No.</th>
<th>Plant</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Banksia</td>
<td>Bird Attracting</td>
</tr>
<tr>
<td>2</td>
<td>Wattle</td>
<td>Bird Attracting</td>
</tr>
<tr>
<td>3</td>
<td>Ornamental Pear</td>
<td>Seasonal Change</td>
</tr>
<tr>
<td>4</td>
<td>Bottle Brush</td>
<td>Bird Attracting</td>
</tr>
<tr>
<td>5</td>
<td>Correa</td>
<td>Bird Attracting</td>
</tr>
<tr>
<td>6</td>
<td>Lambs ear</td>
<td>Textured Plant</td>
</tr>
</tbody>
</table>
Appendix K: Changes to the Southeast Pathway of Ruby Garden

1. Hanging Basket
   Filled with Impatiens walleriana

2. Kangaroo Statue
   Memory-Evoking Element

3. Bottle Brush
   Bird Attracting Plant

4. Banksia
   Bird Attracting Plant
Appendix L: Changes to the Eastern Side of Ruby Garden

1. Jacaranda  
   Seasonal Change

2. Pawpaw  
   Edible Plant

3. Desert Rose  
   Sensory-Provoking Plant

4. Nasturtium  
   Seasonal Change

5. Star Jasmine  
   Sensory-Provoking Plant
Appendix M: Changes to the Edges of Pathways

1. 2 Metres Handrail
   A Means of Safety

2. Contrasting Edges
   A Means of Navigation

3. 1.5 Metres Handrail
   A Means of Safety
Appendix N: The Quick Smell Identification Test

## Appendix O: The Cohen Mansfield Agitation Inventory-Short Form

Please read each of the agitated behaviours, and check how often (from 1-5) they were manifested by the participant over the last 2 weeks; if more than one occurred within a group, add the occurrences, e.g., if hitting occurred on 3 days a week, and kicking occurred on 4 days a week, 3 + 4 = 7 days; circle 4, once or several times a day.

<table>
<thead>
<tr>
<th>Behaviour</th>
<th>Never</th>
<th>Less than once a week</th>
<th>Once or several times a week</th>
<th>Once or several times a day</th>
<th>A few times an hour or continuous for half an hour or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cursing or verbal aggression</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. Hitting (including self), Kicking, Pushing, Biting, Scratching, Aggressive Spitting (include at meals)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. Grabbing onto people, Throwing things, Tearing things or destroying property</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. Other aggressive behaviours or self abuse including: Intentional falling, Making verbal or physical sexual advances, Eating/drinking/chewing inappropriate substances, Hurt self or other</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. Pace, aimless wandering, Trying to get to a different place (e.g., out of the room, building)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. General restlessness, Performing repetitious mannerisms, tapping, strange movements</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7. Inappropriate dress or disrobing</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8. Handling things Inappropriately</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9. Constant request For attention or help</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10. Repetitive sentences, calls, questions or words</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11. Complaining, Negativism, Refusal to</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
follow directions

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. Strange noises, (weird laughter or crying)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13. Hiding things, Hoarding things</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14. Screaming</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>


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### Appendix P: Person-Environment Apathy Rating (PEAR) Scale

