

HEALING GARDENS FOR THE ELDERLY: A REVIEW OF DESIGN GUIDELINES AND THE COMPARISONS WITH THE EXISTING SENIOR OUTDOOR SURVEY (SOS) TOOL

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ABSTRACT

This systematic review evaluated 15 literature that discussed design considerations for outdoor areas for the elderly at hospitals, nursing homes, hospices and also public spaces. An existing result from a study to evaluate the outdoor spaces at the elderly's facilities called Senior Outdoor Survey (SOS) tool was being used to compare with the design recommendations from other literature. The comparison of the SOS tool with the other literature was intended to simplify the guidelines for the design of healing gardens for the elderly. Two types of literature were reviewed in the study which were the peer-reviewed papers and best practice guidelines. Finally, a list of the most essential design features was identified in which may be useful for the health policy makers, hospital administrators and designers who are involved with the outdoor spaces for the elderly. The results have shown that the most essential features to be considered included aspects such as seating, paving material, the activities and, the location of the gardens.

Keywords : long-term care facilities, outdoor environment, senior citizen

1. INTRODUCTION

The next few decades will see a burgeoning need for facilities for seniors, many of who will become increasingly frail. Among such facilities are retirement communities, housing for independent living, assisted living, nursing homes and continuing-care retirement facilities which usually incorporate independent living, assisted living, and skilled nursing on one large campus-like site. It is important in terms of physical and psychosocial health that those who reside in any type of purpose-built facilities for seniors have access to outdoor space that is specifically designed for their needs. (Cooper Marcus & Sach, 2014). Recent research has found that spending time outdoor can have significant health benefits for older adults. Improvements in mood, sleep patterns, and hormone balance may be associated with outdoor usage, partly due to increased physical activity, exposure to bright outdoor light, and contact with nature elements (Babyak et al., 2001; Rodiek, 2006).

Getting old can bring health challenges. Because of the new medications and surgical techniques, people's life expectancy becomes longer. However, the body will become frail and weaker due to many issues, both genetic and the environment. In terms of physical health, as people aged, they lose muscle mass and bone density. The elderly will also face problems regarding balance and they were more prone to falls, often have difficulty sleeping; they are also more prone to depression. (Babyak et al., 2001; Rodiek, 2006). Fortunately, there is a recently rediscovered body of evidence that supports the view that nature generally and everyday living environments in particular, can have a profound effect on health and well-being (Souter-Brown, 2015).

Third age is the period in which the person is withdrawn from the daily activities, such as the workplace, resulting in the different psycho-social problems, such as dementia, agitation, anxiety, loneliness and social exclusion. These problems lead to people's psychological depression with its subsequent effects on their health (Kourkouta, Iliadis, & Monios, 2015). For psychosocial health wise, spending time outdoors improves mood, lessens agitation and aggression among those with dementia, and reduces depression among those with Seasonal Affective Disorder or SAD (Babyak et al., 2001; Rodiek, 2006).

Therefore, a well-designed healing, sensory and therapeutic gardens and landscape treatments are seen as important support tools to the health facilities which not only look good but work well and help to build a sustainable and healthy green activities area for the aging communities.

1.1 Background of Study

One of the greatest achievements of the 20th century's society is the increment of average life expectancy. Over the last 200 years, population of the world achieved outstanding progress in health that resulted in increases of life expectancy. Total life expectancy at birth for Malaysian female is 76.7 years while for Malaysian male is 71.1 years. The result is above the average life expectancy at birth of the global population which is around 71 years. At present, the number of Malaysians aged 60 years and above is estimated to be 1.4 million and is projected to increase to 3.3 million in the year 2020. The percentage of the population that is 60 years and over has also increased over the years - 5.2% in 1970, 5.7% in 1990 and 6.3% in the year 2000. In the year 2020, this percentage is expected to be 9.8% of the population (Mafauzy, 2000).

Eighty percent of people over 65 in Malaysia have long-term disorders and five percent have disability that requires continuous medical supervision (Rosiah, 2003). As a person gets older, the immune systems become less effective at fighting against infections. This means that the elderly are more likely to catch infections and they take longer time to recover from one (Cheah, 2013). According to the Ministry of Health Malaysia (2016), the most common health issues for the elderly are hypertension, diabetes, Parkinson's Disease, falls, heart failure and visual impairment among others.

