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Developing Resilience, Independence and Well-being in Older Adults through Interactive Outdoor Spaces

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Abstract: The morbidity rates in populations of older persons are rising in parallel with increases in life expectancy. Increases in the numbers of older persons, many of whom will be physically dependent, will challenge communities both economically and socially. To compensate for this health loss and the subsequent demands placed on the health care system, there is a growing demand for effective preventative public exercise interventions to enable the ageing population to maintain independence and enjoy a healthier lifestyle. The provision of age-appropriate playground and exercise equipment for older persons has been gaining international popularity and is expected to become increasingly popular among local governments as a direct result of rhetoric relating to the development of age-friendly cities. Using a multidisciplinary lens, this project maps desired rehabilitation outcomes with exercise equipment design and landscape architecture. It seeks to identify both physical and motivational strategies that are most successful in maintaining good health and well-being in old age. Findings suggest that there is demand for open public space interventions that can safely train balance, muscular strength, and cardiovascular fitness. However, there is a lack of health research examining the usefulness and the sustainability of currently available equipment. There is also a necessity to address participation barriers and manage potential adherence issues that prohibit older persons from engaging in beneficial physical activity.

Keywords: resilience, interactive outdoor space, therapeutic landscapes, elderly, playground equipment

Introduction

Older individuals have experienced an unprecedented increase in life expectancy (Mousourakis, 2013). This ageing population is a pivotal demographic shift that will greatly impact the way in which people design and experience landscapes. The global over 65-year-old population is expected to more than double by 2051, whereby the New Zealand elderly cohort is predicted to rise from around 15% in 2016 to 25% by 2051, diminishing the available workforce and expanding the disabled population (Mousourakis, 2013; Statistics New Zealand, 2013; 2000). Furthermore, the mandate for health services will be pushed by chronic diseases, which pointedly contribute to the ever-increasing health loss of people over 60, and particularly those over 85 years of age (Ministry of Health, 2016; World Health Organisation, 2011). Concurrently, these issues are expected to cause a significant fiscal crisis, potentially dwarfing that of the recent economic depression (Kowal, et al.,2014). In this ageing society, rising morbidity rates will become a priority for health professionals and planners, and the

development of preventative measures will be imperative in minimising the significant demand on the health care system (Kowal, et al., 2014; Kershaw, et al, 2017).

Countless studies validate the abundant reimbursements of outdoor spaces for elderly people, who perhaps have the most time available to capitalise on these resources (Sugiyamao, et al., 2007; Kolt, et al., 2007; Grant et al., 2007). Benefits not only include increased participation in physical activity, but also the potential for increased social interactions. Natural settings foster stress recovery, decreased antagonism, and a documented reduction in developing neuropsychological illnesses (Sugiyamao, et al., 2007; McCormack, et al., 2014). Therefore, the importance for older persons to experience independence in 'natural' public space is potentially significant.

Traditional outdoor physical activity strategies such as leisure activities in parks, or in exercise groups, offer recreational advantages (Matsouka, et al., 2008). More contemporary strategies for engaging with outdoor exercise are through targeted fitness zones, which provide specialised equipment to facilitate cardiovascular, strength, and balance training (Cohen, et al., 2012; Volkanovski, 2015). Ever-increasing in popularity, these zones are increasingly being adapted for senior use to not only train for increased aerobic and muscular strength but also to improve motor functioning, balance and flexibility. These settings have the potential for improving overall well-being and increasing resilience to frailty (Kershaw, et al., 2017; Volkanovski, 2015). Developing an understanding of the effectiveness of these exercise strategies is essential to inform the development of future outdoor interactive spaces, which are effective at encouraging exercise participation for developing resilience, independence and well-being in older persons.

Method

The research method involved a review of the rehabilitation literature that examines both physical and motivational outdoor exercise strategies most effective in maintaining good health and well-being in older persons. The results of this were then compared against a systematic evaluation of current outdoor exercise equipment to establish the suitability of those designs and to identify appropriate design parameters for the development of future outdoor interactive spaces that are adequately equipped to manage this susceptible ageing community.

Findings

Many systematic reviews were uncovered which outlined the different physiological needs of older persons, for the prevention of age-related morbidity. It was found that globally there was much agreement on the required levels of physical activity for older persons for maintaining health and wellbeing. Studies highlighted the significance of outdoor spaces for the promotion of physical activity in older adults through methods such as recreation in parks, group fitness, interactive exercise equipment or elderly playgrounds. In particular, there was substantial support for developing interactive outdoor spaces for managing the ageing populations.

