

## Relationships between exposure to urban green spaces, physical activity and self-rated health



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### ABSTRACT

The environment surrounding residences and its recreational and commuting opportunities are believed to affect human health and well-being. To provide scientific evidence for the mechanisms of influence of the types of environments on human well-being, this study examined how the presence of and access to green spaces is related to the level of physical activity and self-rated health. The study focused on the mediating role of outdoor physical activity, utilizing a dataset from a comprehensive, cross-sectional nationwide survey, which included the number of outdoor recreation visits to close-to-home green spaces and respondents' self-rated health status. The survey data were supplemented with precise, GIS-derived data of each respondent's exposure to green spaces, and the relationships were tested using path analyses. The study demonstrated that the presence of and access to green space is evident in the suburbs, where outdoor recreation was related to leisure time physical activity and to self-rated health. Thus, in order to promote health to suburban residents, access to close-to-home green spaces suitable for recreation should be secured. In contrast, in more urban residential areas, green spaces were more connected to frequent physical activity in association with commuting, indicating that investing in infrastructure for safe walking and bicycling could promote public health.

### MANAGEMENT IMPLICATIONS

The research results contribute to strengthening the role and importance of close-to-home recreational opportunities in urban green spaces. Easy accessibility to green spaces should be an important objective in the management and planning of urban and suburban forests and other green spaces. Close-to-home recreation opportunities are particularly vital for older people. If green spaces are also developed for commuting, health and well-being benefits could be realized via increased overall physical activity.

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## 1. Introduction

The concern over decreasing levels of total physical activity, leading to public health issues such as obesity, type 2 diabetes, metabolic syndrome and mortality, as well as mental health problems such as depression is now a global one (Nielsen & Hansen, 2007; World Health Organization, 2010). Therefore it is important to enhance participation in physical activity, since an active lifestyle is known to have positive health effects (Kaczynski &

Henderson, 2007; De Vries, Verheij, Groenewegen, & Spreeuwenberg, 2003; World Health Organization, 2010). The need to improve residents' health status has led to discussion about the potential of green spaces to increase levels of physical activity among residents in communities (De Vries et al., 2011; Kaczynski & Henderson, 2007), as green spaces in close proximity to residents' homes provide low-cost opportunities for increasing physical activity of nearby residents.

Urban and suburban green spaces provide an essential resource for residents' mental and physical well-being and can be influential during both leisure time and commuting. Exposure to green spaces while outdoors and exercising is common in Finland, where cities and towns are still relatively green compared to many other

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European countries (Tyrväinen, Pauleit, Seeland, & de Vries, 2005). The most typical natural environments for outdoor recreation in Finland are forests, as they cover 86% of the country's land area (Forest Statistics, 2013). Natural environments appear to be important for Finns, as even the most urban dwellers still find their favorite places in nature (Korpela, Ylén, Tyrväinen, & Silvennoinen, 2010). At the same time, people's preferences for residential areas seem to vary in terms of their supply of natural spaces as well as their type of constructed areas and their services (Tyrväinen, Silvennoinen, Korpela, & Ylen, 2007). Residents who value a full suite of urban services and densely-built areas inhabit mostly city centers and sub-centers, while suburbs and other less urban areas are often home to "nature lovers" who value easy access to natural spaces, such as forested areas. Nevertheless, continuing urbanization and compact city policies have led to high land-use pressures on urban green areas in growth centers in Finland, and can result in limiting access to favorable green spaces.

Moreover, outdoor recreation constitutes the most important type of physical activity in Finland, as 96% of adults participate in it (Sievänen & Neuvonen, 2011), especially in the form of walking, biking, skiing, and jogging (Borodulin, 2006). On the other hand, only 14% of physical activity during leisure time occurs indoors (Borodulin, Paronen, & Männistö, 2011). Over the past 30 years, Finns have increased physical activity during leisure time, while non-leisure outdoor activities, such as commuting, have decreased (Borodulin et al., in preparation). Consequently, research on how recreational opportunities provided by green-space affects residents' physical activity and health is gaining societal importance. In particular, an improved understanding of the relationships between exposure to green spaces and outdoor recreation is needed to support the significance of green spaces in urban and community planning.