Results from numerous studies have suggested that the design of the physical environment plays a significant role in making health promotion activities possible which contributes to health and life quality for the aged individual (Wijk, 2004). A considerable amount of international research supports

the general positive health effects of physical, mental, and social activities for the elderly. Physical activity, good eating habits, social relations and a meaningful life are the pillars upon which good health for the elderly should be built (Folkhalsoinstitut, 2002). Therefore, the role of the environment in the health improving process is a growing concern among architects, designers, environmental psychologists and health care provider (Devlin, 2003).

Recent studies have found important health benefits for older adults who spend even small amount of time outdoors. Such benefits include increased physical activity, better Vitamin D absorption, improved mood, reduced stress, and increased longevity leading to the conclusion that spending time outdoor is a vital resource for remaining healthy in old age (Berrigan & Troiano, 2002; Humpel, Owen, & Leslie, 2002; Lavizzo-Mourey & McGinnis, 2003; Netz et al; 2005; Takano, Nakamura, & Watanabe, 2002). People appreciated traditional garden elements such as lawns, trees, flowers and water features; ninety percent of garden users experienced a positive change of mood after time spent outdoor (Cooper Marcus, 2007).

Exposure to nature (e.g. looking through a window, walking by a park) and actively participating outdoors (e.g. gardening, hiking) promotes both physical and mental health (Maller et al., 2005; Pretty, 2004). In addition, there is a strong ideology in the urbanized Western world that people can "attain physical, mental, and spiritual healing by simply spending time out-of-doors or seeking out remote or isolated places where they can 'get away from it all' and 'surrounded by nature' (Gesler, 2003).

1.2 Problem Statement

According to Malaysia's Minimum Retirement Age Act 2012, the minimum retirement age of an employee shall be upon the employee attaining the age of 60 years. Retirement is the point that a person stops employment completely. For most of the people, retirement is a reward for decades of daily work. Unfortunately, a research from the Institute of Economic Affairs (IEA) done by Sahlgren (2013) found that retirement has a detrimental impact on mental and physical health. In a study involving 5,422 individuals done by Skerret from Harvard School of Public Health in year 2012, the result has shown that those who had retired were 40% more likely to have had a heart attack or stroke than those who were still working. Moreover, the incident mostly happened during the first year after retirement.

Retirement is a life course transition involving environmental changes that influence health behaviors, social interactions and psychosocial stresses (Moon, 2015). These aspects had made retirements ranked 10th on the list of

Holmes-Rahe's 'Stress Inventory Life's 43 Most Stressful Events'. Therefore, it is necessary to provide a cozy environment to make the seniors enjoy, be healthy and feel rewarding. According to Vaillant (2012), there are four key elements to achieve the goal. The first element is forging a new social network where establishing a new social network is good for mental and physical health. The second element is play which involved the outdoor or indoor activities such as gardening, exercise, dancing. The third and fourth elements are being creative and keep learning.

In addressing the issues, this paper intends to compare the design guidelines from the Senior Outdoor Survey (SOS) with other literature discussing the guidelines for gardens for the elderly. The result of this paper is to establish a set of simplified guideline which is the most essential for the design of outdoor environment to the elderly.

2. METHODOLOGY

The criteria for the selection of the literature review was based on a few aspects. The aspects are:

1. Selection of search engine: Medline, Science Direct and Scopus. Besides that, the search also included manual reference-checking to find some additional articles.
2. The literatures had to be focus on design consideration or guideline of healing, therapeutic or supportive gardens, landscape or outdoor environment which is beneficial to the elderly.
3. Two types of literature were included in the study: peer-reviewed literature and best practice guideline.
4. Only literature from English language sources include in the search.
5. The literature had to be published before March 2016 (when the search was conducted)

2.1 Keywords and Search Combinations

The search was divided into three rounds (Table I). In the first round, the key words were searched independently. In the second round, the search included the first round's key words and additional with AND or OR and the secondary key search words. Lastly, the search was narrowed down by including the final set of key words.

