

**PROCEEDINGS**  
of the  
**INTERNATIONAL CONFERENCE**  
on  
**CHANGING CITIES III**  
*Spatial, Design, Landscape & Socio-economic Dimensions*

**Under the aegis of**

The Department of Planning and Regional Development, University of Thessaly  
The Greek Ministry of Tourism

Editor:  
**Professor Aspa Gospodini**  
*University of Thessaly*

**Syros-Delos-Mykonos Islands, Greece • June 26-30, 2017**

Title: Proceedings of the International Conference on Changing Cities III:  
Spatial, Design, Landscape & Socio-Economic dimensions

ISBN: 978-618-5271-12-1

Copyright 2017: Grafima Publications

---

**GRAFIMA PUBLICATIONS**

Str. Eksadaktylou 5, 546 35 Thessaloniki, Greece

Tel./Fax: +30,2310.248272 • e-mail: [grafima@grafima.com.gr](mailto:grafima@grafima.com.gr)

[www.grafima.com.gr](http://www.grafima.com.gr)

# Therapeutic landscape design for older persons health and well-being

C. Kershaw<sup>1</sup>; J. Cornwall<sup>2</sup>; J. McIntosh<sup>1</sup>; B. Marques<sup>1\*</sup>

<sup>1</sup>School of Architecture; Victoria University of Wellington; New Zealand

<sup>2</sup>Graduate School of Nursing; Midwifery and Health; Victoria University of Wellington; New Zealand

\* Corresponding author: E-mail: jacqueline.mcintosh@vuw.ac.nz; Tel +64 463 6296

## Abstract

Over the last century urbanisation and vehicle-orientated development has resulted in large-scale environmental deterioration that has fostered disconnection from the outdoors and decreased levels of personal engagement with the physical landscape. This is associated with increasing levels of physical inactivity, which is of particular concern for the health of our population, and especially the rapidly growing population of older persons for whom illness and inactivity can lead to dependence and high care requirements. Existing research supports a wide range of positive effects for physical, mental and social wellbeing from outdoor exercise, particularly through engagement with nature, however many current landscapes largely inhibit exercise participation and efficacy for older persons and require targeted design refinement to facilitate accessibility, inclusivity and sociability. We explore the potential for rekindling the connection to public green space to foster improvements in disability prevention and rehabilitation in older persons.

In order to identify how therapeutic landscape design could be developed to best assist older persons' health and wellbeing, we examined epidemiological data, injury statistics, and currently available outdoor fitness equipment that is specifically marketed for use by older persons. We identified a number of problematic design issues, including poor equipment design, a failure to integrate cognitive tasks, and modest integration of safe, age- and ability-specific elements. By incorporating design elements that specifically address elements of prevalent morbidities and concerns, such as psychological restoration, stress reduction, attention recovery, and dementia, the health and wellbeing of older persons in the community could be facilitated. Furthermore, the development of age-specific interactive equipment or landscapes would improve balance, increase range of motion and joint health for many body regions, fortify resilience to falls, build strength and cardiovascular fitness, and assist with preventing the transition becoming frail. Our design suggestions include integrating interactive landscapes with ecological regenerative planning to assist with the prevention of common morbidities in older persons.

*Keywords: elderly; health; wellbeing; fitness equipment; landscape architecture; design.*

## 1. INTRODUCTION

Approximately one third of all adults were inadequately active in 2008, with this lack of physical activity contributing to 3.2 million deaths.[1] The World Health Organisation has attributed these high rates of physical inactivity to lack of engagement with recreational physical activity and an upsurge in sedentary behaviour during professional and home-based activities.[1] It is estimated that nearly 30% of diabetes and ischaemic heart disease cases are caused by these sedentary lifestyles.[2] Additionally, several factors relating to increased urbanisation including more vehicle-based transport, high population density areas, pollution

and a lack of adequate public open space have been attributed to the lessening of physical activity.[1, 3] A lack of physical activity is now considered the fourth primary cause of worldwide mortality and a significant contributor to societal health loss.[4]

While currently the elderly only make up around 12% of the population, they contribute to approximately 30% of all health loss [5] and in coming years chronic morbidity in older persons will place a significant demand on the healthcare system.[6] This increase in the number of older persons, coupled with a concomitant rise in healthcare expenditure, highlights the need for improving the lifestyles and overall wellbeing of ageing people, pre-emptively, to provide improved health and resilience to frailty and common morbidities.

