

## **HEALING SPACES: IMPROVING HEALTH AND WELLBEING FOR THE ELDERLY THROUGH THERAPEUTIC LANDSCAPE DESIGN**

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### **ABSTRACT**

Existing research supports a wide range of positive effects for physical, mental and social wellbeing from outdoor exercise, particularly through engagement with nature, however few current landscapes facilitate exercise participation and efficacy for older persons and often require targeted design refinement to foster accessibility, inclusivity and sociability. In order to identify how therapeutic landscape design can be developed to best assist older persons' health and wellbeing, epidemiological data, injury statistics, and currently available outdoor fitness equipment that is specifically marketed for use by older persons were examined. A number of problematic design issues were identified including poor equipment design; failure to integrate cognitive tasks; and minimal integration of safe, age and ability-specific elements. This paper advocates rekindling the connection to public green space in order to foster disability prevention and promote rehabilitation in older persons. The incorporation of design elements that specifically address elements of prevalent morbidities and concerns, such as psychological restoration, stress reduction, attention recovery, the health and wellbeing of older persons in the community could be improved. Age-specific design suggestions include integrating interactive landscapes with ecological regenerative planning to assist with the prevention of common morbidities in older persons.

**Keywords:** landscape; health and wellbeing; older persons; exercise; outdoor; therapeutic

### **1. INTRODUCTION**

In 2008, inadequate physical activity was linked to 3.2 million deaths worldwide [1] and is now considered the fourth primary cause of mortality and a significant contributor to societal health loss [1]. This will be of considerable consequence in the next few decades as a dramatic rise in the number of older persons is projected [2-8]. While currently the elderly only make up around

12% of the population, they contribute to approximately 30% of all health loss [9]. Age has been identified as a primary risk factor for the development and progression of most chronic degenerative diseases [10]. The increase in the number of older persons, combined with the associated rise in healthcare needs, is anticipated to place a heightened demand on the healthcare system [11]. These statistics highlight the urgent need for improving the overall fitness and wellbeing of our aging population, to improve health, and to build resilience to frailty and common morbidities, such as diabetes and heart disease.

Regular exercise in older persons has been proven to combat neuropsychological and musculoskeletal disorders, improve bone and muscular functioning, and reduce the risk of falls [1]. Numerous studies have demonstrated a statistically significant decrease in the risk of cardiovascular and all-cause mortality among those who are classified as highly fit or active compared with those in a similar age range who are classified as moderately fit and active or low fit or sedentary [12-14]. In addition, suitable amounts of exercise can combat non-communicable diseases, such as cardiovascular disorders, some by up to 30% [14]. A recent meta-analysis of previous studies shows that “individuals who engage in the equivalent of 150 min per week of moderate intensity leisure time physical activity have 15% to 20% lower risk of developing CAD than those who undertake no leisure time physical activity” [16] (p.577). Psychological restoration, stress reduction, and attention recovery from exercise can also help to attenuate the effects of dementia [17]. If appropriately implemented, targeted exercise opportunities could also address the physiological needs of the elderly through improved balance, strength, and cardiovascular fitness [18].

The amount of exercise necessary for improvement is not significant; current recommended levels of physical activity are approximately thirty minutes of moderate activity on at least five days per week [19-20]. However, while it is understood that there is a substantial need for population-based interventions for increasing physical activity rates, research finds that there are complicated participation and adherence issues which prevent engagement, due to a combination of behavioral, environmental, cultural, and social factors [18, 21].

Through examination of models that promote outdoor physical activity, it has been demonstrated that environmental surroundings play a significant role in exercise behaviors for the general population [6, 22]. Similarly, 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 [21, 23-24]. Characteristics such as accessibility, naturalness, and inclusivity to age, ethnicity, cultural, and socio-economic status situate parks in a unique position for implementing influential interventions [6]. It is therefore apparent that there is a growing demand for therapeutic landscapes to rekindle connections to existing public green space. Increasing the

use and the effectiveness of these existing resources and enhancing them for additional health benefits within the older population, is of critical importance for older persons' physical, mental, and social wellbeing.

Currently, there is limited knowledge of 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 is effective at supporting elderly health and wellbeing.