The publications that fulfilled all the selection criteria represented six countries with the majority from United States (7 publications), two each

from Australia, United Kingdom and Sweden, and one each from Taiwan and Malaysia. Nine of the publications were peer-reviewed journals and six of them were best practice guidelines.

Table 1 : Search words used in the search rounds and the number of publications

Search Round	Key Word	Number of publication
1	healing garden or environment or landscape and elderly or senior citizen	291
	AND or OR	
2	hospital facilities or nursing home facilities or hospices facilities and planting design or outdoor environment or indoor environment	55
	AND	
3	design guideline or design consideration or design recommendation	15

2.2 Analytical Framework

Senior Outdoor Survey (SOS) Tool

Most of the existing tools neglect outdoor spaces and only developed to evaluate physical environment features at long-term care facilities which mainly focused on the indoor environment (AHRQ, 2007; Cutler, 2000). Few existing tools contained items related to the outdoor environment; those few that include outdoor items ask only minor information such as "Is there an outdoor space?" without attempting to evaluate the space (Rodiek et al., 2014). The lack of evidence-based tools for evaluating features associated with outdoor usage at long term care communities has made it difficult for care providers and researches to clearly assess the important features that can encourage or discourage residents' outdoor usage (Bardenhagen & Rodiek, 2015). To address this gap, a preliminary version of the SOS tool (Seniors' Outdoor Survey) was developed and published in 2014 and pilot-tested at nearly 200 outdoor spaces within 68 assisted living facilities in a large multiregional study (Rodiek, 2008). Thus, it is a valid and reliable tool to evaluate the satisfaction of an outdoor space facility in term of the needs and the preferences of the elderly. The tool assesses the effectiveness of an outdoor area for seniors housing. This tool is beneficial and important for long term care administrators, planner, landscape architect and designer when creating and designing an outdoor spaces especially for the seniors citizen.

There are five major design recommendations: 1) access to nature; 2) outdoor comfort and safety; 3) walking and outdoor activities; 4) indoor-outdoor connection and 5) connection to the world. However, the SOS tool consists of 60 elements to be considered. It may not be suitable for a project with a budget constraint. The priority should be given to the elements which are most beneficial for the elderly. The design recommendations that were mentioned in the 15 literature were reviewed and compared with the design recommendations of the Senior Outdoor Survey (SOS) tool. The number of times various design recommendation were mentioned in the reviewed literature will be calculated and later synthesized based on the 60 elements of the SOS tool.

3. RESULTS

The table below shows the relationship between the 15 reviewed literature and design recommendations of SOS tool.

Table 2 : Access to nature

Design Recommendation Items (SOS)	Literature															Total	
	Cochrane, T.G. (2010)	Cooper Marcus, C (2007)	Mark B. Detweiler (2012)	Chalfont, G.E. (2005)	Bengtsson, A. & Carlsson, G. (2006)	Bengtsson, A. & Carlsson, G. (2013)	Tseng, Chang, & Yi, (2014)	Rohde, J. (2012)	David Kamp (2011)	Perkin et al., (2006)	Susan Rodiek (2008)	Susan Rodiek (2006)	Othman & Fadzil (2014)	Sarkissian, W. & Stenberg, B. (2013)	Thompson, C.W (2003)		
1. Access to nature (14)																	
Abundance of greenery					x	x						x					3
Diverse mix of plants and trees		x	x	x	x	x					x						6
Abundant flowers and color					x							x		x			3
Easily reachable or raised plants	x		x		x				x	x				x			6
Hard boundaries screened by plants	x	x							x					x			4
Seating has pleasant view						x	x										2
Water features available					x	x	x	x				x			x		6
Features with movement			x														1
Amenities for pet	x																1
Amenities for birds and wildlife	x				x	x			x	x							5
Can see domesticated animals											x		x				2
Outdoor fairly quiet		x			x												2
Privacy from resident rooms		x			x				x			x					4
Private places to sit	x	x			x									x			4

As shown from Table 2, the elements that most discussed by the 15 publications were diverse mix of plants and tree, easily reachable or raised plants, water features available, amenities for birds and wildlife, hard boundaries screened by plants, privacy from resident rooms and private places to sit. According to Sarkissian & Stenberg (2013), designers should select flowering plants and trees that change color with the seasons and provide diversity throughout the year and indigenous plants that encourage native birdlife and beneficial insect and animals. As a summary, garden design should have variety of vegetation especially with different species, approaches that can provide privacy and

comfort in the outdoor environment to the elderly.

