



Therapeutic Environments and the Role of Physiological Factors in Creating Inclusive Psychological and Socio-Cultural Landscapes

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Accepted: 23 July 2021

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Abstract

The outdoor environment offers an important platform for engaging older adults from a variety of social, cultural and ethnic orientations for the purpose of improving or maintaining their physical and mental health as well as facilitating their social and cultural connections. Using a multidisciplinary lens, this study looks at the requirements and potential of a more inclusive landscape design that acknowledges different modes of health, recovery and rehabilitation, drawing from both the past and the future and providing suggestions on how more efficient and culturally appropriate ways of maintaining health and social connectivity can be achieved in later life.

Keywords Seniors health · Urban environments · Therapeutic environments · Landscape architecture · Outdoor exercise · Health and wellbeing

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Introduction

According to the World Population Prospects report by the United Nations, the population of people over 60 years of age is predicted to double by 2050, rising from 962 million globally in 2017 to 2.1 billion in 2050 (United Nations, 2017; Wiles et al., 2012). This dramatic increase in the population of people over 60 years of age is anticipated to create significant consequences for planners and designers, as there will be a need to be mindful of catering for the health and wellbeing of a changing population. The increase in the number of older persons, combined with the associated rise in healthcare needs, is anticipated to not only place a significant demand on the healthcare system but on individual independence and quality of life (Keene et al., 2016). With the number of physically impaired older persons expected to double from 2013 to 2038, there is the risk that with an increasing inaccessibility to health care, the demographic groups which are already experiencing uptake barriers and poor health may be further disadvantaged (Statistics, 2014). The development and implementation of widespread population-based preventative or rehabilitative measures will play a significant role in developing resilience in older adults, to mitigate these negative health implications (Edington et al., 2016). As a result, those responsible for delivering the built environment will need to find more effective ways of influencing the maintenance of health and social wellbeing into old age (Kershaw et al., 2018; van den Berg & van den Berg, 2015).

One potential solution to rising seniors' morbidity is to deliver therapeutic landscapes that incorporate age-specific outdoor interactive equipment or landscape elements, eHealth technologies, or motivational strategies into public green space to encourage physical activity for multiple demographic and cultural profiles within society. Older persons are a main user of open green spaces, therefore, the usefulness of population-based interventions, must not be undervalued (Chow, 2013; Marques et al., 2019; Volkanovski & Marshall, 2015). The development of these spaces may be a cost-effective, sustainable approach to assist with supporting the increasing proportion of physically impaired older persons in our communities. Outdoor exercise equipment has been shown to be appropriate for training cardiovascular fitness, balance and muscle strengthening, while beneficial exercise and engagement with nature has proven mental health benefits by reducing stress and aiding mental disorders including dementia and depression (Grant, 2008; van den Berg & van den Berg, 2015; Kershaw et al., 2017a). However, there are low adherence rates in this kind of exercise among older adults, and there are numerous barriers that prevent certain user demographics from engaging in this type of beneficial physical activity (Grant et al., 2007; Rhodes et al., 1999; Rosenkranz & Kolt, 2013).

Adapting the built environment to cater for changing populations will require awareness of many factors that influence uptake of physical activity and of concern is the fact that many population-based interventions fail to meet the needs of different cultures within society, many of whom are often most in need of such interventions. Culture, which is a vital enduring aspect of self-identity in older adults, will

be a primary concern for addressing uptake barriers in relation to physical activity and exercise for some countries. In New Zealand, this is particularly true as the immigration rate continues to increase (Day & Cohen, 2000), with the country experiencing a shift from a bicultural to multicultural society. Within this 'new' and more multicultural society, there are higher rates of disability not only in Māori persons (New Zealand's Indigenous population), but also Pacific, Asian and other, comparative to the dominant European cohort (Statistics, 2014). Within New Zealand, it is predicted that the biggest demographic rise will come from Asian groups, rising from 540,000 to between 1.2 and 1.4 million in 2038 (Statistics, 2015). Consequently, a more diverse range of cultural barriers will need to be addressed in any future solutions, and not just those of the previously numerically dominant New Zealand European element of the population. With the growth of the older population expected to increase in both size and diversity, planners and policy makers will be forced to consider the future needs and expectations of higher proportions of Māori, Pacific and Asian peoples.