Regular exercise in older persons can combat neuropsychological and musculoskeletal disorders, improve bone and muscular functioning, and reduce the risk of falls.[4] The World Health Organisation has identified falls, occurring to persons over 60 years, as an urgent health concern due to the ongoing health issues which arise after an occurrence, such as long-term mobility loss and dependence, osteoporosis, and increased risk of fractures.[7] Furthermore, the fear of falling again often contributes to additional reduction in physical activity with the onset of frailty.[8] Neurological decline is also an outcome of physical inactivity and mobility loss, and it contributes to dementia and depression in older individuals. [9, 10] Suitable amounts of exercise can combat non-communicable diseases, some of by up to 30%, such as cardiovascular disorders.[11] Current recommended levels of physical activity are approximately thirty minutes of moderate activity on at least five days per week.[2, 12, 13]

The World Health Organisation has agreed upon a global non-communicable disease target, to achieve a ten-percent inactivity reduction by 2025.[4, 14] However, while it is understood that there is a substantial need for population-based interventions for increasing physical activity rates to compound morbidity, there are complicated participation and adherence issues which prevent engagement, due to a combination of behavioural, environmental, cultural and social factors.[15-17] This will be of significant consequence in the next few decades as a dramatic rise in the number of older persons is projected.[18, 19]

Through examination of models which promote outdoor physical activity, it has been demonstrated that environmental surroundings play a significant role in exercise behaviours for the general population.[20, 21] Studies of public parks and exercise installations have indicated that public open spaces are a fundamental resource for achieving health, and social, population-based outcomes.[16, 22, 23] Characteristics such as accessibility, naturalness and inclusivity to age, ethnicity, cultural and socio-economic status puts parks in a unique position for implementing influential interventions.[21] It is therefore apparent that there is an ever-growing demand for therapeutic landscapes which rekindle connections to existing public green space. Increasing use and effectiveness of these existing resources, and enhancing them for additional health benefits within the older population, is of importance for older persons physical, mental and social well-being.

If appropriately implemented, targeted exercise opportunities could also address the physiological needs of the elderly through improved balance, strength, and cardiovascular fitness.[15] Psychological restoration, stress reduction and attention recovery can also help attenuate the effects of dementia.[24, 25] In a society where the proportion of older persons is increasing, urban planning strategies have the potential to allow communities to adapt to the needs of a demographic shift and to promote independence and wellbeing.[23, 26, 27] It has become apparent however, that to achieve genuine sustainable development a multi-disciplinary approach is necessary. Input from a wide group of stakeholders is required to address interwoven issues including vehicle-orientated development, environmental deterio-

ration, and the increasing withdrawal from the outdoors, which panders inactivity across generations.[1, 3] At present, there is limited knowledge on how older persons' health should best be addressed through engagement with interactive outdoor landscapes. While we are witnessing a growing trend for the incorporation of outdoor exercise equipment into urban parks and walkways, the benefits of this development long term remains to be seen. This paper seeks to contribute to this knowledge gap, by informing on the suitability of different outdoor exercise strategies. Through a scrutiny of currently available outdoor fitness equipment marketed for use by older persons, design parameters have been identified in order to ensure the development of outdoor spaces are effective at supporting elderly health and well-being.

## 2. METHOD

The research method involved an investigation of epidemiological and injury data of older people to determine appropriate design parameters for therapeutic landscapes which target disability prevention and rehabilitation in older persons. We included in our evaluation reports which identified the suitability and dosage of cardiovascular, strength and balance training in elderly people for morbidity and fall prevention, to determine the appropriateness of incorporating interactive exercise equipment into therapeutic landscapes.

This data which identified the types and effectiveness of outdoor exercise strategies for elderly, was then correlated with the equipment currently available. Our main inclusion criterion were associations with elderly people and targeted outdoor exercise for the prevention of chronic disorders. We focused especially on the aspect of public space and gave preference to more recent articles. Specific items within the assessment instruments from each study that related to elderly physical activity in outdoor spaces were, where possible, extracted for the purposes of this review for establishing problematic design issues with the existing outdoor fitness equipment marketed for use by older persons, and the public green spaces which support it. Appropriate design parameters were then identified to guide the design of future outdoor interactive spaces and ensure that they are adequately equipped to manage this susceptible ageing community.

## 3. RESULTS

Research identified the different physiological and psychological needs of elderly persons and highlighted the importance of outdoor exercise for older citizens physical, mental, social and spiritual wellbeing. From this, it was found that current outdoor interactive spaces were suitable for physically training the well elderly, however, for those seeking rehabilitation much of the equipment was unfit for purpose. There are also important adherence barriers due to ineffective implementation strategies.