<table>
<thead>
<tr>
<th>Stimulus Clarity</th>
<th>Environment Subscale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chaotic</td>
<td>1</td>
</tr>
<tr>
<td>Multiple competing, disorganised, or overwhelming stimuli as a whole without a single discernible one. Stimulus is complicated and indiscernible.</td>
<td>Uncomplicated and indiscernible</td>
</tr>
<tr>
<td>Static atmosphere with minimal stimulus present</td>
<td>Complicated but discernible</td>
</tr>
<tr>
<td>Multiple stimuli are present but at least one stimulus discernible e.g., multiple people walking around or talking but one person is talking to the subject in front of him/her</td>
<td>Straightforward</td>
</tr>
<tr>
<td>At least one primary stimulation present that is very straightforward, consistent, well-organised, or guided without overwhelming background or competing stimulus</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stimulus Strength</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimal</td>
<td>Weak</td>
</tr>
<tr>
<td>No detectable stimulus</td>
<td>Vague, weak, occasional stimulus e.g., unclear background conversation or background music</td>
</tr>
<tr>
<td>Clear, detectable, continuous, routine stimulus (e.g., meal in the front, clear conversation, moderate volume of TV, or music as a main activity)</td>
<td>Moderate</td>
</tr>
<tr>
<td>Loud, noisy, and/or overwhelming stimulus. e.g., loud conversation, alarm OR novel or surprised event</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stimulus Specificity</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not toward the participant</td>
<td>Partially toward the participant</td>
<td>Toward the participant</td>
</tr>
<tr>
<td>Either no stimulus or only stimulus delivered toward others, not toward the subject. E.g., alarms not meant to the subject to respond to</td>
<td>Stimulus delivered to the group including the subject. E.g., music and TV show played in public areas that subject is present</td>
<td>Stimulus directly delivered to the subject. e.g., call subject’s name or present stimulus in front of the subject. OR door alarm triggered by the subject</td>
</tr>
<tr>
<td>Stimulus is not only directly offered to the subject, but is also tailored based on subject’s need, preference or to the subject personally. E.g., staff asks subject about the</td>
<td>Directed and related to the participant</td>
<td></td>
</tr>
<tr>
<td>Interaction Involvement</td>
<td>No interaction</td>
<td>Interaction does not include the participant</td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>There is no interpersonal conversation or interaction involved</td>
<td>Interpersonal conversation or interaction is present but does not include subject</td>
<td>Interpersonal conversation or interaction is present only when subject initiates it</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physical Accessibility</th>
<th>Very inaccessible</th>
<th>Somewhat inaccessible</th>
<th>Very accessible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stimulus is distant and external barriers are put up, so subject is unable to reach out without others’ assistance. e.g., bed ridden with bedrail raised.</td>
<td>Stimulus is distant. No external barriers are put but subject is limited by physical disability. So, subject can physically access stimulus but requires assistance or assistive device. e.g., subject sits on the wheelchair away from the ongoing activity</td>
<td>Stimulus is distant. But no external barriers are put up and subject can physically access stimulus without assistance or assistive device</td>
<td>Stimulus is present in front of subject. Subject can easily physically access stimulus on his/her own without assistance.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environmental Feedback</th>
<th>Restrictive</th>
<th>Attentive</th>
<th>Prompting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prohibits subject’s engagement or expression e.g., staff says “don’t do that!” OR door alarm triggered when subject attempts to go out</td>
<td>Disregards subject’s expression, response, needs, or desire OR responds to subject in a cold manner</td>
<td>Monitors subject’s expression, response, needs, or desire OR responds to subject in a passive, neutral manner</td>
<td>Prompts subject’s expression or engagement OR responds to subject or fulfill their desire in a warm, welcoming neutral manner</td>
</tr>
</tbody>
</table>


237
## Appendix P: Person-Environment Apathy Rating (PEAR) Scale

<table>
<thead>
<tr>
<th>Apathy Subscale</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Facial expression</strong></td>
<td>Extreme expression</td>
<td>Moderate expression</td>
<td>Mild expression</td>
<td>Minimal expression</td>
</tr>
<tr>
<td>Constant, loud, or excessive facial expression of mood e.g., laugh, weep, or yell (with sounds)</td>
<td>Occasional, observable facial expression of mood, e.g., obvious frown or smile (often with mouth opened or teeth exposed)</td>
<td>Infrequent, slight facial expression of mood, e.g., slight forehead, eyebrow, or mouth curves turning toward up or down</td>
<td>No observable facial expression of mood, e.g., no forehead, eyebrow, or mouth curves turning toward up or down</td>
<td></td>
</tr>
<tr>
<td><strong>Eye contact</strong></td>
<td>Sustained eye contact with specific target</td>
<td>Random eye contact with unspecific target</td>
<td>Eyes open but blank</td>
<td>Eyes closed</td>
</tr>
<tr>
<td>Sustained eye contact with specific target</td>
<td>Random eye contact with unspecific target</td>
<td>Eyes open but blank</td>
<td>Eyes closed while not at rest</td>
<td></td>
</tr>
<tr>
<td><strong>Physical engagement</strong></td>
<td>Enthusiastic engagement</td>
<td>Basic engagement</td>
<td>Slight engagement</td>
<td>Minimal engagement</td>
</tr>
<tr>
<td>Constantly and energetically engage in activity/interaction/conversation with intimate physical contact or thoughtful physical actions e.g., energetically eating a meal with food preparation and adjustment, e.g., put cream in coffee OR using</td>
<td>Pay constant attention and constantly engage in an activity/interaction/conversation including sufficient physical contact, gesture, or actions (including talking) but no observable thoughtful physical action or intimate physical contact</td>
<td>Pay some attention and intermittently engage in an activity/interaction/conversation with slight physical action or using head or upper body movement to interact with others without physical contact</td>
<td>Not engage in any observable activity OR only maintain a still position with minimal gesture, body movement, or physical interaction with anyone or anything</td>
<td></td>
</tr>
</tbody>
</table>
physical actions or intimate physical contact interacting with others e.g., hug, kiss