Table 3 : Outdoor comfort and safety

Design Recommendation Items (SOS)	Literature															Total	
	Cochrane, T.G. (2010)	Cooper Marcus, C (2007)	Mark B. Detweiler (2012)	Chalfont, G.E. (2005)	Bengtsson, A. & Carlsson, G. (2006)	Bengtsson, A. & Carlsson, G. (2013)	Tseng, Chang, & Yi, (2014)	Rohde, J. (2012)	David Kamp (2011)	Perkin et al., (2006)	Susan Rodiek (2008)	Susan Rodiek (2006)	Othman & Fadzil (2014)	Sarkissian, W. & Stenberg, B. (2013)	Thompson, C.W (2003)		
2. Outdoor comfort and safety (15)																	
Plenty of seating available		x		x		x	x		x	x		x	x		x	x	9
Choice of different seating types		x		x						x	x					x	5
Some seating easily movable			x							x	x				x		4
Seats available in sun or shade	x	x										x	x		x		6
Seats will not tip over												x					1
Seating has arms and backs	x	x								x	x	x			x	x	7
Seats comfortably shaped													x		x		2
Seats do not get hot or cold																	0
Seats with cushions													x				1
Swing, glider, rocking chairs													x				1
Table for coffee, food, etc.			x										x				2
Restroom, drinking fountain																x	2
Microclimate control																	0
Smoking areas well separated			x														1
Outdoor area well maintained	x														x		6

Based on Table 3, the most common elements suggested by the literature were plenty of seating available, seating has arms and backs, seats available in sun or shade, outdoor area well maintained, choice of different seating types and, some seating was easily movable. According to the result, placement and the design of the seating for senior citizens should be given a priority. In addition, design with low maintenance costs and the outdoor environment have to be well maintained at all time for the safety and aesthetic purposes.

Table 4 : Walking and outdoor activities

Design Recommendation Items (SOS)	Literature															Total	
	Cochrane, T.G. (2010)	Cooper Marcus, C (2007)	Mark B. Detweiler (2012)	Chalfont, G.E. (2005)	Bengtsson, A. & Carlsson, G. (2006)	Bengtsson, A. & Carlsson, G. (2013)	Tseng, Chang, & Yi, (2014)	Rohde, J. (2012)	David Kamp (2011)	Perkin et al., (2006)	Susan Rodiek (2008)	Susan Rodiek (2006)	Othman & Fadzil (2014)	Sarkissian, W. & Stenberg, B. (2013)	Thompson, C.W (2003)		
3. Walking and outdoor activities (14)																	
Abundant walkways of different lengths															x		3
Roundtrip walkways available											x					x	3
Paving level, easy for wheelchair	x	x				x				x					x		5
Paving non-skid and non-glare	x	x								x	x	x			x	x	8
Handrails along some walkways	x													x	x		4
Walkways partly shaded																	1
Interesting views from walkways	x																2
Frequent seating along walkways	x																1
Some walkway seating in shade																	2
Destinations to walk toward			x								x						2
Places for social activities	x					x	x				x	x			x	x	6
Places for recreation and exercise			x								x	x	x	x	x	x	7
Play area for children	x																4
Place for gardening, hort. therapy	x		x	x							x	x	x		x	x	8

Referring to Table 4, 7 sub-elements in this category achieved a minimum of 4 number of hits which included non-skid and non glare paving, level surface for wheelchairs, places for gardening and horticultural therapy, places for recreation and exercise, places for social activities, handrail along walkways and, play areas for children. In reference to the table, gardens must be easily accessible especially for the frail elderly or those with wheelchairs or walkers. Besides that, garden design should provide social interaction with various activities so that people have the possibility to spend time together.

