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Health & Place

journal homepage: www.elsevier.com/locate/healthplace

Visiting green space is associated with mental health and vitality: A cross-sectional study in four European cities

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ARTICLE INFO

Article history:

Received 11 August 2015

Received in revised form

22 December 2015

Accepted 8 January 2016

Keywords:

Natural environment

Visits to green spaces

Mental health

Vitality

Cross-sectional study

ABSTRACT

Many epidemiological studies have found that people living in environments with more green space report better physical and mental health than those with less green space. However, the association between visits to green space and mental health has seldom been studied. The current study explored the associations between time spent in green spaces by purposeful visits and perceived mental health and vitality in four different European cities, and to what extent gender, age, level of education, attitude towards nature and childhood nature experience moderate these associations. Data was gathered using a questionnaire administered in four European cities (total $n=3748$). Multilevel analyses showed significant positive associations between time spent visiting green spaces and mental health and vitality in the pooled data, as well as across the four cities. Significant effect modification was found for level of education and childhood nature experience. The findings confirm the hypothesis that more time spent in green space is associated with higher scores on mental health and vitality scales, independent of cultural and climatic contexts.

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1. Introduction

Mental health is a public health priority in Europe: almost a third of the population is affected at some point in life by a mental disorder of which depression and anxiety are the most common (WHO, 2013). There is a growing body of evidence that the built environment can have a negative impact on mental health (Francis

et al., 2012; Krabbendam and van Os, 2005; Lederbogen et al., 2011; Peen et al., 2010). Exposure to urban stressors such as noise, fear of crime and crowding, without possibilities for restoration from stress, may in the long term affect mental health and increase the risk of depression, anxiety and fatigue syndromes (Marin et al., 2011; Tafet and Bernardini, 2003). There is evidence from experimental studies that living environments with natural elements (or green spaces), such as urban parks, forests and nature areas, are important restorative environments for urban dwellers (Barton and Pretty, 2010; Thompson et al., 2011; van den Berg et al., 2007;

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van den Berg et al., 2003). Moreover, several epidemiological studies have found a positive association between the availability of green spaces in the living environment and mental health (Beyer et al., 2014; de Vries et al., 2003; Maas et al., 2009a; Paquet et al., 2013; Richardson et al., 2013; Sugiyama et al., 2008; van Dillen et al., 2012; White et al., 2013; Gascon et al., 2015; van den Berg et al., 2015). Continued urbanisation and changes in lifestyle that diminish opportunities for visits to green spaces are, therefore, a concern.

1.1. Visits to green spaces

Previous epidemiological studies have primarily focused on the association between mental health and the amount of green space in the living environment. These studies either have objectively measured the amount of green space using different distance buffers around the respondent's residence (Maas et al., 2009a, 2009b; van Dillen et al., 2012; White et al., 2013) or used a subjective measure by asking the respondents to assess the greenness of their neighbourhood (Sugiyama et al., 2008). Few studies have focused on visits to green spaces. Two studies showed that both a larger number of visits and more time spent per week in green space was significantly associated with lower levels of perceived stress (Grahn and Stigsdotter, 2003; Stigsdotter et al., 2010). Another study found that respondents living closer to green space reported lower levels of stress, and that the association was mediated by the number of visits (Nielsen and Hansen, 2007). Thus, more studies are needed to investigate the relationship between visits to green spaces and mental health in more European countries with different cultural and climatic contexts.

1.2. Effect modifying factors

Besides investigating the relationship between visits to green spaces and mental health in general populations, more insight is needed to identify which population subgroups benefit most from visits to green space. People may differ in use and perception of green spaces, e.g. being more or less sensitive to the potential mental benefits of green spaces, due to differences in socio-demographic and psychological factors. Some researchers argued that men and women use and perceive green space in different ways with women dedicating more importance to quality and safety of green spaces (Maas et al., 2009a; Richardson et al., 2010; Astell-Burt et al., 2014). In previous studies on the relationship between availability of green space and mental health, effect modification has been found for gender, age and level of education (Astell-Burt et al., 2013; Astell-Burt et al., 2014; de Vries et al., 2003; Mitchell and Popham, 2007; Maas et al., 2006). These studies showed that the positive associations were stronger for individuals with lower levels of education. However, it is not known whether these differences are due to differences in exposure to green spaces or differences in use and perception of green spaces. For gender and age, the findings showed gender-specific variations across the life course probably due to differences in activity patterns (Astell-Burt et al., 2013; Astell-Burt et al., 2014; see also van

den Berg et al., 2015). Furthermore, psychological factors such as attitude, beliefs and preferences shaped through learning might moderate the relationship between exposure to green space and mental health (Bratman et al., 2012; Hartig et al., 2011). There is some evidence that childhood nature experience plays an important role in developing a nature-oriented attitude and preferences for nature-based activities in adult life (Asah et al., 2012; Chawla, 2009; Ward Thompson et al., 2008; Wells and Lekies, 2006).

1.3. Objectives

The main objective of this study was to investigate the association between self-reported time spent in green spaces during purposeful visits and the following mental health indices: (1) perceived mental health and (2) perceived vitality. In addition, whether these relationships differ between cultural and climatic contexts and to what extent do the socio-demographic factors (gender, age and level of education), and psychological factors (attitude towards green space and nature childhood experience) modify these relationships were examined. It was hypothesised that visits to green spaces would be associated with mental health benefits and that these benefits would be larger for the elderly, subgroups with a lower level of education, a higher positive attitude towards green space or with ample childhood nature experiences compared to young and middle-aged subgroups and subgroups with higher level of education, a less positive attitude or less childhood nature experiences.

2. Methods

2.1. Study background

This cross-sectional study used data collected in the EU-research project Positive Health Effects of the Natural Outdoor Environment in Typical Populations in Different Regions in Europe (PHENOTYPE). In the PHENOTYPE project, similar methods were used to collect data on the relationship between exposure to green space and health and its underlying mechanisms in a sample of residents from four European cities: Barcelona (Spain); Doetinchem (the Netherlands); Kaunas (Lithuania); and Stoke-on-Trent (UK). See for an overview of the study protocol (Nieuwenhuijsen et al., 2014). Data for this study were derived from a face-to-face questionnaire administered in the same period (May to November 2013), with the exception of Kaunas where data were collected with a postal questionnaire. The ethical committees of the involved research institutes approved the study and all participants signed an informed consent.

2.2. Study population and data collection

In each of the four cities, approximately 30 spatial units (or neighbourhoods) were selected such that variability in access to green space and in socioeconomic status (SES) was ensured. A random sample of 30–35 adults was drawn from the general

Table 1
Methods of respondent approach and response rates per city.

City	Invited <i>n</i> (%)	Willing to participate <i>n</i> (%)	Participated <i>n</i> (%)	Method of respondent approach
Doetinchem	10220 (100)	904 (8.8)*	861 (8.4)	Answer card and reminders
Stoke-on-Trent	2826 (100)	1352 (48.9)	1044 (36.9)	Premailed and face-to-face approach
Barcelona	2230 (100)	n.a.	1045 (46.9)	Premailed and face-to-face
Kaunas	4672 (100)	n.a.	997 (21.3)	Approached by postal mail to fill out questionnaires

* In total, 904 were willing to participate but data from 861 participants were eventually collected.

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