### 3.1 Physical Exercise Needs of Elderly:

Results showed that physical disability such as cardiovascular and musculoskeletal disorders in older persons stemmed largely from loss of muscular and cardiovascular strength due to physical inactivity. These often resulted in balance deterioration which is known to be a significant contributor to falls.[10] To address this concern and prevent the corresponding health loss and reduction in quality of life, the World Health Organisation recommends that

seniors over 65 years should participate in either moderate physical activity for a minimum of 150 minutes or 75 minutes of vigorous-intensity aerobic exercise each week. For further health advantages, older adults can extend to 300 minutes of moderate-intensity aerobic exercise weekly, or 150 minutes for the later. In addition to this cardiovascular training, muscular strength training should be undertaken for major muscle groups at least 2 days per week. For safety, this age group should adhere to 10 minute intervals, while individuals with poor mobility should engage in training which enhances balance and prevents falls on 3 or more days per week. When health conditions prevent seniors from undertaking the suggested dosage of physical activity, they should participate in as much as their ability allows for rehabilitation.[10, 12, 13]

### **3.2 Importance of Outdoor Exercise:**

Findings suggest that traditional methods of physical activity for this generation, such as gardening or hanging out the laundry is beneficial for improving mobility, functioning and the quality of life for older individuals.[28] Yet, these activities are not entirely suitable for combatting morbidity as they are less effective at improving cardiovascular and muscular strength in older adults.[28] Furthermore, while targeted indoor exercises such as physical therapy or use of indoor gyms may temporarily improve the function of muscles and joints, overall wellbeing and enjoyment may be low due to a disconnection from nature, and social activity.[16, 29] Moreover, stimulus which encouraged elderly to travel out of their home was considered very important for maintaining mobility.[30, 31] It was found that going to parks and public spaces achieved more holistic wellbeing by providing physical, social and psychological benefits.[3, 16]

Research also shows that people develop emotional connections to outdoor spaces much like they do with their homes. As older people have spent more time developing attachments with significant spaces over their lifespan, they receive stronger psychological benefits from interaction with the outdoors, such as sense of belonging and security. This connection can often be developed through contact with nature which stimulates an innate bond genetically engrained from previous millennia.[26] Studies show that elderly people can receive numerous physical and mental healing benefits from this engagement such as stress reduction and ease with mental disorders including dementia and depression.[24, 25] Interaction with exercise equipment while in outdoor spaces has the potential to provide new challenges for elderly persons to refine these outcomes in more effective ways.[32]

### **3.3 Outdoor Interactive Spaces:**

Our survey found that the inclusion of age- and ability-specific elements in public parks, termed “elderly fitness zones”, or “senior playgrounds”, are becoming increasingly popular in western countries, whom have recently adapted the concept from Asia.[27] This type of infrastructure encourages the built environment to be age-friendly while proactively promoting physical activity, social recreation, independence and well-being for ageing populations.[15, 27] However, our findings suggest there is very little research which identifies appropriate design parameters, such as the suitability of current equipment, whether it is fit-for-purpose or if appropriate methods of implementation and integration with the landscape have been adopted. Current research was limited to a handful of positive case studies which assessed physiological outcomes and elderly perceptions of outdoor fitness equipment;[21, 32-37]; preliminary research from playground suppliers;[38] and several opinion pieces commenting on the need for, or the apparent success of such installations.[25, 27, 39]



A 2014 study, which assessed balance changes in women over 65 years after using outdoor exercise equipment in a public park, found that the program was efficient in developing improved balance. It further discovered that participants also experienced increased daily functioning and perceived improvements in general health and wellbeing.[21] Another study at Rovaniemi Polytechnic in Finland also assessed the physiological and psychological improvements of a group of 40 people aged between 65 and 81 interacting with specialised play equipment. The team discovered that the subjects showed significant improvements in “balance, speed and coordination after just three months of larking about on the climbing frames and play equipment”. [36] Furthermore, the participants perceived mental and physical wellbeing increased because of the beneficial exercise while discovering more independence and confidence within themselves. Once immersed these seniors found that their initial concerns about seeming foolish went away relatively quickly especially after experiencing good physical results. One senior found that after practicing walking on a narrow beam for three months, her lap time reduced from over a minute to 17 seconds, demonstrating the potential of this equipment for improving mobility. [36] This is encouraging for policy makers whom aim to reduce fall rates in older populations, and promote healthy and successful ageing.