Table 5: Indoor-Outdoor Connection

Design Recommendation Items (SOS)	Literature													Total		
	Cochrane, T.G. (2010)	Cooper Marcus, C (2007)	Mark B. Detweiler (2012)	Chalfont, G.E. (2005)	Bengtsson, A. & Carlsson, G. (2006)	Bengtsson, A. & Carlsson, G. (2013)	Tseng, Chang, & Yi, (2014)	Rohde, J. (2012)	David Kamp (2011)	Perkin et al., (2006)	Susan Rodtek (2008)	Susan Rodtek (2006)	Othman & Fadzil (2014)	Sarkissian, W. & Stenberg, B. (2013)	Thompson, C.W (2003)	Total
4. Indoor-outdoor connection (11)																
Easily reached from indoor commons					x	x				x						3
Visible from main indoor areas	x	x	x		x	x		x				x	x	x		8
Indoor transition space near doorway												x				1
Outdoor transition space near doorway									x							1
Multiple ways to reach outdoor area								x								1
Doors unlocked during daytime			x		x											2
Doors open with little effort									x		x					2
Doors do not close too quickly																0
Automatic door available, easy to use																0
Can easily cross door threshold						x										1
Wide paved landing outside doorway		x								x						2

As shown from Table 5, one sub-element has the most hit which was “visible from main indoor areas”. The garden needs to be visible from well-used interior area such as the waiting room and there should be adequate signages in the facilities to alert users on the garden’s presence (Copper Marcus, 2016). Besides that, it should also be near or clearly visible from a reception desk/nursing station so the safety of the residents are guaranteed.

In Table 6, only one sub-element achieved 4 hit which was “area is located near main entry”. The elderly like to spend time near the front entrance of a facility (Copper Marcus & Barnes, 1999). Thus, they can see the surrounding and observed something new and different from the facility.

Table 6 : Connection to the outside

Design Recommendation Items (SOS)	Literature													Total		
	Cochrane, T.G. (2010)	Cooper Marcus, C (2007)	Mark B. Detweiler (2012)	Chalfont, G.E. (2005)	Bengtsson, A. & Carlsson, G. (2006)	Bengtsson, A. & Carlsson, G. (2013)	Tseng, Chang, & Yi, (2014)	Rohde, J. (2012)	David Kamp (2011)	Perkin et al., (2006)	Susan Rodtek (2008)	Susan Rodtek (2006)	Othman & Fadzil (2014)	Sarkissian, W. & Stenberg, B. (2013)	Thompson, C.W (2003)	Total
5. Connection to the world (6)																
Area is located near main entry		x			x								x	x		4
Views of vehicles arriving at facility														x		1
Views of front-door activities									x							1
Views of offsite scenery		x														1
Views of nearby streets or traffic					x											1
Views of offsite buildings, activities		x			x	x										3

4. DISCUSSIONS

The most discussed design recommendations (items which were mentioned more than 4 times) from the reviewed literature can be summarized as follows.

A-Seating

When selecting furniture for the elderly, the physical frailty of the users must be considered. Gardens should provide plenty of seating with different choices such as those with arms and backs and also seating which are moveable. Other than that, the elderly prefer areas with overhead awning which allowed them to stay outside but with protection from the hot sun.

B-Pavement Material

Elderly often feel vulnerable. Therefore, a garden space needs to be safe. Material of the pavement must be non-skid and non-glare with even and smooth surface which will be easy for wheelchair users to move around. Handrail should be provided along some walkway.

C-Activities

Provide outdoor activities such as areas for gardening and horticultural therapy. Horticultural therapy has been shown to have positive benefits to the elderly. Besides that, horticultural therapy is considered as a restorative technique which may improve memory, attention, sense of responsibility and social interaction. Moreover, gardens can provide areas for recreation and exercise purposes, places for social activities and also play area for children which are beneficial for physical and mental health of the elderly.

D-Location of the Garden

The outdoor garden needs some sense of enclosure and the absence of feeling that users are in a “fishbowl” or being stared at. Thus, the location and orientation of the garden are significant such as the garden should be near the main entrance and also visible from main indoor area.

E-Access to Nature

Many research had found the importance of health benefits for the elderly such as improved mood and reduced stress by having contact with nature. Thus, a well- designed garden should provide elements that could encourage the elderly access to nature such as a diverse mix of plants and trees, availability of water features and also amenities for birds and wildlife.