OR whole body action to approach to the stimulus e.g., frequently eating a meal that is offered but no adjustment for the meal OR Using the whole body or lower extremity movements (e.g., walking) to approach or avoid specific targets OR have some

OR Using upper body movement to approach the stimulus e.g., eating one bite of the meal once a while OR e.g., nod, head shake, shrug, lean body, or hand shake

Purposeful gestures, but not intimate physical contact with others (e.g., weaving hand to say goodbye, hand-to-hand contact)

Purposeful activity

Self-initiated purposeful activity

e.g., asking for a refill of water during meal time

Purposeful activity with prompt e.g., dressing or eating a meal only when offered

Activity without observable purpose e.g., wandering without destination

Minimal activity e.g., sitting without talking or doing anything


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Appendix Q: Engagement of a Person with Dementia Scale (EPWDS)

Engagement of a Person with Dementia Scale (EPWDS)

The Engagement of a Person with Dementia Scale (EPWDS) measures the behavioural and emotional expressions and responses of people with dementia when presented with a psychosocial activity (i.e., non-pharmacological). The scale is designed to examine whether an individual with dementia exhibits an emotional or behavioural expression/response of engagement with, in, or following the introduction of the activity.

To capture different expressions of engagement towards a psychosocial activity, the EPWDS measures five dimensions of engagement: affective, visual, verbal, behavioural, and social. Each dimension of engagement should be assessed separately but interpreted collectively to generate a comprehensive overview of the person with dementia’s experience of engagement toward the stimulus. Every dimension consists of a subscale that measures positive engagement and a subscale that measures disengagement or negative engagement. The EPWDS acknowledges that not all psychosocial activity involves the five dimensions of engagement, but a low score on a certain dimension of engagement may suggest a limitation of the psychosocial activity for the person with dementia assessed.

How to use the scale:

- The EPWDS is developed primarily for research with people with dementia across settings (e.g., acute, community and long-term care).
- It is recommended that the EPWDS is used for observational periods with a minimum observation duration of 10 minutes.
- The EPWDS can be used to establish a baseline comparison prior to the introduction of the psychosocial activity.
- Each item is measured on a 1-5 Likert scale. Please tick a value for each of the items.
- The “not applicable” option should only be used when a certain type of engagement is irrelevant or unable to be determined for the person with dementia (e.g., a person who has lost verbal capability after a stroke).
• Items 2, 4, 6, 8, and 10 are reverse scored items. After scoring the observational period on the EPWDS, simply reverse the numerical scoring of items 2, 4, 6, 8 and 10. This means that, a score of 5 becomes 1, 4 becomes 2, 3 remains as 3, 2 becomes 4 and 1 becomes 5.

• After reverse scoring items 2, 4, 6, 8, and 10, add the scores for all 10 items to get an overall measure of engagement for the person with dementia.

• If all items across the five dimensions of the EPWDS are measured, the total score will range from 10 – 50. The higher the total score, the higher the level of positive engagement exhibited by the person with dementia. The lower the total score, the higher the level of disengagement or negative engagement exhibited by the person with dementia.

• To examine and control for environmental effects on the engagement level of the person with dementia, an inter-correlation analysis can be conducted between the total EPWDS score and the environmental rating under the section titled “Details of Observation Period and Psychosocial Activity”.

**Details of Observation Period and Psychosocial Activity:**

Start Time of Observation Period: ___________________________ End Time of Observation Period: ___________________________

Total Duration of Observation Period: ___________________________ Type of Psychosocial Activity: ___________________________

Group or Individual Psychosocial Activity: ___________________________ Location of Psychosocial Activity: ___________________________

**Appropriateness of the Environment:**

Please indicate the extent to which you agree or disagree to the following statement:

The overall environment (e.g., lighting, noise level, and presence of other) is appropriate for the target psychosocial activity to induce positive engagement in people with dementia.

1 2 3 4 5

☐ ☐ ☐ ☐ ☐

Strongly disagree Strongly agree
**Affective Engagement**

Please indicate the extent to which you agree or disagree to the following statements: the person with dementia.

<table>
<thead>
<tr>
<th></th>
<th>Displays positive affect such as pleasure, contentment or excitement (e.g., smiling, laughing, delight, joy, interest and/or enthusiasm).</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>Strongly disagree</td>
<td></td>
<td></td>
<td></td>
<td>Strongly agree</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Displays negative affect such as apathy, anger, anxiety, fear, or sadness (e.g., disinterest, distressed, restlessness, repetitive rubbing of limbs or torso, repeated movement, frowning, crying, moaning, and/or yelling).</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td></td>
<td>Strongly disagree</td>
<td></td>
<td></td>
<td></td>
<td>Strongly agree</td>
</tr>
</tbody>
</table>

**Visual Engagement**

Please indicate the extent to which you agree or disagree to the following statements: the person with dementia.