Despite the necessity to include an appropriate cross-section of cultures in any future solutions, there is a paucity of research on minority ethnic groups and physical activity, and in particular surrounding uptake and utilisation of outdoor spaces for physical activity. As such, the lack of robust, empirical research on this important section of society means that future planning and development of resources is at risk of being ill informed. Minority groups embody a diverse range of cultures, religions, and traditions; however, they continue to be unrecognized and repeatedly experience inequality in health compared to majority populations due to a lack of economic or cultural accessibility. In fact, physiological disparities because of detrimental inactivity are sometimes related to socio-cultural conditions and circumstances in the built environment (McCormack et al., 2014; Nguyen & Cihlar, 2013), highlighting the importance of understanding how development of the built environment needs to cater for an increasingly disparate population.

Culture will undoubtedly play an important role in the development of effective and appropriate therapeutic landscapes; however, no consistent framework has been developed for recognizing and translating culture into productive and meaningful environmental expressions (Wendt & Gone, 2012). A recent review of research conducted on therapeutic environments revealed that there is a lack of reference to ethnicity and/or culture and their role in shaping the connection between health and place (Wilson, 2003). Additionally, research in this area has largely focused on the western contexts, avoiding the unique connection of culture, place, and health that is noticeable within minority ethnic groups (Wendt & Gone, 2012). Consequently, the contribution of these elements to the design of outdoor interactive spaces that are targeted at engaging the broad and diverse demographic profile of older persons in our communities remains unclear.

Exploring design parameters to guide the development of appropriate outdoor environments for older adults is required in order to cater to the changing demographic profiles that are emerging in many countries, and in particular, the cultural elements which may influence successful uptake of these spaces. Using a multidisciplinary lens, this article seeks to explore the underlying cultural barriers to engaging in physical activity among older adults, with a focus on how culture can inform the

development of outdoor interventions that may positively influence physical activity amongst older persons.

Method

This study involved a multidisciplinary review of literature that explored relevant cultural, psychological, and environmental barriers for engagement with physical activity strategies that are relevant to older person's utilisation of outdoor interactive spaces. Electronic journal databases (Jstor, Proquest and Scopus) were used as well as the internet search engine Google Scholar. The following terms were searched as keywords: cultural landscapes, seniors physical activity, ethnicity, fitness equipment, holistic health, intergenerational activity, outdoor exercise, psychological benefits, rehabilitative landscapes, social landscapes and therapeutic environments both individually and in various Boolean permutations. Additionally, landmark book publications were included in the literature review. The search primarily covered the period from January 2000 to April 2020. The twenty-year time frame was used predominantly to capture research specific to seniors as well as to understand the connections and evolutions of the field.

From the first capture of several hundred articles, one team member selected thirty-two articles were selected for deeper evaluation based on their relevance for seniors. Adopting a critical synthesis approach, these were then evaluated by conducting a strengths and weaknesses analysis of the study design. As causal relationships between therapeutic environments and human health are difficult to establish, this critical literature review covered studies that focussed on association rather than causation. The literature reviewed revealed a number of themes and relationships that relate to therapeutic environments, human health and seniors' exercise. These themes and relationships were used to construct a conceptual framework of the barriers to wellbeing that sustained physical inactivity. This was achieved by organising the themes and relationships, according to associations that have been empirically evaluated by the published studies. In addition, design directions for culturally appropriate outdoor spaces for older people were established.

Results

While many studies related to the benefits of using outdoor spaces for overall wellbeing and the adherence barriers for older persons, very few studies analysed the suitability of outdoor exercise equipment for older persons from different cultural backgrounds. The review found that the barriers, which sustained physical inactivity, could be considered under the following broad headings: psychological, environmental and socio-cultural barriers. Psychological barriers regarding physical activity of older adults refer to the role that components such as confidence, perceived exercise enjoyment and satisfaction, influence engagement with physical activity (Lee et al., 2008). Socio-cultural barriers of seniors refer to societal cultural beliefs, and social or religious practices, which influence perceived barriers, or prevent persons

from engaging in activity. Environmental barriers are attributes of the physical environment such as access to facilities, high residential density and footpaths/sidewalks (Cleland et al., 2015). In order to effectively consider these barriers in a design framework, each must be considered at the same time, in order to avoid solving the problems of one at the cost of another. Accordingly, they have been distilled into four key themes: motivation, self-efficacy, fear of falling (including the environmental considerations of functionality and inclusivity) and social support.

Motivation

Motivation as the drive to initiate behaviour is accepted as an essential requisite for physical activity (Gurleyik, 2012). Lack of motivation has been cited as one of the main barriers to changing sedentary behaviour (Chao et al., 2000). In a study of sedentary behaviour reduction in-group of overweight and obese older adults, results showed that a lack of motivation manifested itself in numerous forms. During the study, participants were asked to reduce sitting time and increase breaks from sitting. Results showed that individuals were insufficiently motivated to follow these instructions either as they were not seeing immediate benefits or because they lacked personal accountability for reducing their sedentary behaviour. Others stated that reducing sitting time by standing up felt artificial and forced, as they had no idea what to do while standing (Greenwood-Hickman et al., 2015).