Suitability of Exercise for Elderly Persons:

A large majority of independent unimpaired older persons have the capacity for participating in moderate to high intensity exercise (Brown, et al., 2011). Thus, recommendations for cardiovascular, strength and balance training is relatively

comprehensive in order for people over 60 to maintain independence, prevent non-communicable diseases, and build resilience to falls and frailty (World Health Organisation, 2010). The New Zealand Ministry of Health recommends older adults engage in a minimum of 30 minutes of moderate aerobic activity, 5 days per week. This could include brisk walking, cycling, kapa haka (a Maori performing art), kilikiti (a Pacific Island version of cricket) or playing with grandchildren (Ministry of Health, 2013). There are also the options of vigorous aerobic exercise, such as running, tennis, hiking, energetic dancing or martial arts, to a total of 75 minutes per week (Ministry of Health, 2013). Additional resistance training on major muscle groups such as legs, hips, back, abdomen, chest, shoulders and arms should be undertaken at least 2 days per week to receive muscle and bone strength benefits (Hurley, et al., 2000; Seguin, 2003; Ministry of Health, 2013). Sessions of flexibility and balance exercises are also extremely beneficial for elderly persons' to improve mobility and increase resilience to falls and injury. This could include modified tai chi, stretching, yoga, pilates (Ministry of Health, 2013; Chen, et al., 2007; Mason, et al., 2013; Pata et al., 2014). For impaired elderly, the range of ability is still quite varied and recommendations suggest participation as capability allows (Ministry of Health, 2013). Consequently, progressive rehabilitation and preventative strategies for improving independence and well-being would seem essential for outdoor interactive spaces.

Suitability of Interactive Outdoor Spaces:

While there is numerous research on the effectiveness and adherence of traditional outdoor exercise strategies (Ishee, 2004; Laurant et al., 2002; McPhate et al., 2013), very little research has been published on the application of modern outdoor fitness equipment for elderly participation (Chow, 2013; Cohen, et al., 2012; Betterncourt, et al., 2012; Cranney, et al., 2016; Mitchell, et al., 2007; Scott et al., 2014). Additionally, studies which test the health implications of outdoor exercise equipment on elderly persons were limited to: a study of balance training in elderly women using public parks, Leiros-Rodriguez, et al., 2014) another study on the physiological effects of outdoor exercise equipment in elderly people, (Kim, et al., 2013) and two studies which assessed the effects of an outdoor recreational exercise program on sedentary seniors (Mitsouka, et al., 2008; 2008b).

Recreation in Parks / Group Outdoor Fitness:

Studies showed that group outdoor fitness was very beneficial in providing the social interaction and leisure which helped for exercise adherence (Young, et al., 2016). The adaptable nature of group classes meant that changes could be made to suit preferences and interest to increase uptake. A limitation of this method of exercise is its exclusivity, as it is often targeted towards specific demographics and may be inaccessible to certain cultural groups or people with low esteem (Francis, 2014). Additionally, the reliance on other people for direction or motivation, the lack of equipment and low self-efficacy were deemed to be detrimental to long-term adherence (Grant, 2008). Furthermore, in instances without feedback it is difficult for elderly persons to undertake appropriate levels or types of exercise, or to monitor their progress. A systematic review conducted in 2002 found that common participation barriers for exercise in public green spaces were that; the provided spaces were not appropriately designed for elderly physical activity; environmental factors such as lack of scenery and vegetation resulted in undesirable settings; exercise surfaces were often of poor quality, a lack of equipment limited opportunities for exercise (Francis, 2014; Humpel, et al., 2002). Without adaptation currently existing public parks may not have appropriate or

maintained facilities for effective physical activity, reducing enjoyment and safety (Grant, et al., 2007).

Outdoor Exercise Equipment:

Research found there is a strong demand for age-friendly exercise equipment within the outdoor public sector, as elderly people have a stronger tendency for participating in exercise in an outdoor environment, if it is well-designed (Kim, et al., 2013). Additionally, there are many economic barriers, which prevent people from engaging with beneficial exercise which must be addressed when designing within public space (Loukaitou-Sideris, et al., 2016). This can be seen in the numerous case studies of free outdoor fitness zones which are increasing in popularity globally and are becoming increasingly implemented in public parks (Chow, 2013; Volkanovski, et al., 2015; Cranney, et al., 2016; Elwell, et al., 2016). These interventions are of specific significance for people of low socio-economic status, whom are more likely to face health problems and may have scarce access to health care and exercise equipment (Elwell, et al., 2016).

Based on an assessment of exercise equipment currently available of the market, it was found that many of the elements do target muscular strength, balance and cardiovascular fitness in older adults (Caldwell, 2010; Martin, et al., 2007). However, the resemblance to indoor gym equipment is uncanny, with only equipment materiality altered to be more durable in outdoor conditions (Caldwell, 2010). Thus, the only key difference between outdoor and indoor equipment is that comfort is often stripped when adapting it for outdoor use (Chow, 2013). Therefore, there is a requirement for better-fit, ergonomic designs to make outdoor gym equipment more comfortable for older persons, while ensuring and outdoor maintenance is still a significant design parameter.

While there is an essential need for the equipment to be designed to effectively target specific muscles and bodily systems, which the equipment seems to do, the existing capabilities of older persons need to be considered for equipment to be utilised for strength maintenance and rehabilitation in a safe manner (Aparicio et al., 2010). This is a main concern for many older persons, who find equipment intimidating and have health and safety concerns such as physical disabilities (Fredriksson, et al., 2011). We suggest there a need for progressive adaptable elements to allow for a diverse range of capabilities as well as systems that provide meaningful feedback.