<table>
<thead>
<tr>
<th></th>
<th>Maintains eye contact with the activity, materials used, or the person/s involved.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td></td>
<td>Strongly disagree</td>
<td></td>
<td></td>
<td></td>
<td>Strongly agree</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Appears inattentive, has an unfocused stare or turns head/eyes away from the activity, materials used, or the person/s involved.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td></td>
<td>Strongly disagree</td>
<td></td>
<td></td>
<td></td>
<td>Strongly agree</td>
</tr>
</tbody>
</table>
### Verbal Engagement

Please indicate the extent to which you agree or disagree to the following statements: the person with dementia...

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Initiates, participates, or maintains verbal conversation, sounds or gestures (e.g., nodding) in response to the activity, or the materials used, or the person/s involved.</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td></td>
<td>Strongly disagree</td>
<td></td>
<td></td>
<td></td>
<td>Strongly agree</td>
</tr>
<tr>
<td>6. Refuses to participate in the activity or in a conversation related to the activity by verbalising e.g., “no”, “stop”, etc. OR verbalises negative comment, complaint, and sound (e.g., groaning, or cursing, or swearing) in response to or related to the activity, or the materials used, or the person/s involved.</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td></td>
<td>Strongly disagree</td>
<td></td>
<td></td>
<td></td>
<td>Strongly agree</td>
</tr>
</tbody>
</table>

### Behavioural Engagement

Please indicate the extent to which you agree or disagree to the following statements: the person with dementia...

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Responds to an activity by approaching, reaching out, touching, holding or handling the activity, the material used, or the person/s involved.</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td></td>
<td>Strongly disagree</td>
<td></td>
<td></td>
<td></td>
<td>Strongly agree</td>
</tr>
<tr>
<td>8. Responds to an activity by avoiding, shoving away, pulling back from, hitting, or mishandling the activity, the material used, or the person/s involved.</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td></td>
<td>Strongly disagree</td>
<td></td>
<td></td>
<td></td>
<td>Strongly agree</td>
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</tbody>
</table>
### Social Engagement

Please indicate the extent to which you agree or disagree to the following statements: the person with dementia…

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Strongly disagree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.</td>
<td>Uses the activity or the material/s to encourage others to interact, or as a communication channel to interact and talk with others (e.g., staff and other residents).</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>Strongly disagree</td>
<td>Strongly agree</td>
</tr>
<tr>
<td>10.</td>
<td>In response to the activity, is distracting or disrupting others (e.g., staff/facilitator and other residents).</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>Strongly disagree</td>
<td>Strongly agree</td>
</tr>
</tbody>
</table>

Appendix R: Information Sheet for the Residents

Creating a dementia-friendly environment in Australian residential aged care facilities through the use of a therapeutic landscape

INFORMATION SHEET

Residents

GUHREC Reference Number: 2018/085

Research Team

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Background
There are more than 413,106 people living with dementia in Australia and it is estimated that this will increase to 1,100,890 by the year 2056. Agitation and apathy in people with dementia are often due to excessive or insufficient levels of stimulation in the environment; inappropriate environmental conditions; as well as the lack of engagement or socialisation with others. Therapeutic landscapes, which include hardscapes (e.g., walkway, gazebos and water features, softscapes (e.g., plants, flowers and tree) and different scents, colours, textures and sounds, have been shown to have beneficial impacts on health and well-being of people with dementia by reducing agitation, as well as improve apathy and social engagement. To date, little attention has been placed on the characteristics of friendly and stimulating environments for people with dementia while designing these therapeutic landscapes.

The aim of this study, which is a PhD research project, is to examine the effect of a newly designed therapeutic landscape (i.e., garden) that is aligned with the characteristics of a friendly stimulating environment on agitation, apathy, and engagement in people with dementia living in residential aged care facility.

**What the research will involve**

Ten residents from one long-term aged care facility will be recruited to take part in the study. Your basic demographics information (i.e., age, gender, education level, marital status and history of agitated behaviour) will be collected through your medical and nursing records. You will complete, face-to-face with the researcher, a social biography (~30 mins) to understand your background and interests to ensure an efficient design of a therapeutic garden. You will be brought to the newly designed therapeutic garden by the researcher for daily sessions of 60 minutes (Monday to Friday) for a period of 4 weeks. Your interaction and engagement with the environment will be
observed and documented by the researcher. At the end of the 4-weeks period, you will be interviewed to seek your views about the newly designed therapeutic garden (~30 minutes). The interview will last approximately 30 minutes and will be conducted in the care facility. Interviews will be digitally recorded so that the interview can be accurately transcribed. The digital audiotape will be erased following the transcription of the interview.