In addition to motivation, previous research has shown that culture can meaningfully influence the motivational climate of physical activity settings. This influence also affects perceptions of ‘achievement motivation’, which refers to the need for success or the attainment of excellence (Hatton et al., 2017a; Kershaw et al., 2017b; Markus & Kitayama, 2010). According to the social context framework developed by Markus and Kitayama (2010), individuals’ achievement motivation differs by culture. For instance, individuals from an Eastern cultural background displayed an interdependent viewpoint of the self (e.g., endeavour to fit in and affiliate with others). On the other hand, individuals within a western cultural perspective displayed an independent perspective of the self (e.g. endeavour to be unique and stand out among others) (Hayashi, 1996). In sum, the differences between individualistic and collectivist cultures will have different influences on motivation in older adults, therefore there is a significant need to understand the role that culture plays in motivation.

Self-efficacy

Self-efficacy refers to a person’s perceived abilities to perform a certain behaviour to achieve a desired result. Research has shown that low self-efficacy is a significant barrier to exercise in all seniors regardless of cultural difference (Francis, 2014). It has also been found that the ability of individuals with low perceived confidence to engage physical activity becomes lower as they age. (Lee et al., 2008). Individuals with greater perceived confidence are better able to maintain an increased sense of energy, sustain less perceived effort and report a more positive affect after exercise

(Franco et al., 2015). Various studies have also found that self-efficacy may play a significant role in the initiation of exercise adoption as well as in maintenance (Bauman et al., 2012; Crain et al., 2010; van Stralen et al., 2009). While there is evidence suggesting that self-efficacy is associated with initiating an exercise program, its role in terms of long-term adherence is unclear because only a few studies have provided such evidence. Of these studies, authors (Slovinec D'Angelo et al., 2014) found that in older adults with coronary heart disease autonomous motivation and self-efficacy were important predictors of short-term (6-month) exercise behaviour regulation, however long-term exercise behaviour (12 months) was only predicted by autonomous motivation (Slovinec D'Angelo et al., 2014).

Fear of Falling

One of the main physical barriers identified was concern over mobility and capability (Othman & Fadzil, 2015). Of these concerns, falling was cited multiple times throughout the literature. Numerous articles have recorded the concern of injury from falling experienced by adults as they enter later years. The concern is well placed as over 30% of seniors over 65 years of age, fall at least once each year (Voermans et al., 2007). This is the result of physiological changes that occur with age, such as osteoporosis, postural instability, weakened muscle strength, reduced vision and cognitive impairment; all of which are risk factors for falling (Rubenstein, 2006). In addition, more than 70% of seniors have suffered from a fear of further falls; this has significant psycho-social consequences, and can result in a lack of confidence, increased anxiety and depression. These elements can all lead to an increased fear of falling, leading to the avoidance of physical activity, which can raise the chances of falling (Bösner et al., 2012; Lachman & Weaver, 1998; Yardley & Smith, 2002).

Recently, health-promotion research has focused heavily on falls and fall prevention among older adults. Reviews of the literature have shown that a wide range of falls-prevention strategies are highly effective, these include multifactorial risk screening and intervention programmes, muscle strength and balance training, home exercise programmes and Tai Chi programmes (Gillespie et al., 2003; Parker et al., 2005). However, a large majority of these interventions have neglected the patients' views and cultural background during the development stages. As a result, service or guideline developers have little information by which to improve acceptability or adherence. For instance, while many interventions have suggested the use of inter-generational playgrounds to help encourage older adults to participate in physical activity, research has shown that seniors who have a significant fear of falling are wary of interacting with these playgrounds. Seniors have emphasized that they are worried about being knocked over by younger persons, which discourages them from using facilities in public spaces (Mitchell et al., 2007). At the same time, inter-generational playgrounds have been cited as being excellent connectors for adults, seniors and children (McIntosh et al., 2019). In addition, they provide cognitive and physical benefits and help to reduce stress (Finlay et al., 2015). To address these issues, it has been suggested that separate recreational facilities should be provided which only cater to seniors needs, however this creates issues around exclusivity,

in a context that is aiming to promote inclusive recreation in public space. This is one of the many paradoxes that is a challenge for those designing falls prevention programmes.