## **2. MATERIALS AND METHODS**

Published epidemiological and injury data for older people, 65 years plus, was analyzed to establish design parameters for therapeutic landscapes which target disability prevention and rehabilitation in older persons. Reports which identified the suitability and dosage of cardiovascular, strength, and balance training in elderly people for morbidity and fall prevention, were included in this literature review. Types and effectiveness of outdoor exercise strategies for the elderly were then correlated with the equipment currently available. Inclusion criteria were associated with elderly people and targeted outdoor exercise for the prevention of chronic disorders. From the literature, specific criteria were identified to assess the performance of the existing outdoor fitness equipment marketed for use by older persons in public green spaces and to develop design criteria suited to guide the design of future outdoor interactive spaces to manage the susceptible aging community. This study was endorsed by the institutional review board.

## **3. RESULTS**

Research identified both physiological and psychological needs for a therapeutic landscape. The importance of the outdoors was highlighted as particularly important for older citizens' physical, mental, social and spiritual wellbeing. However, age associated impairments and co-morbidities presented specific challenges for universal design. Most current outdoor interactive spaces were found to be ill-suited to physically training those well elderly and for those seeking rehabilitation much of the equipment was unfit for purpose. In addition, adherence barriers were identified and determined largely attributable to ineffective implementation strategies.

### 3.1. Physiological Needs of the Elderly

Research showed that physical disability such as cardiovascular and musculoskeletal disorders in older persons stemmed largely from loss of cardiovascular and muscular strength due to physical inactivity. Additional findings by Feldman *et al.* [12] show that individuals with higher activity levels and physiological fitness have a lower mortality risk, as shown in Table 1.

**Table 1: Key Medical Findings from Literature 2007-2017.**

Author	Title	Findings
Giada <i>et al.</i> [15]	Exercise prescription for the prevention and treatment of cardiovascular diseases: part I	Suitable amounts of exercise can combat non-communicable diseases, some by up to 30%.
Prasad & Das [25]	Physical inactivity: a cardiovascular risk factor	Physical activity plays a critical role in primary and secondary prevention of coronary artery disease (CAD).
Ruiz <i>et al.</i> [26]	Association between muscular strength and mortality in men: prospective cohort study	Muscular strength seems to add to the protective effect of cardiorespiratory fitness against the risk of death.
Feldman <i>et al.</i> [12]	No Evidence of an Upper Threshold for Mortality Benefit at High Levels of Cardiorespiratory Fitness	People with higher activity levels and physiological fitness have a lower mortality risk

Addressing concerns of inactivity and the corresponding health loss and reduction in quality of life, the World Health Organization 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 latter. A recent study has shown that in older British men, accumulating more minutes of activity from light intensity upwards was associated with lower all-cause mortality [27]. This suggests that short bursts of light activity of any duration may increase the chances of living longer. However, currently no research has replicated this investigation with a larger sample size or one including women.

Traditional methods of physical activity for this generation, such as gardening or hanging out the laundry, are beneficial for improving mobility, functioning, and the quality of life for older individuals [28]. However, these activities are not entirely suitable for combatting morbidity as they are less effective at improving cardiovascular and muscular strength in older adults [28].

Muscular strength seems to add to the protective effect of cardiorespiratory fitness against the risk of death [26]. Loss of muscular strength often resulted in balance deterioration which is known to be a significant contributor to falls [29]. 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 [19-20, 29].

The location of exercise plays an important role in its effectiveness. Stimulus which encouraged elderly to travel out of their home was considered very important for maintaining mobility [30]. Green space and green infrastructure improve mental and physical health and have been shown to reduce health inequalities [31]. 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 [21, 32]. It seems clear that for many, if not most, getting outdoors leads to greater levels of activity than remaining inside.

### **3.2. Psychological Needs of the Elderly**

Research also shows that people develop emotional connections to outdoor spaces much as 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 a sense of belonging and security. This connection can often be developed through contact with nature which stimulates an innate bond genetically engrained from previous millenniums [33]. 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 [17, 34].

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, who have recently adapted the concept from Asia [35]. This type of infrastructure encourages the built environment to be age-friendly while proactively promoting physical activity, social recreation, independence, and wellbeing for aging populations [18, 35]. 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 [2-8]; preliminary research from playground suppliers [36], and several opinion pieces commenting on the need for, or the apparent success of, such installations [34-35].

One recent study, which assessed the effectiveness and effects of using outdoor exercise equipment, found that the program was efficient in the development of improved physical function, muscle strength, balance, and had high adherence and participation rates. However, unlike the 2014 study by Leiros-Rodriguez *et al.* [6], it found no perceived improvements in general health and wellbeing. 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 [4]. 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” [4] (p. 4). 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 [2]. 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 [2, 7]. 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 [2]. In response, Lapland University has been conducting research on how to make physical activity of older people more playful and fun, operating under the concept that seniors would profit from engaging with younger generations [8]. Based on this research and other similar findings, various playground manufacturers such as Lappset and KaBoom are now developing intergenerational play equipment [37].