**How will participants be recruited**

If you meet the following criteria, you will be eligible for the study: aged 65 years or older; with mild to moderate dementia; have a recent history of agitated behaviour; with acceptable visual, auditory and sensory perceptions; mobile with or without a mobile walking aid; as well as being a resident of the RACF for at least 3 months. If you are immobile and/or bedridden, you will be excluded.

Facility manager will identify potential residents based on the inclusion and exclusion criteria. Identified potential residents and, if appropriate, their legally authorised representatives, legal guardian or family members will be approached and asked for inclusion in the study by the facility manager. If you are willing to speak with the researcher about potential participation, the researcher will then visit the facility to talk through the research with you and your legally authorised representatives, legal guardian or family members who have expressed an interest, and provide you with a project information sheet and written informed consent form. For those of you who cannot provide informed consent, proxy consent will be sought from your legally authorised representatives, legal guardian or family members. Once consent is received, you will be screened by the researcher to ensure you have an adequate level of cognition.
as well as visual, auditory and smell sensory perceptions to be fully eligible to participate in the study.

**Expected Benefits**

You may directly benefit from the therapeutic garden through a reduction in the level of agitation and apathy as well as an increase in the level of social engagement in participants. Furthermore, the research will generate evidence to give a better understanding about the effects of a therapeutic landscape (i.e., garden) that is aligned with the characteristics of a DFE on agitation, apathy, and engagement in people with dementia living in a residential aged care facility.

**Risks**

No foreseeable risks will be posed to you in this study. However, you may feel tired during the 60-minutes sessions to the therapeutic garden. You can choose to stop interacting with the garden or to leave the therapeutic garden at any time. An attempt will be made by the researcher to convince you to continue to interact and engage with the characteristics of the therapeutic garden. If you still wish to stop or leave the therapeutic garden, you can do so.

**Confidentiality**

All information collected in this project will be kept confidential, and only the named investigators will have access to the data collected. All data will be de-identified prior to data entry and transcription, and an ID code will be assigned to you. Hard copies of all data collected, processed, and analysed during the project will be held for five years in secure storage at Griffith University. The audio-recording of interviews will be destroyed after transcription. Electronic files will be stored on a Griffith
University secure research drive, with access restricted to the listed CIs. You will NOT be named or identifiable in any research publications arising from the study.

**Voluntary Participation**

Your participation in this study is entirely voluntarily, and non-participation will not involve any penalty or impact on your current or future care. If you decide to take part and later withdraw from this project, you are free to do so at any stage. No explanations need to be given and there will be no penalty for withdrawal from the project.

**Ethical Conduct**

Griffith University conducts research in accordance with the *National Statement on Ethical Conduct in Research Involving Humans*. If you have any concerns or complaints about the ethical conduct of the research project, please contact the Manager, Research Ethics, Office for Research, Bray Centre, Nathan Campus, Griffith University (Tel: 07 3735 4375 or research-ethics@griffith.edu.au).

**Privacy Statement**

The conduct of this research involves the collection, access and/or use of your identified personal information. The information collected is confidential and will not be disclosed to third parties without your consent, except to meet government, legal or other regulatory authority requirements. A de-identified copy of this data may be used for other research purposes including publishing openly (e.g., in an open access repository). However, anonymity will at all times be safeguarded. For further information consult the University’s Privacy Plan at [http://www.griffith.edu.au/about-griffith/plans-publications/griffith-university-privacy-plan](http://www.griffith.edu.au/about-griffith/plans-publications/griffith-university-privacy-plan) or telephone (07) 3735 4375.

**Feedback**
You will receive a summary of the results at the end of the study period.

THANK YOU FOR CONSIDERING PARTICIPATION IN THIS STUDY.
Appendix S: Consent Form for the Residents

Creating a dementia-friendly environment in Australian residential aged care facilities through the use of a therapeutic landscape

CONSENT FORM

Residents

GUHREC Reference Number: 2018/085

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Griffith University
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parinaz.motealleh@griffithuni.edu.au

By signing below, I confirm that I have read and understood the information package and in particular:
I understand my involvement in this research will include: (a) an assessment of my visual, auditory and smell sensory perceptions; (b) the collection of my social biography; (c) participation in daily sessions of 60 minutes (Monday to Friday) for a period of 4 weeks in the therapeutic garden; (d) observations of my participation in the therapeutic landscape by the researcher; and (e) a semi-structured interview about my experiences during the sessions.