Social Support

Motivation to undertake in physical activity has been found to be influenced by the presence or absence of social support (Smith et al., 2017). Singh (2000) has shown that offering exercise in a group setting may help to relieve fears and increase physical activity. Therefore, developing interventions that enable social support can help to create a sense of community and allow older adults, particularly those from similar cultural backgrounds, to interact with each other. Belza et al. (2004) have reported that a cultural history of oppression has created barriers to physical activity through low self-esteem and lower motivation for self-care. For example, in a study of Native Americans, participants expressed strong cultural connectivity and the need to be with others like themselves when considering physical activity. This cultural connection of being with others of the same background, identity and age range was also shown to be important to Filipino and Korean people (Belza et al., 2004). Overall, cultural and community connection were seen as very important and key motivators for participation. Similar findings were found to be relevant to New Zealand, with its bicultural context of collectivist Māori and Pasifika cultures. Throughout the literature, four key themes of social support emerged; these were friendship; benefits to family; socialization; and, motivation from other people. In several studies, participants acknowledged that undertaking physical activity in outdoor gyms allowed them to make new connections and solicit encouragement from others (Lee et al., 2018). In a study by Copeland et al. (2017) results found that the subtheme of family was significant as a motivator to participation in physical activity. A study participant stated that access to outdoor gyms not only allowed her to bring her children with her when she was exercising, but it was also a good role-modelling opportunity (Copeland et al., 2017).

Discussion

Outdoor environments offer an important platform for engaging older adults from a variety of social, cultural and ethnic orientations for the purpose of improving or maintaining their physical and mental health, as well as facilitating their social and cultural connections (Child et al., 2014). Furthermore, through targeted physical activity these designed landscapes have the potential to combat costly morbidity, including diseases such as heart disease, diabetes and cancer (Bostrom et al., 2017). In addition, the factors of reduced strength and lack of balance both contribute to falls, which is the most common cause of injury and fear. This can be combatted through targeted physical activity (World Health Organization, 2007). Our review highlights specific areas for consideration in how the design of culturally appropriate outdoor exercise spaces for older persons can be undertaken, including a need to

incorporate the specific design parameters. These include progressive and adaptive design and feedback technologies, intergenerational and inclusive design, landscape integrated solutions and traditional healing elements.

Progressive and Adaptive Design and Feedback/eHealth Technology

Designing age-specific exercise equipment may be a solution to barriers presented by fear and mobility. Incorporating design features such as handrails, safe materials and flooring, and simplified designs can help to take into consideration reduced ranges of motion, strength and balance (Cranney et al., 2016). In addition to the design features mentioned, accessibility for individuals with walking aids must also be incorporated. Overall, the equipment must be inclusive to other capabilities. An adaptive approach, whether it be in the design of the equipment itself or in its layout in a wider landscape, needs to provide adequate challenges which increase in difficulty to accommodate a wide range of capabilities and progress. Moreover, if feedback systems are integrated into the equipment, which can measure the suitability of each activity based on individual performance, seniors could gain confidence over time (Lim et al., 2017). In this manner, users could exercise safely as the technology could allow users to identify weaknesses in hands or feet and could alert on possible safety issues such as foot dragging or imperceptible limps as well as identifying if they are using the equipment correctly (Alexander et al., 2010). In addition, with smartphones or other smart technologies, the use of this equipment could extend to use outside the home, in the outdoor environment. Research has found that eHealth technologies can increase individual's sense of wellness, including physiological, psychological, and social and health well-being, by providing patient-centred progressive engagement with long-term physical activity participation (Marques et al., 2020).

Intergenerational and Inclusive Design

Lack of social support is one of the many barriers to physical activity (Kershaw et al., 2017b). Designing therapeutic landscapes that integrate physical activity with other routine daily activities, such as spending time with children; gardening, gathering food and food shopping; or, doing the laundry and cleaning can be one of the solutions to increase motivation when there is a lack of social support. In addition, integrated and inclusive design has the potential to address various sociocultural barriers. In order to develop and implement intergenerational and inclusive design, input from local community groups, primary schools, early childhood centres etc. is an imperative if the goal is to promote beneficial social interactions between different generations and ethnic groups (Bettencourt & Neves, 2012; McConnell & Naylor, 2016). Making exercise equipment less intimidating, or 'gym-like' and by developing the materiality and form of this equipment in a site and location-sensitive manner can result in a cultural shift and remove negative exercise connotation, reducing stigma barriers regarding appropriateness.