Another study found that many of the seniors visiting parks in Taipei went to partake in traditional physical activity such as walking or participating in group exercise as opposed to coming specifically to use the outdoor fitness equipment. [32] Despite this, many elderly often used the equipment in conjunction with their regular routine to gain additional benefits and to add some fun to their workout. One user commented, “I came to the park for group exercise, and I am heading back home soon to do some laundry. But before I go, I’m going to play on the equipment a little while”. [32] This may be promising in the sense that long-term exercise efficacy may be maintained with more beneficial results through engagement with specifically designed therapeutic landscapes.

However, not all studies have been so positive. A study of seniors playgrounds which assessed their characteristics of use discovered that while these playgrounds were designed for elderly use, the largest proportion of users were children and adults. [33] It was concluded that implementation sessions with an instructor and further promotion were required to develop knowledge and confidence around physical fitness and ensure the appropriate use of equipment within elderly populations so as to increase uptake. [33, 35] It was also acknowledged in the study that most elderly users participated due to encouragement from friends and close relatives such as children or grandchildren. [33] In response, Lapland University has been conducting research on how to make physical activity of older people more playful and fun. They are operating under the concept that seniors would profit from engaging with younger generations. [36] Through this research, the playground manufacturer Lappset, has begun developing intergenerational play equipment, however this has yet to be tested or implemented. [36]

Interactive outdoor exercise equipment for the elderly has generated international interest and frameworks for effective delivery of this exercise type are still being developed. [40] Despite promising design developments, a larger evidence base is required to assess health and well-being outcomes of existing seniors’ playgrounds in order to determine the success of prevention and rehabilitation of morbidity. In addition there is still limited research around the implementation of equipment for the elderly in public space and it is likely that existing urban design issues may prevent adherence. As previous research shows, if these spaces were better designed and integrated for a more inclusive public realm, older citizens may have greater uptake. [16, 26, 41]

## 4. DISCUSSION

As seniors today grew up in a less sedentary world where outdoor activity and recreation was more actively supported, it can be concluded that self-efficacy is less of a significant concern. While behavioural, cultural and social factors do impact adherence, it has been identified that an inadequate built environment is the predominate barrier towards exercise uptake in our older generation.[22, 23] Over the last century urbanisation and vehicle-orientated development has taken priority over walkable, inclusive and sustainable urban design. This has resulted in large-scale environmental deterioration and has fostered a societal disconnection from the landscape.[3, 23] It has been acknowledged globally that there is a substantial need for better designed, senior-friendly outdoor public spaces to meet the growing demand for built environments which promote active lifestyles and resilience in our ageing populations.[23, 26] It can also be concluded that there is a need for appropriate design parameters for the implementation of interactive equipment marketed at older persons to ensure the development of therapeutic landscapes are suitable for supporting their health and well-being.

### 4.1 Physical Wellbeing

In response to the epidemiological finding, a landscape targeted at exercising elderly would need to incorporate the following design parameters. Firstly, the landscape should effectively encourage the training of cardiovascular and muscular fitness and balance in a safe manner allowing for varying fitness and mobility levels. These exercise types, and the equipment which promotes them needs to allow for progression in order to address the requirements for rehabilitation and improving capabilities and fitness levels.[42, 43] Furthermore, designed elements should involve mental and social stimulation for improving cognitive functioning for the prevention of psychological disorders and overall health and wellbeing.[16, 27]

### 4.2 Mental Health and Social Wellbeing

Research shows that when undertaken outdoors, there are numerous benefits of physical activity for both physical and psychological restoration.[44] However other factors such as; levels of isolation, the amount of engagement, the sense of community, belonging and place, and the overall environmental qualities can influence the efficacy of these cognitive reimbursements.[27] Firstly, social interactions can encourage elderly to use public spaces recreationally, but also through these vital connections it stimulates cognitive functioning for the prevention of chronic mental diseases such as dementia and depression.[16] To facilitate social activity, the designed environment needs to support observation and conversation through the inclusion of interactive furniture and equipment which engages elderly to either participate, cooperate or spectate in order to develop confidence and interest.[27, 44] Variation and adaptability are equally beneficial for maintaining long-term intrigue.[45]

One way of achieving this may be through intergenerational design where the interaction between elderly and children may play a significant role in encouraging older people to initially engage in physical activity and to maintain adherence through the social interactions and playful or game-like elements.[46, 47] The role of technology is another design consideration, whereby the relationship between person and equipment may be updated to serve a different function. Feedback systems may also be used for increasing effectiveness. [48] Additionally, the contextual physical environment plays a vital role in levels of engagement and overall wellbeing. Connection to nature such as water and vegetation elements, indigenous flora and fauna, and biodiversity, can enhance enjoyment and mental wellbeing.[24,