I understand that I can choose to stop interacting with the garden or to leave the therapeutic garden at any time (e.g., feeling tired). An attempt will be made by the researcher to convince me to continue to interact and engage with the characteristics of the therapeutic garden. If I still wish to stop interacting with the garden or to leave the therapeutic garden, I can do so.

I understand that once my interview is completed and has been transcribed and the transcriptions checked for accuracy, the digital recordings will be destroyed.

I have had any questions answered to my satisfaction.

I understand the risks involved.

I understand that my participation in this research is voluntary.

I understand that I am free to withdraw consent at any time, without explanation or penalty.

I understand that my name and other personal information that could identify me will be removed or de-identified in publications or presentations resulting from this research.

I understand that a summary of the general findings from the study will be made available to participants, their legally authorised representatives, legal guardians or family members and the long-term aged care facility.
I understand that I can contact the Manager, Research Ethics, at Griffith University Human Research Ethics Committee on 3735 4375 (or research-ethics@griffith.edu.au) if I have any concerns about the ethical conduct of the project.

☐ I agree to participate in the project.

<table>
<thead>
<tr>
<th>Name of participant</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Signature of participant</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td></td>
</tr>
</tbody>
</table>

In the case where the participant is unable to provide informed consent, the following substituted consent process will be used:

☐ I agree to _______________________ (name of participant) to participate in the research project.

<table>
<thead>
<tr>
<th>Name of legally authorised representatives, legal guardian</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Signature of legally authorised representatives, legal guardian</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td></td>
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</table>
Appendix T: Interview Schedule for the Residents

INTERVIEW SCHEDULE

Residents

GU Reference Number: 2018/085

Preamble:
As you are aware, this research project is investigating the effect of a dementia-friendly environment through the use of a therapeutic landscape (i.e., garden) on people with dementia who live in the residential aged care facility (RACF). The purpose of this interview is to explore your personal views and experiences of using this therapeutic garden which will give me an insight into its impact on the people with dementia.

I would like to digitally record the interview. Once the interview is completed and has been transcribed and the transcriptions checked for accuracy, the digital recordings will be destroyed. Is this okay with you?

All information collected in this project will be kept confidential. Only investigators will have access to the data collected. Your name and other personal information will be removed or de-identified in publications or presentations resulting from this research.

The interview is expected to take about 30 minutes, but you are free to stop at any point.
Do you have any questions before we begin?

For the purpose of the digital recording, can you please state your full name?

In general, what are your thoughts on this new therapeutic garden and the impact it has had on you?

Probe:

Has there any particular benefits for you? If yes, please give an example.

Have there been any negative outcomes for you? If yes, please give an example.

What is your view of the daily visits of new therapeutic garden designed for the residents of the RACF?

Probe:
Were the daily sessions of 60 minutes too long or too short?

Is there anything you would like to change or add to the new therapeutic garden?

Probe:

*If yes, please provide reasons for this change and how it might improve the new therapeutic garden.*

Which part of the new therapeutic garden was the most attractive to you?

Probe:

*Why it was the most attractive part?*

What would you like to change about the new therapeutic garden?

Probe:

*Why do you like to change it?*

7. What did you not like about the new therapeutic garden?

Probe:

*Why did you not like it?*

*How would you like to change it?*

8. Were there any difficulties that you experienced during moving about the new therapeutic garden?

Probe:

*If yes, what was it?*

9. Do you think the new therapeutic garden has benefitted you at any specific time or situation more than other times or situations?

Probe:

*If yes, give an example.*
10. Were there any difficulties that you experienced during moving about the new therapeutic garden?

*Probe:*

*If yes, what was it?*
Appendix U: Information Sheet for the Staff

Creating a dementia-friendly environment in Australian residential aged care facilities through the use of a therapeutic landscape

INFORMATION SHEET

Staff

GU Reference Number: 2018/085

Research Team

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Menzies Health Institute Queensland
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parinaz.motealleh@griffithuni.edu.au

Background
There are more than 413,106 people living with dementia in Australia and it is estimated that this will increase to 1,100,890 by the year 2056. Agitation and apathy in people with dementia are often due to excessive or insufficient levels of stimulation in the environment; inappropriate environmental conditions; as well as the lack of engagement or socialisation with others. Therapeutic landscapes, which include hardscapes (e.g., walkway, gazebos and water features, softscapes (e.g., plants, flowers and tree) and different scents, colours, textures and sounds, have been shown to have beneficial impacts on health and well-being of people with dementia by reducing agitation, as well as improve apathy and social engagement. To date, little attention has been placed on the characteristics of friendly and stimulating environments for people with dementia while designing these therapeutic landscapes. The aim of this study, which is a PhD research project, is to examine the effect of a newly designed therapeutic landscape (i.e., garden) that is aligned with the characteristics of a friendly stimulating environment on agitation, apathy, and engagement in people with dementia living in residential aged care facility.