Landscape Integration and Traditional Healing Systems

Integration with the landscape is another technique that can be used for achieving more approachable interactive installations. Setting interactive challenges by using landforms, natural settings and existing structures may help to redefine what an exercise intervention actually is, therefore widening the scope to include a therapeutic landscape. In this perspective, another strategy for raising awareness and participation in culturally diverse demographics may be to consider traditional healing systems. By removing the barrier that exists between health professionals, the built environment and Indigenous peoples, a more appropriate and inclusive means of delivering education around why or how to participate in physical activity is possible. For example, therapeutic healing systems for many Indigenous peoples maintain that all things are connected, and no single entity can co-exist without its supportive web of interrelationships. This supports the idea of a cycle of life where all living and non-living things are connected to one another and human beings are seen as part of a wider community consisting of many entities and even landforms.

There is a need for interventions that provide a platform for seniors to engage in physical and social activity that is coupled with eHealth technologies in order to improve confidence, safety and progressive engagement. This may assist seniors to overcome physical and perceived barriers, allowing them to participate effectively in physical activity (Perkins et al., 2008). Furthermore, a lack of cultural suitability substantially limits the effectiveness of exercise interventions, by not appropriately encouraging access to physical activity for non-western people. Therefore, the design of outdoor therapeutic landscapes must encompass an approach that is sensitive, receptive and responsive to a diverse range of cultural perspectives, not just the western paradigm.

Strengths, Limitations and Future Research

This research adopted a multidisciplinary approach, drawing from research in landscape architecture, cultural geography, eHealth and technology, psychology, sociology and public health. This allowed us to capture elements that might not be found in a single discipline and added to the richness of the data. However, it also revealed a lack of research or development that investigates the adaptation of traditional Māori or Pasifika exercise techniques for contemporary health promotion. For example, our review of seniors' exercise equipment currently on the market shows that some elements are designed based on international traditional exercise, such as the Tai Chi Wheel, based on the Chinese Tai Chi martial arts; or the Cross-walk, inspired from Nordic walking (Andrianopoulos et al., 2014), but we found little to address the strong connections many Indigenous people hold with the land and the native flora and fauna (Hatton et al., 2017b; Smith, 2004). A limitation of this research is that of our own cultural heritage and the western research paradigm that we operate within. Indigenous ways of being are still not widely published and hence the socio-cultural landscapes are still under explored. We believe that it is imperative for future research to seek the involvement of the different ethnic groups themselves to ensure culturally appropriate processes are adopted and methods of implementation are socially and culturally responsive.

Conclusion

“Ageing in place” is a popular term used in ageing policy, defined as “remaining living in the community, with some level of independence, rather than in residential care” (Davey et al., 2004, p. 133). It also refers to a framework increasingly being used by planners and urban designers to develop urban environments, with spaces utilised to support ageing populations. To develop outdoor therapeutic environments that cater effectively for older persons of diverse cultures, design of these areas must incorporate elements that provide specifically for the cultural, physical, psychological and social needs of this demographic. Identifying specific cultural conditions, modifying these to address psychological and socio-cultural barriers to the use of outdoor spaces by the seniors then synthesizing these with the environmental imperatives of the microenvironment will allow the designer to explore appropriate design solutions. However, this alone is not enough, cultural factors are often complexly interwoven with social and personal characteristics and life contexts when related with physical activity and individuals are often not consciously aware of the role that their culture and ethnicity play in shaping their values and beliefs. From the research undertaken, the authors conclude that to move forward we must first look back and consider traditional healing systems. Then working with the latest technologies, they maintain that a therapeutic environment must provide and maintain motivation through progressive designs with feedback mechanisms that can relate to eHealth technologies and can access intergenerationally inclusive philosophies.

Funding This study was funded by the Health Research Council of New Zealand (grant number 16/682).

Declarations

Conflict of Interest The authors declare that they have no conflict of interest.

Informed Consent None.

Ethical Treatment of Experimental Subjects (Animal and Human) This article does not contain any studies with human participants or animals performed by any of the authors.

References

- Alexander, G. L., Havens, T. C., Rantz, M., Keller, J., & Casanova Abbott, C. (2010). An analysis of human motion detection systems use during elder exercise routines. *Western Journal of Nursing Research*, 32(2), 233–249.
- Andrianopoulos, V., Klijn, P., Franssen, F. M. E., & Spruit, M. A. (2014). Exercise training in pulmonary rehabilitation. *Clinics in Chest Medicine*, 35(2), 313–322.
- Bauman, A. E., Reis, R. S., Sallis, J. F., Wells, J. C., Loos, R. J. F., & Martin, B. W. (2012). Correlates of physical activity: Why are some people physically active and others not? *The Lancet*, 380(9838), 258–271.