5. CONCLUSION AND IMPLICATION FOR DESIGN

A well-designed garden for the elderly plays an important role in providing a sense of belonging and also encourage the elderly to be more physically active. Based on the results, a better understanding and guide to the suitable design elements should be given consideration when creating outdoor spaces for the elderly. The results of this paper may contribute to future research and to the professionals who are involved in the design and management of healthcare facilities for the elderly.

REFERENCES

- AHRQ - Agency for Healthcare Research and Quality. (2007). *Environmental scan of instruments to inform consumer choice in assisted living facilities*. Retrieved from <http://www.ahrq.gov/legacy/research/lcscan/lcappa.pdf>
- Australia.Maller, C., Townsend, M., Pryor, A., Brown, P., St Leger, L., (2005). Healthy naturehealthy people: ‘Contact with Nature’as an upstream health promotion inter-vention for populations. *Health Promot. Int.* 21 (1), 45–54. <http://dx.doi.org/10.1093/heapro/dai032>.
- Babiyak,M.,Blumenthal,J.A., & Herman,S.(2001). Exercise was effective in the long term than sertraline or exercise plus sertraline for major depression in older adults. *Evidence-Based mental Health*, 4(4), 105.
- BBC News (2016). *Over-65s in England ‘living longer than ever before*. <http://www.bbc.com/news/health-35550407>
- Bengtsson, A. & Carlsson, G. (2006). Outdoor nvironments at three nursing homes: focus group interviews with staff. *Journal of Housing for the Elderly*, 19(3/4), pp49-69.
- Bengtsson, A. & Carlsson,G. (2013). Outdoor environments at three nursing homes-qualitative interviews with residents and next of kin. *Urban Forestry & Urban Greening* 12. (pp.393-400).
- Berrigan, D., & Troiano, R. (2002). The association between urban form and physical activity in U.S. adults. *American Journal of Preventive Medicine*, 23(2), 74-79.
- Cochrane,T.G.(2010). Gardens that Care: Planning Ooutdoor Environments for people with Dementia. *Alzheimer’s Australia SA Inc.*,(pp.3-22).
- Chalfont,G.E. (2005). Creating enabling outdoor environment for residents. *Nursing & Residential Care*, Vol. 7, No10.
- Cooper Marcus, C. (2007). Healing gardens in hospitals. *Interdisciplinary Design and Research e-Journal*. Volume I, Issue I, Design and Health.
- Cooper Marcus & Sach, (2014). *Therapeutic Landscape : Garden for the frail elderly*. Chapter 9, pp129.
- Country Meters. *Malaysia population clock*. <http://countrymeters.info/en/Malaysia> (retrieved 23 March 2016)
- Cutler, L. J. (2000). Assessment of physical environments of older adults. In R. L. Kane & R. A. Kane (Eds.), *Assessing older persons: Measures, meaning, and practical applications* (pp. 360– 379). New York: Oxford University Press
- Detweiler, M.B., Sharma,T., Detweiler, J.G., Murphy, P.F., Lane,S., Carmen,J., Chudhary, A.S., Halling,M.H., & Kim, K.Y. (2012). What is the evidence to support the use of therapeutic gardens for the elderly? *Korean Neuropsychiatric Association*, pp.100-110.
- Devlin, A. S. (2003). Health care environments and patient outcomes: A review of the literature. *Environment and Behavior*. Vol. 35 No.5. 665-694
- Gayle Souter-Brown. (2015). *Landscape and Urban Design for Health and Well-being. Introduction*, pp1.
- Gabriel H. Sahlgren. (2013). *Work Longer, Live Healthier : The relationship betweeneconomic activity, health and government policy*. IEA Discussion Paper No. 46
- George E. Vaillant, MD. (2009). *Keys to a Healthy Retirement* . <https://hbr.org/2009/04/keys-to-a-healthy-retirement> (retrieved 10 April 2016) (Online information).
- Gesler,W..(2003). Healing Places. Rowman and Littlefield, Lanham,MD.
- Humpel, N., Owen, N., & Leslie, E. (2002). Environmental factors associated with adults’ participation in physical activity. *American Journal of Preventive Medicine*, 22(3), 188–199.
- Kamp,D. (2011). *Design Consideration in the Design of Outdoor Spaced for Elder Populatio*s. Center for Design and Health, School of Architecture,University of Virginia.
- Kourkouta, L., Iliadis,Ch., & Monios,A. (2015). Psychosocial issues in