Different mechanisms mediate the effects of exposure to green spaces on our health. Many studies have researched the influence of natural environments on the level of physical activity, hypothesizing that an increase in physical activity increases well-being. Despite the inconsistencies in these studies, they have generally identified a positive association between exposure to green spaces and physical activity levels (e.g. Li, Fisher, Brownson, & Bosworth, 2005; Mytton, Townsend, Rutter, & Foster, 2012; Neuvonen, Sievänen, Tönnnes, & Koskela, 2007). In addition, several reviews have concluded that environmental factors, such as the proximity and accessibility of recreation areas and parks, promote physical activity (e.g. Bauman et al., 2012; Humpel, Owen, & Leslie, 2002; Kaczynski & Henderson, 2007; Van Holle et al., 2012). Therefore, improvements to green spaces in and near urban areas are considered beneficial in promoting physical activity of its residents (Coombes, Jones, & Hillsdon, 2010; Jongeneel-Grimen, Droomers, van Oers, Stronks, & Kunst, 2014).

Although the association of green spaces with general health is mediated by physical activity (e.g. De Jong, Albin, Skärbäck, Grahn, & Björk, 2012), some studies have responded more critically towards this mediating role of physical activity (e.g. de Vries, van Dillen, Groenewegen, & Spreewenbergh, 2013; Fan, Das, & Chen, 2011; Richardson, Pearce, Mitchell, & Kingham, 2013). According to Hartig, Mitchell, De Vries and Frumkin (2014) it is "surprising that even though physical activity is assumed to be an important pathway joining nature with health, only few studies have formally investigated the extent to which any association between nature and health might be mediated by physical activity levels" (p. 215). Therefore, the understanding of the relationships between green exposure, physical activity and perceived health benefits still lacks rigorous scientific evidence.

This study investigates the relationship between exposure to green spaces and self-rated (perceived) health in urban areas in Finland. The aim is to improve knowledge about the relationship

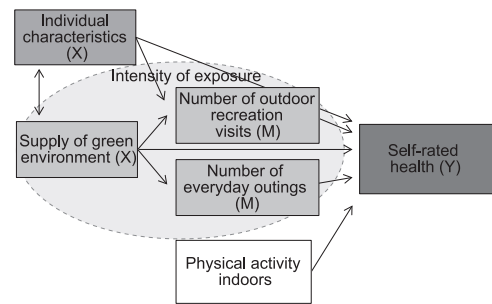


Fig. 1. Hypothesized structure of the study.

between green spaces, physical activity and self-rated health by pursuing the following two research questions: (1) *Is the presence of and access to green spaces in proximity to urban neighbourhoods related to the physical activity of residents and their self-rated health?* (2) *Does outdoor physical activity have a mediating role in the relationship between exposure to green space and self-rated health?* In the process, several hypotheses will be explored (Fig. 1). We expect that a short distance to green spaces would be associated with a higher frequency of outdoor recreation visits. We also expect that age, gender, income and educational level would each be related to everyday outings (commuting) and to self-rated health. In addition, we expect that outings, both for recreational and commuting purposes, will be associated with higher scores for self-rated health. Finally, we expect that the increased participation in outdoor activities would mediate the association of access to green spaces with self-rated health. By exposure to green spaces we refer to the combined impact of the intensity of use of green spaces (i.e. the number of outdoor recreation visits and everyday outings) and the supply (i.e. the presence and accessibility) of green spaces (cf. Mitchell & Popham, 2008).

## 2. Methods

### 2.1. Study design

In this study, we used survey data from the *Finnish National Outdoor Recreation Demand Inventory (LVVI)* measuring the demand for outdoor recreation in Finland. Part of this large dataset focuses on nature-based recreation and well-being. The data were collected during the winter and spring of 2009, using Internet and mail questionnaires. A random sample of 8000 Finns aged between 15 and 74 years was drawn from the national population register. Of these, 3108 (38.9%) persons participated in this survey (Virtanen, Nyberg, Salonen, Neuvonen, & Sievänen, 2011).

From the original dataset, we excluded respondents whose medical condition prevented them from participating in outdoor recreation ( $n=28$ ). We also limited our focus to urban populations, as the majority of Finnish people (78%) now live in urban areas, and the level of urbanization is expected to grow in the foreseeable future (Association of Finnish Local and Regional Authorities, 2014). Moreover, we found that in rural areas the distance to green spaces varies little, and thus no significant differences in health status were expected based on the distance to the green space. In the survey, respondents indicated whether they lived in cities (urban), suburban areas or rural areas. For the analyses, we eliminated all rural respondents ( $n=612$ ), respondents we could not classify their type of residential area ( $n=53$ ), or whose type of residential area was not reported ( $n=92$ ). The final dataset contained 2323 responses. The data were further divided into two data subsets, based on the respondents' own assessments of the type of residential area: those living in urban areas ( $n=456$ ) and

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