**What the research will involved**

You will be interviewed to seek your views about the newly designed therapeutic garden (~30 minutes) on participating residents with dementia. The interview will last approximately 30 minutes and will be conducted in the care facility at a date and time that is convenient to you. Interviews will be digitally recorded so that the interview can be accurately transcribed. The digital audiotape will be erased following the transcription of the interview.

**Why you have been chosen to participate**
You have been chosen to participate in this study as you are a direct care staff engaged in the care of residents with dementia who are involved in this study.

Risks

Participation in this study poses no foreseeable risks as the study will only seek your views about the newly designed therapeutic garden on participating residents with dementia. You will only be asked to reveal to the researcher what you feel comfortable to discuss. It is recommended that you stop the interview immediately and discuss with the researcher any concerns that may arise during the interview.

Confidentiality

All information collected in this project will be kept confidential, and only the named investigators will have access to the data collected. All data will be de-identified prior to transcription, and an ID code will be assigned to you. Hard copies of all data collected, processed, and analysed during the project will be held for five years in secure storage at Griffith University. The audio-recording of interviews will be destroyed after transcription. Electronic files will be stored on a Griffith University secure research drive, with access restricted to the listed CIs. You will NOT be named or identifiable in any research publications arising from the study.

Voluntary Participation

Your participation in this study is entirely voluntarily, and non-participation will not involve any penalty or impact on your relationship with the facility/organisation. If you decide to take part and later withdraw from this project, you are free to do so at any stage. No explanations need to be given and there will be no penalty for withdrawal from the project.

Ethical Conduct
Griffith University conducts research in accordance with the *National Statement on Ethical Conduct in Research Involving Humans*. If you have any concerns or complaints about the ethical conduct of the research project, please contact the Manager, Research Ethics, Office for Research, Bray Centre, Nathan Campus, Griffith University (Tel: 07 3735 4375 or research-ethics@griffith.edu.au).

**Privacy Statement**

The conduct of this research involves the collection, access and/or use of your identified personal information. The information collected is confidential and will not be disclosed to third parties without your consent, except to meet government, legal or other regulatory authority requirements. A de-identified copy of this data may be used for other research purposes including publishing openly (e.g., in an open access repository). However, anonymity will at all times be safeguarded. For further information consult the University’s Privacy Plan at [http://www.griffith.edu.au/about-griffith/plans-publications/griffith-university-privacy-plan](http://www.griffith.edu.au/about-griffith/plans-publications/griffith-university-privacy-plan) or telephone (07) 3735 4375.

**Feedback**

You will receive a summary of the results at the end of the study period.

**THANK YOU FOR CONSIDERING PARTICIPATION IN THIS STUDY.**
Appendix V: Consent Form for the Staff

Creating a dementia-friendly environment in Australian residential aged care facilities through the use of a therapeutic landscape

CONSENT FORM

Staff

GU Reference Number: 2018/085

Research Team

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04 7870 9042 / 04 9065 8345
parinaz.motealleh@griffithuni.edu.au

By signing below, I confirm that I have read and understood the information package and in particular:
I understand that once my interview is completed and has been transcribed and the transcriptions checked for accuracy, the digital recordings will be destroyed.

I have had any questions answered to my satisfaction.

I understand the risks involved.

I understand that my participation in this research is voluntary.

I understand that I am free to withdraw consent at any time, without explanation or penalty.

I understand that my name and other personal information that could identify me will be removed or de-identified in publications or presentations resulting from this research.

I understand that a summary of the general findings from the study will be made available to me.

I understand that I can contact the Manager, Research Ethics, at Griffith University Human Research Ethics Committee on 3735 4375 (or research-ethics@griffith.edu.au) if I have any concerns about the ethical conduct of the project.

☐ I agree to participate in the project.