Interactive outdoor exercise equipment for the elderly has generated international interest and frameworks for effective delivery of this exercise type are still being developed [38]. Despite promising design developments, a larger evidence base is required to assess health and wellbeing 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 spaces and it is likely that existing urban design issues may prevent adherence. While going to parks and public spaces achieves more holistic wellbeing by providing physical, social, and psychological benefits [21, 39], if these spaces were better designed and integrated for a more inclusive public realm, older citizens may have greater uptake [21, 33, 40].

#### **4. DESIGN PARAMETERS**

Parameters for successful design are grouped by requirements for physical wellbeing, social, accessibility, and safety.

##### **4.1. Physical wellbeing**

In response to the epidemiological findings, a landscape targeted at exercising elderly people 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 improve capabilities and fitness levels [41-42]. Furthermore, designed elements should involve mental and social stimulation for improving cognitive functioning for the prevention of psychological disorders and overall health and wellbeing [21, 35].

##### **4.2. Social requirements**

Research shows that when undertaken outdoors, there are numerous benefits of physical activity for both physical and psychological restoration [43], 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 [35]. “Social interactions can encourage elderly people to use public spaces recreationally, but also through these vital connections, they can stimulate cognitive functioning for the prevention of chronic mental diseases such as dementia and depression” [21] (p. 1947). To facilitate social activity, the designed environment should encourage 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 [35, 43]. The location of the outdoor gym with a playground, a walkway, and other amenities has been found to be important in raising the awareness of the exercise equipment and attracting new users [7]. Variation and adaptability are equally beneficial for maintaining long-term adherence [44].

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 [35].

#### **4.3. Accessibility and safety requirements**

A therapeutic landscape must be physically accessible and safe to allow ease of use by those with impairments and to prevent further disability [43, 45]. In a design sense this may refer to the permeability or the ease in which persons may get-to or move-through a public space [21, 24]. Certain demographics feel a sense of connection or belonging in communal settings for achieving mental and social wellbeing [35, 43] and it is essential therefore that rehabilitative landscapes are placed in public areas with good physical accessibility, such as within close proximity to public transport networks and easily accessible by walking, cycling, and driving [46, 47]. Furthermore, if the intended landscape is designed for the elderly it should be implemented in or nearby to communities which have the highest proportion and numbers of older persons and close to senior housing in order to maximize the reach of the intervention [48]. Co-locating free activities such as an outdoor gym and walkway can provide equitable access to exercise opportunities [7].

The therapeutic landscape should have appropriate gradients for walkability with good visibility and lighting [24, 35, 46]. Attention should be given to the layout of elements and ground surfaces, to enable persons with impairments or mobility devices to participate [35]. 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 [36]. Situating interactive elements in popular public spaces may also give a sense of supervision, increasing the sense of safety of the



intervention [7, 38, 46]. Additionally, multi-cultural material or engagement strategies should be incorporated when appropriate to ensure inclusive design [24]. 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 [44].

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. Achieving these physiological goals can consequently develop resilience, independence, and improve the quality of life within the aging population [49], mitigating future demands on the health system through maximization of existing landscape resources in a widespread population-based approach.

## **5. 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 behavioral, cultural, and social factors do impact adherence, it has been identified that an inadequate built environment is the predominant barrier to exercise uptake in our older generation [23-24]. Over the last century urbanization 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 [24, 39]. 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 aging populations [24, 33]. 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 wellbeing.

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 [50]. 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 [51].

The contextual physical environment plays a vital role in levels of engagement and overall wellbeing. A recent study [5] shows that the most cited facilitators, particularly for women, to further outdoor gym use were the provision of shade, increasing the amount and variety of

equipment types and the inclusion of instruction. Connections to nature such as water and vegetation elements, indigenous flora and fauna, and biodiversity, can enhance enjoyment and mental wellbeing [17, 34, 43, 52]. The overall environmental quality which is equally important can be influenced by noise, air and light pollution, traffic, and grey infrastructure [24, 35, 39]. 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 [7, 24, 35, 46].

## 6. CONCLUSIONS

This research has explored the potential for a therapeutic landscape to rekindle connection to public green space, and 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. Findings suggest that existing 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.

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