25, 44, 49] as does, the overall environmental quality which is influenced by noise, air and light pollution, traffic and grey infrastructure.[3, 23, 27] In sum, comfort within an outdoor space is of great significance and attention to shade, shelter, aesthetic values and views should not be overlooked in the design of therapeutic landscapes.[23, 27, 50]

### 4.3 Accessibility and Safety

Another design parameter for a therapeutic landscape is physical accessible and safety to allow ease of use for those with existing impairments (which is likely to affect up to half of users) and to prevent further disability.[44, 51] In a planning sense this may also refer to the permeability or the ease in which persons may get-to or move-through a public space.[16, 23] Another aspect of this is cultural or social equity whereby certain demographics feel a sense of connection or belonging in communal settings for achieving mental and social wellbeing [27, 44] It is essential that rehabilitative landscapes are placed in public areas which have good physical accessibility, such as within close proximity to public transport networks and are easily accessible by walking, cycling, and driving.[50, 52] Furthermore, if the intended landscape is designed for elderly it should be implemented in or nearby communities which have the highest proportion and numbers of older persons and close to senior housing in order to maximise the reach of the intervention.[53]

The therapeutic landscape itself should have appropriate gradients for walkability with good visibility and lighting.[23, 27, 50] Furthermore, attention should be given to the layout of elements and ground surfaces, to enable persons with impairments or mobility devices to participate.[27] Fear of falling is a debilitating problem for most elderly people so adapting equipment to be age-friendly is of particular importance for interactive components.[38] Situating interactive elements in popular public spaces may also give a sense of supervision, increasing the sense of safety of the intervention.[40, 50] Additionally, multi-cultural material or engagement strategies should be incorporated when appropriate to ensure inclusive design.[23] Consideration must be given to the form and materiality of the equipment for it to be approachable and simple to use with appropriate directions and signage.[45] Sensitive implementation techniques will also be of significance.

### 4.4 Sustainable Development

As defined by the United Nations, sustainable development is: “development which meets the needs of the present without compromising the ability for future generations to meet their own needs”. [54] The Brundtland report goes on to state the importance of how this is not something which can be constant or everlasting, it is in fact something that will be in a continuous state of flux and therefore systems need to be able to change in order to resist a shift in a negative direction.[54] The same applies to the development of existing public space resources to manage shifting demographics. If appropriate design parameters are incorporated, with successful uptake, therapeutic landscapes have the potential to effectively train balance, increase the range of motion and joint health for many body regions, fortify resilience to falls, build strength and cardiovascular fitness and assist with preventing the transition to frailty. In achieving these physiological goals can consequently develop resilience, independence and improve the quality of life within the ageing population.[15], sustainably mitigating future demands on the health system through maximisation of existing landscape resources in a widespread population-based approach. If this is done in an environmentally sensitive manner, such as designing for the regeneration of ecosystem health, improving biodiversity, or incorporating water management strategies, suitable development of the public green network may support sustainable development.[23]

#### **4.5 Design Parameters**

While there is a significant demand for therapeutic landscapes which support disability prevention and rehabilitation, this research shows that in order to be successful in achieving overall wellbeing for older people, these spaces are required to support inclusivity, sociability and enjoyment.[27] Current public spaces may ineffectively provide this, in spite of the provision of outdoor exercise equipment, which may inhibit exercise participation and efficacy for all generations. Furthermore, the integration of equipment and technology into the landscape must be appropriately considered for suitable development of the public green network which supports sustainable development in a regenerative manner.

#### **5. CONCLUSION**

This project has explored the the potential for a therapeutic landscape which rekindled connection to public green space, to foster disability prevention and rehabilitation in older persons. It presents evidence that indicates outdoor natural settings can support a wide range of constructive outcomes for physical, mental and social wellbeing of older persons through engagement with physical activity. Yet, findings suggest that currently landscapes and exercise equipment situated within them largely inhibit exercise participation and efficacy. These interactive outdoor spaces require targeted design refinement to facilitate accessibility, inclusivity and sociability. This paper suggests that most appropriate solutions will be interdisciplinary designs which incorporate medical data and physiological considerations with the equipment design, while also integrating with the landscape through ecological regenerative planning and urban design strategies.