<table>
<thead>
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<th>Name of participant</th>
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<tbody>
<tr>
<td>Signature of participant</td>
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<tr>
<td>Date</td>
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</tbody>
</table>
Appendix W: Interview Schedule for the Staff

INTERVIEW SCHEDULE

Staff

GU Reference Number: 2018/085

Preamble: This research project is investigating the effect of a dementia-friendly environment through the use of a therapeutic landscape (i.e., garden) on people with dementia who live in the residential aged care facility (RACF). The purpose of this interview is to explore your views of the therapeutic garden on participating residents in the RACF which will give me an insight into its impact on the people with dementia.

I would like to digitally record the interview. Once the interview is completed and has been transcribed and the transcriptions checked for accuracy, the digital recordings will be destroyed. Is this okay with you?

All information collected in this project will be kept confidential. Only investigators will have access to the data collected. Your name and other personal information will be removed or de-identified in publications or presentations resulting from this research.

The interview is expected to take about 30 minutes, but you are free to stop at any point. Do you have any questions before we begin?

For the purpose of the digital recording, can you please state your full name?

What is your position in the RACF?

How long have you worked here?

In general, what are your thoughts on this new garden? Has the garden had any impact on the participants in the study?

Probe:

*Explain any particular benefits for the group of participants or individuals?*

Have there been any negative outcomes for the group of participants or individuals?

Probe:
If yes, please give an example.

Has the garden had any positive impact on the participants in the study?

Probe:

Explain any particular benefits for the group of participants or individuals?

What is your view of the daily visits of the new therapeutic garden designed for the residents of the RACF?

Probe:

Were the daily 60 minutes sessions too long or too short?

Do you think the new therapeutic garden has benefitted some participants more than others?

Probe:

If yes, why do you think this is the case? Who and why? Give examples of why you think the new therapeutic landscape has benefited.

Do you think the new therapeutic garden has benefitted group of participants at any specific time or situation more than other times or situations?

Probe:

If yes, give an example.

Do you think the new therapeutic garden has benefitted each participant at any specific time or situation more than other times or situations?

Probe:

If yes, give an example.

Do the participants ever talk about the new therapeutic garden?

Probe:

If yes, what did they say?
References


https://doi.org/10.1021/es403688w


Alzheimer’s Australia. (2004). *Dementia care and the built environment* (No.3).

Alzheimer’s Australia.


https://www.fightdementia.org.au/about-dementia/health-professionals/clinical-resources/non-pharmacological-treatments


Alzheimer’s Australia Vic. (2020). *Purposeful activities for dementia.* Dementia Australia. Retrieved 22 May, 2020 from


https://doi.org/10.1177/0193945914521903


https://doi.org/10.1046/j.1440-1800.2002.00157.x


Association of Perioperative Registered Nurses Journal, 103(3), 265-269.
https://doi.org/10.1016/j.aorn.2016.01.016


https://doi.org/https://doi.org/10.1016/j.socscimed.2017.11.035

https://doi.org/10.1089/eco.2014.0028

https://doi.org/https://doi.org/10.1016/j.ufug.2013.03.008


influences neuropsychiatric symptoms and other outcomes in assisted living residents. *International Journal of Geriatric Psychiatry*, 25(10), 1044-1054. https://doi.org/10.1002/gps.2460


social participation of people with dementia. *Gerontology and Geriatric Medicine, 1*(1), 2333721415607833. https://doi.org/10.1177/2333721415607833


278


10.1680/udap.14.00031


publications/getting-tough-on-missing-data-a-boot-camp-for-social-science-researchers


https://doi.org/10.1093/oxfordhb/9780199604456.013.0051


https://doi.org/https://doi.org/10.1016/0277-9536(92)90360-3


https://doi.org/10.1068/d110171


Environmental Research and Public Health, 16(8), 1337.
https://doi.org/10.3390/ijerph16081337


288


Motealleh, P., Moyle, W., Jones, C., & Dupre, K. (2019). Creating a dementia-friendly environment through the use of outdoor natural landscape design intervention in...
long-term care facilities: A narrative review. *Health & Place, 58*(1), 102148.
https://doi.org/10.1016/j.healthplace.2019.102148


https://doi.org/https://doi.org/10.1016/j.healthplace.2012.06.003

https://doi.org/https://doi.org/10.1016/j.healthplace.2018.05.001


https://doi.org/https://doi.org/10.1016/j.healthplace.2016.03.002


https://doi.org/10.1177/1471301215591334


https://doi.org/10.1093/geront/gnx041


https://doi.org/10.1176/appi.ajgp.13.11.991

296


https://doi.org/10.1080/01634371003741482


https://doi.org/http://dx.doi.org/10.1080/02763893.2016.1198740

https://doi.org/10.12968/nrec.2018.20.2.86

https://doi.org/10.1016/j.eurpsy.2018.07.008