- Belza, B., Walwick, J., Schwartz, S., LoGerfo, J., Shiu-Thornton, S., Taylor, M., & LoGerfo, J. (2004). Older Adult perspectives on physical Activity and Exercise: Voices From Multiple cultures. *Preventing Chronic Disease*, 1(4), 1–12.
- Bettencourt, L., & Neves, R. (2012). Seniors' playground and physical activity: perceptions and practises. *Journal of Aging and Physical Activity*, 20(suppl), S276.
- Bösner, S., Keller, H., Wöhner, A., Wöhner, C., Sönnichsen, A., Baum, E., & Donner-Banzhoff, N. (2012). Prevention of falls by outdoor-walking in elderly persons at risk ("power")—a pilot study. *European Geriatric Medicine*, 3(1), 28–32.
- Bostrom, H. E., Shulaker, B., Rippon, J., & Wood, R. (2017). Strategic and integrated planning for healthy, connected cities: Chattanooga case study. *Preventive Medicine*, 95, S115–S119.
- Chao, D., Foy, C. G., & Farmer, D. (2000). Exercise adherence among older adults: Challenges and strategies. *Contemporary Clinical Trials*, 21(5), S212–S217.
- Child, S., McKenzie, T., Arredondo, E., Elder, J., Martinez, S., & Ayala, G. (2014). Associations between Park Facilities, User Demographics, and Physical Activity Levels at San Diego County Parks. *Journal of Park and Recreation Administration*, 32(4), 68–81.
- Chow, H. W. (2013). Outdoor fitness equipment in parks: A qualitative study from older adults' perceptions. *BMC Public Health*, 13(1), 1216.
- Cleland, V., Hughes, C., Thornton, L., Squibb, K., Venn, A., & Ball, K. (2015). Environmental barriers and enablers to physical activity participation among rural adults: A qualitative study. *Health Promotion Journal of Australia*, 26(2), 99–104.
- Copeland, J. L., Currie, C., Walker, A., Mason, E., Willoughby, T. N., & Amson, A. (2017). Fitness equipment in public parks: Frequency of use and community perceptions in a small urban centre. *Journal of Physical Activity and Health*, 14(5), 344–352.
- Crain, A. L., Martinson, B. C., Sherwood, N. E., & O'Connor, P. J. (2010). The long and winding road to physical activity maintenance. *American Journal of Health Behaviour*, 34(6), 764–775.
- Cranney, L., Phongsavan, P., Kariuki, M., Stride, V., Scott, A., Hua, M., & Bauman, A. (2016). Impact of an outdoor gym on park users' physical activity: A natural experiment. *Health & Place*, 37, 26–34.
- Davey, J. A., de Joux, V., Nana, G., & Arcus, M. (2004). *Accommodation options for older people in Aotearoa/New Zealand*: Christchurch: Centre for Housing Research.
- Day, K., & Cohen, U. (2000). The role of culture in designing environments for people with dementia: A study of Russian Jewish immigrants. *Environment and Behavior*, 32(3), 361–399.
- Edington, D. W., Schultz, A. B., Pitts, J. S., & Camilleri, A. (2016). The Future of Health Promotion in the 21st Century: A Focus on the Working Population. *American Journal of Lifestyle Medicine*, 10(4), 242–252.
- Finlay, J., Franke, T., McKay, H., & Sims-Gould, J. (2015). Therapeutic landscapes and wellbeing in later life: Impacts of blue and green spaces for older adults. *Health & Place*, 34, 97–106.
- Francis, P. (2014). Physical activities in elderly: benefits and barriers. Bachelor of Social Services and Health Care degree thesis, Arcadia University of Applied Sciences.
- Franco, M. R., Tong, A., Howard, K., Sherrington, C., Ferreira, P. H., Pinto, R. Z., & Ferreira, M. L. (2015). Older people's perspectives on participation in physical activity: A systematic review and thematic synthesis of qualitative literature. *British Journal of Sports Medicine*, 49(19), 1268–1276.
- Gillespie, L. D., Gillespie, W. J., Robertson, M. C., Lamb, S. E., Cumming, R. G., & Rowe, B. H. (2003). Interventions for preventing falls in elderly people. *Physiotherapy*, 89(12), 692–693.
- Grant, B., Jones, P., McLean, G., & O'Neill, D. (2007). Physical Activity in the Lives of Midlife and Older New Zealanders. *Australasian Parks and Leisure*, Spring, 45–48.
- Grant, B. C. (2008). Should Physical Activity Be On The Healthy Ageing Agenda? *Social Policy Journal of New Zealand*, 33, 163–177.
- Greenwood-Hickman, M. A., Renz, A., & Rosenberg, D. E. (2015). Motivators and barriers to reducing sedentary behavior among overweight and obese older adults. *The Gerontologist*, 56(4), 660–668.
- Gurleyik, D. (2012). *The effects of cultural differences on motivation goal theory in physical activity settings*. University of North Carolina at Greensboro.
- Hatton, W., Marques, B., & McIntosh, J. (2017a). Therapeutic landscapes: the role of culture. In A. Gospodini (Ed.), *Proceedings of the International Conference on Changing Cities III Spatial, Design, Landscape & Socio-economic Dimensions* (pp. 1495–1503). Thessaloniki, Greece: Grafima Publications.
- Hatton, W., Marques, B., & McIntosh, J. (2017b). Mātauranga Māori and Therapeutic Landscapes. In *The IAFOR International Conference on the City 2017 Official Conference Proceedings* (pp. 15–28). Nagoya, Japan: International Academic Forum (IAFOR).