Adherence rates for the utilisation of outdoor interactive spaces also need to be addressed. One study showed that within 6 months of engaging in physical activity, 50% of participants dropped out before they were exposed to any long-term health benefits (Schutzer, et al., 2004). This is a significant problem as once exercise participation ceases, the health benefits are quickly lost (Schutzer, et al., 2004). Other issues identified include a lack of encouragement, energy and time, or perceptions of incapability due to old age (Kolt et al., 2007; Grant, et al., 2007). In addition, lack of company or interactivity was another common theme (Grant, et al., 2007). This suggests that while the equipment may be appropriate for the required training of balance, muscle strength and cardiovascular fitness, the equipment may be ill-suited for the physical, mental and social disparities within ageing population. Furthermore, the equipment may not inspire the social behaviour and confidence that are deemed essential for adherence. In summary, while it is important to establish stimulating exercise strategies for elderly persons to maintain long-term engagement, there are significant participation barriers, which need to be adequately addressed to successfully engage older persons in physical exercise. We conclude that while there is now a wide range

of equipment available on the market, it is not mentally stimulating enough to encourage long-term participation (Lim, et al., 2007) and there may be a need to provide a form of interactivity or feedback system into the outdoor exercise equipment to develop physical activity motivational strategies (Kelders, et al., 2016).

Elderly Playgrounds:

One attempt to address needs for increased social interaction and feedback and introduce some enjoyment is the clustering of fitness equipment into playgrounds for the elderly. The design challenges for these senior playgrounds have been to either adapt previous equipment to be more enjoyment and sociable, or to develop an entirely new concept which is enjoyable, yet efficient at training balance, muscular and cardiovascular fitness. Manufacturing companies developing equipment for these outdoor spaces include Kotobuki and GameTime who often modify existing exercise equipment for elderly play such as new interactive bars adapted from lateral pulldowns. Other companies, such as Xccent and Lappset have focussed designs around improving daily functioning and improving balance and proprioception for fall prevention in older adults (Lim, et al., 2007). A Lappset study showed that interactive equipment such as the high horizontal bar was useful for exercising the upper body for flexibility and strength, which could aid individuals in reaching high shelves, putting on shoes, or hanging laundry (Lappset, 2014) Another designed element involved walking on varying surfaces to develop lower body strength and joint flexibility for improving mobility up and down stairs and for moving in and out of a chair (Lappset, 2014). While marketed as play equipment, these elements were perhaps the least interactive pieces in the playground compared with the swing, or tai chi wheel so there may still be a disconnect between physiological needs and the requirement for psychological stimulation.

Recent studies show that currently elderly playgrounds are effective at enticing seniors to engage which is stimulating a cultural shift towards an acceptability for exercise and exercising with equipment among older adults (Cranney, et al., 2016; Scott, et al., 2014; Scott, 2006; Neville, et al., 2013). It appears many hesitant older persons were sufficiently intrigued by the new playgrounds that they let go of the notion that they were either too old to exercise, or their fears of appearing silly (Scott, 2006). Research found that participation in exercises in this form promoted social interaction among elders' as it provided a platform for them to meet for group exercise. Consequently, these interactions allowed increased encouragement towards participation and adherence (Loukaitou-Sideris, et al., 2014). This is particularly beneficial as studies found that female seniors preferred to exercise in groups, as it gave them more motivation, confidence and enjoyment (Chow, 2013; Leiros-Rodriguez et al., 2014). Through this social interaction, important relationships may be developed for overall wellbeing and improved quality of life. Furthermore, a study found that the inclusion of a trainer or supervisor, for introducing elderly to the equipment increased confidence within participating seniors, thereby increasing the efficacy of these therapeutic landscapes (Mitchell, et al., 2007; Scott, et al., 2014; Leiros-Rodriguez et al., 2014).

As senior playgrounds have only recently gained international popularity, there is the risk that the equipment may not be entirely fit-for-purpose despite the increasing inclusion of interactive elements. Furthermore, there are limited studies on the effectiveness of this play equipment for improving balance, muscular strength and cardiovascular fitness, or the long-term usage. In addition, very little research was found regarding the ethnic, cultural, and gender barriers. These knowledge gaps must be addressed in future research to ensure

appropriate development of interactive outdoor spaces that are inclusive for all elderly populations

Conclusion

This paper explores the potential of exercise strategies in interactive outdoor landscapes, by integrating cross-disciplinary knowledge to identify appropriate design parameters of these spaces. It argues that the interactive outdoor landscapes can be beneficial to elderly lifestyles for maintaining their independence and well-being. Findings suggest that there is demand for public open space interventions that can safely train balance, muscular strength, and cardiovascular fitness. However, there is a lack of research with respect to both the usefulness and the appropriateness of currently trending senior exercise equipment, which may not be fit for purpose for this older age group. Additionally, while there is promising enthusiasm around contemporary outdoor senior fitness equipment there are still physical activity participation and motivational barriers for the older person. In addressing adherence barriers findings suggests that more interactive and engaging exercise equipment, improved feedback systems and better integration with outdoor landscapes, could promote long-term effectiveness of physical activity for the elderly. Furthermore, to overcome additional participation problems, further research is required on specific ethnic, cultural, gender and age barriers.

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