- elderly. *Prog Health Sci* 2015, Vol 5, No1.
- Lavizzo-Mourey, R., & McGinnis, J. (2003). Making the case for active living communities. *American Journal of Public Health*, 93(9), 1386–1388.
- Mafauzy, M. (2000). The Problems and Challenges of the Aging Population of Malaysia. *Malays J Med Sci*. 7(1), pp 1–3.
- Netz, Y., Wu, M., Becker, B., & Tenenbaum, G. (2005). Physical activity and psychological well-being in advanced age: A meta-analysis of intervention studies. *Psychology and Aging*, 20(2), 272–284.
- Othman, A.R., & Fadzil, F. (2014). Influence of outdoor space to the elderly wellbeing in a typical care centre. *Procedia-Social and Behavioral Science* 170, pp 320-329.
- Perkins, B., Hoglund, J. D., King, D., Cohen, E.R., & Kliment, S.A. (2006). *Accommodations for seniors*. National Council of Architectural Registration Boards, pp.3-8.
- Pretty, J., 2004. How nature contributes to mental and physical health. *Spiritual Health Int*. 5 (2), 68–78. <http://dx.doi.org/10.1002/shi.220>.
- Patrick J. Skerrett. (2012). *Is retirement good for health or bad for it?* <http://www.health.harvard.edu/blog/is-retirement-good-for-health-or-bad-for-it-201212105625>. (retrieved 5 April 2016) (Online information).
- Rosiah Omar. (2003). *Being Old in Malaysia: Issues and Challenges of Older Women*, pp116-131.
- Rodiek, S.(2006). A missing link : Can enhanced outdoor space improve seniors housing?. (pp.1-19). *Seniors Housing & Care Journal*. Volume 14, Number 1.
- Rodiek, S. (2008). Outdoor space for aging: environmental assessment and survey of assisted living residents and staff. *Proceedings of the 39th Annual Conference of the Environmental Design Research Association*, B. Rodriguez & M. Chapin (Eds.)pp. 62-69.
- Rodiek, S., Lee, C., & Nejati, A. (2014). You can't get there from here: Reaching the outdoors in senior housing. *Journal of Housing for the Elderly*, 28(1), 63-84. doi:10.1080/02763893.2013.858093
- Rodiek, S., Nejati, A., Bardenhagen, E., Lee, C., & Senes, G. (2014). Seniors' Outdoor Survey: An observational tool for assessing outdoor environments at long-term care settings. *e Gerontologist*. doi: 10.1093/geront/gnu050
- Rohde, J. (2012). *Residential healthcare facilities*. The Centre For Helath Design, pp.3-14.
- Sarkissian, W. & Stenberg, B. (2013). *Guidelines for planning for older people in public open space*. Nimbin NSW Australia.
- Suzman, R. & Beard, J. (2011). *Global health and aging*. https://d2cauhfh6h4x0p.cloudfront.net/s3fspublic/global_health_and_aging.pdf?q.52VK49USX58EJwZ3BjLl.yphsH2T_h (retrieved 21 March 2016) (Online information)
- Takano, T., Nakamura, K., & Watanabe, M. (2002). Urban residential environments and senior citizens' longevity in megacity areas: The importance of walkable green spaces. *Journal of Epidemiology and Community Health*, 56(12), 913–918.
- Thompson, C.W. (2003). *Older People's Pedestrian Needs: Inclusive Design for Getting Outdoors*. Openspace Research Centre, Edinburgh Colledge of Art.
- Tseng, W.C., Chang, W.C., & Yi, K.J. (2014). Landscape design for outdoor leisure spaces at nursing homes: A case study of Taiwan Suang-Lien Elderly Centre. *Journal of Food, Agriculture & Environment* Vol.12(2), pp1036-1044.