- Hayashi, C. T. (1996). Achievement motivation among Anglo-American and Hawaiian male physical activity participants: Individual differences and social contextual factors. *Journal of Sport and Exercise Psychology*, 18(2), 194–215.
- Keene, L., Bagshaw, P., Nicholls, M. G., Rosenberg, B., Frampton, C. M., & Powell, I. (2016). Funding New Zealand's public healthcare system: Time for an honest appraisal and public debate. *New Zealand Medical Journal*, 129, 10–20.
- Kershaw, C., Stoner, L., McIntosh, J., Marques, B., Wood, P., & Cornwall, J. (2017a). A potential role for outdoor, interactive spaces as a healthcare intervention for older persons. *Perspectives in Public Health*, 137(4), 212–213.
- Kershaw, C., Lim, J., McIntosh, J., Marques, B., & Cornwall, J. (2017b). The Role of Cultural Orientation in Therapeutic Landscape Design. In G. Cairns (Ed.), *AMPS Proceedings Series 10 Cities, Communities and Homes: Is the Urban Future Livable?* (pp. 50–57). Derby, England: AMPS C.I.O.
- Kershaw, C., Marques, B., & McIntosh, J. (2018). Rehabilitating Healthcare: Healthcare landscapes a catalyst for health, well-being and social equity. In P. Rajagopalan, M. Andamon (Eds.), *Proceedings of the 52nd International Conference of the Architectural Science Association (ANZAScA)* (pp. 511–516). Melbourne, Australia: ANZAScA and RMIT.
- Lachman, M. E., & Weaver, S. L. (1998). The sense of control as a moderator of social class differences in health and well-being. *Journal of Personality and Social Psychology*, 74(3), 763.
- Lee, J. L. C., Lo, T. L. T., & Ho, R. T. H. (2018). Understanding outdoor gyms in public open spaces: A systematic review and integrative synthesis of qualitative and quantitative evidence. *International Journal of Environmental Research and Public Health*, 15(4), 590.
- Lee, L. L., Arthur, A., & Avis, M. (2008). Using self-efficacy theory to develop interventions that help older people overcome psychological barriers to physical activity: A discussion paper. *International Journal of Nursing Studies*, 45(11), 1690–1699.
- Lim, J., McIntosh, J., Marques, B., Cornwall, J., & Rodriguez-Ramirez, E. (2017). Smart systems for rehabilitation and independence. In A. Gospodini (Ed.), *Proceedings of the International Conference on Changing Cities III Spatial, Design, Landscape & Socio-economic Dimensions* (pp. 1171–1181). Thessaloniki, Greece: Grafima Publications.
- Markus, H. R., & Kitayama, S. (2010). Cultures and selves: A cycle of mutual constitution. *Perspectives on Psychological Science*, 5(4), 420–430.
- Marques, B., McIntosh, J., & Kershaw, C. (2019). Healing spaces: Improving health and wellbeing for the elderly through therapeutic landscape design. *International Journal of Arts and Humanities*, 3(2), 20–34.
- Marques, B., McIntosh, J., Valera, A., & Gaddam, A. (2020). Innovative and Assistive eHealth Technologies for Smart Therapeutic and Rehabilitation Outdoor Spaces for the Elderly Demographic. *Multimodal Technologies and Interaction*, 4(4), 76–97.
- McConnell, J., & Naylor, P.-J. (2016). Feasibility of an intergenerational-physical-activity leadership intervention. *Journal of Intergenerational Relationships*, 14(3), 220–241.
- McCormack, G. R., Rock, M., Swanson, K., Burton, L., & Massolo, A. (2014). Physical activity patterns in urban neighbourhood parks: Insights from a multiple case study. *BMC Public Health*, 14(962), 1–13.
- McIntosh, J., Marques, B., & Lim, J. (2019). Designing Schools for Children with Impairments: The Powers of Architecture. *The International Journal of Design in Society*, 13(3), 17–29.
- Mitchell, V., Elton, E., Clift, L., & Moore, H. (2007). Do older adults want playgrounds?. In *Proceedings of INCLUDE, Designing with People* (pp. 1–4). London: Royal College of Art.
- Nguyen, H. M., & Cihlar, V. (2013). Differences in physical fitness and subjectively rated physical health in Vietnamese and German older adults. *Journal of Cross-Cultural Gerontology*, 28(2), 181–194.
- Othman, A. R., & Fadzil, F. (2015). Influence of outdoor space to the elderly wellbeing in a typical care centre. *Procedia-Social and Behavioral Sciences*, 170, 320–329.
- Parker, M. J., Gillespie, W. J., & Gillespie, L. D. (2005). Hip protectors for preventing hip fractures in older people. *Cochrane Database Systematic Review*, 3, CD001255.
- Perkins, J. M., Multhaupt, K. S., Perkins, H. W., & Barton, C. (2008). Self-efficacy and participation in physical and social activity among older adults in Spain and the United States. *The Gerontologist*, 48(1), 51–58.
- Rhodes, R. E., Martin, A. D., Taunton, J. E., Rhodes, E. C., Donnelly, M., & Elliot, J. (1999). Factors associated with adherence among older adults. *Sports Medicine*, 28(6), 397–411.
- Rosenkranz, R. R., & Kolt, G. S. (2013). A review of enablers and barriers to physical activity participation among older people of New Zealand and international populations. *International Sports Medicine Journal*, 14(4), 294–312.

- Rubenstein, L. Z. (2006). Falls in older people: epidemiology, risk factors and strategies for prevention. *Age and ageing*, 35(suppl_2), ii37–ii41.
- Singh, M. A. F. (2000). *Exercise, nutrition and the older woman: Wellness for women over fifty*. CRC Press.
- Slovinec D'Angelo, M. E., Pelletier, L. G., Reid, R. D., & Huta, V. (2014). The roles of self-efficacy and motivation in the prediction of short-and long-term adherence to exercise among patients with coronary heart disease. *Health Psychology*, 33(11), 1344.
- Smith, A. (2004). A Māori Sense of Place? Taranaki Waiata Tangi and Feelings for Place. *New Zealand Geographer*, 60(1), 12–17.
- Smith, G. L., Banting, L., Eime, R., O'Sullivan, G., & van Uffelen, J. G. Z. (2017). The association between social support and physical activity in older adults: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity*, 14(1), 56.
- Statistics, N. Z. (2014). *Disability Survey: 2013*. Wellington: Statistics NZ.
- Statistics, N. Z. (2015). *National Ethnic Population Projections: 2013 (base)–2038*. Wellington: Statistics New Zealand.
- United Nations. (2017). *Revision of World Population Prospects*. New York, USA: United Nations.
- van den Berg, A., & van den Berg, M. (2015). Health Benefits of Plants and Green Space: Establishing the Evidence Base. *Acta Horticulturae*, 1093, 19–30.
- van Stralen, M. M., De Vries, H., Mudde, A. N., Bolman, C., & Lechner, L. (2009). Determinants of initiation and maintenance of physical activity among older adults: A literature review. *Health Psychology Review*, 3(2), 147–207.
- Voermans, N., Snijders, A., Schoon, Y., & Bloem, B. (2007). Why old people fall (and how to stop them). *Practical Neurology*, 7(3), 158–171.
- Volkanovski, J., & Marshall, N. (2015). Seniors' Playgrounds May Never Get Old. In P. Burton & H. Shearer (Eds.), *Proceedings of the State of Australian Cities Conference*. Queensland, Australia: Griffith University.
- Wendt, D. C., & Gone, J. P. (2012). Urban-indigenous therapeutic landscapes: A case study of an urban American Indian health organization. *Health & Place*, 18(5), 1025–1033.
- Wiles, J. L., Leibling, A., Guberman, N., Reeve, J., & Allen, R. E. S. (2012). The meaning of “aging in place” to older people. *The Gerontologist*, 52(3), 357–366.
- Wilson, K. (2003). Therapeutic landscapes and First Nations peoples: An exploration of culture, health and place. *Health & Place*, 9(2), 83–93.
- World Health Organization. (2007). *WHO Global Report on Falls Prevention in Older Age*. WHO.
- Yardley, L., & Smith, H. (2002). A prospective study of the relationship between feared consequences of falling and avoidance of activity in community-living older people. *The Gerontologist*, 42(1), 17–23.

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