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Elderly resident's uses of and preferences for urban green spaces during heat periods

Arne Arnberger[a,*], Brigitte Allex[a], Renate Eder[a], Martin Ebenberger[a], Anna Wanka[b], Franz Kolland[b], Peter Wallner[c], Hans-Peter Hutter[c]

[a] Institute of Landscape Development, Recreation and Conservation Planning, Department of Spatial, Landscape and Infrastructural Sciences, University of Natural Resources and Life Sciences Vienna, 1190 Vienna, Austria
[b] Department of Sociology, University of Vienna, Rooseveltplatz 2, 1090 Vienna, Austria
[c] Institute of Environmental Health, Center for Public Health, Medical University Vienna, Kinderspitalgasse 15, 1090 Vienna, Austria

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ABSTRACT

Heat affects cities because of the urban heat island effect and will increasingly affect these areas due to ongoing urbanization and climate change. Among those most vulnerable towards urban heat are the elderly. This study analysed coping behaviours to avoid heat stress among 193 elderly residents living independently in urban heat islands of Vienna. A visual discrete choice experiment employed digitally calibrated images to simulate urban green spaces and analysed green-space preferences of the elderly on hot days. This study found three coping behaviours among the elderly: outdoor, home and second-home coping. Heat-coping segments differ in their health status, adaptive capacity and green-space use. Green spaces which provide shadow and a pond and which are easily accessible and cooler than the home would encourage most of the elderly for a visit. Segments differ in their preferences for green spaces. Study findings underline the importance of a heat-adjusted green-space design for the elderly.

1. Introduction

1.1. Urban heat islands' impacts on residents

Residents of urban areas suffer during hot periods because of the urban heat island effect (WHO, 2011) which causes higher temperatures in urban compared to rural areas. Intensive heat affects the health and well-being of urban residents and can result in higher morbidity and mortality during and post heat waves (Hajat et al., 2002; Gabriel and Endlicher, 2011). This negative impact on human health has been observed in many European and US-cities (Klinenberg, 2002; Michelozzi et al., 2004). It is projected that climate change will further increase heat waves in frequency and duration during the 21st century (IPCC, 2013), increasing the likelihood of additional risk for urban residents.

Elderly residents are particularly vulnerable towards heat stress (Klinenberg, 2002; Kravchenko et al., 2013; The Lancet, 2015; WHO, 2011; Wilhelmi and Hayden, 2010). As many cities have a large and increasing elderly population of which a high number live in poor housing conditions, the issue is set to become far more important in the near future. Thus, reducing vulnerability of elderly people is a priority for city administrations.

One strategy in reducing heat stress impacts is the greening of cities because vegetation has a measurable cooling effect on the urban microclimate (Bowler et al., 2010). Another option is the provision of publicly accessible green spaces specifically adjusted for the elderly for hot days. Such green spaces can lower temperatures by providing shade and water bodies equipped with drinking fountains and opportunities for passive recreational activities. However, little research has addressed heat-coping behaviours of elderly residents and whether green spaces play a role for this risk group during heat periods. It is also not known what kind of green spaces the elderly prefer on hot days and whether they would visit them. This study analysed stated behaviour of elderly residents who live in

* Corresponding author at: Institute of Landscape Development, Recreation and Conservation Planning, University of Natural Resources and Life Sciences Vienna, Pete Jordan-straße 82, 1190 Vienna, Austria.
E-mail addresses: arne.arnberger@boku.ac.at (A. Arnberger), brigitte.allex@boku.ac.at (B. Allex), renate.eder@boku.ac.at (R. Eder), martin.ebenberger@boku.ac.at (M. Ebenberger), anna.wanka@univie.ac.at (A. Wanka), franz.kolland@univie.ac.at (F. Kolland), peter.wallner4@gmail.com (P. Wallner), hans-peter.hutter@meduniwien.ac.at (H.-P. Hutter).

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local heat islands within Vienna to avoid heat stress and modelled their preferences for green spaces for hot periods.

1.2. Heat-coping behaviours and green spaces

Heat is an environmental stressor and affects vulnerable groups (Confalonieri et al., 2007). Societal vulnerability in the context of urban heat and human health is a function of interacting components of individual sensitivity, exposure and adaptive capacity (Wilhelmi and Hayden, 2010). Based on these components, Mees et al. (2015) describe vulnerable groups as those who are more sensitive to heat, for example, having difficulties in regulating body temperature; are exposed to neighbourhoods without green spaces and living in older poorly insulated apartments; and having limited adaptive capacity because they are less mobile and often live in social isolation. The elderly living in cities and in particular those who live in specific hot areas within the city typically fall into this risk group.

Coping is a reaction to undesired environmental or social stressors such as noise, heat or crowding. These kinds of compensatory mechanisms in reducing stress are summarized under the concept of coping (Arnberger and Eder, 2012; Baum and Paulus, 1991). Successful heat-coping, for example visiting cooler sites, requires adaptive capacity that is critical to an understanding of vulnerability (Wilhelmi and Hayden, 2010). However, there is insufficient data on the capacity of households to adapt to urban heat (Mees et al., 2015). Particularly data on the elderly who live independently in social isolation in urban heat islands is missing.

While research has investigated positive effects of green spaces on urban microclimate (e.g. Bowler et al., 2010) and analysed relationships between outdoor recreation behaviour and weather conditions in general (Brandenburg et al., 2007; Lin et al., 2010), little research has studied the behaviour in and preferences for green spaces of urban residents during heat periods. Lafortezza et al. (2009) focused on physical and psychological benefits and the general well-being associated with the use of green spaces by adults when heat stress episodes occur. The authors found that the users of green spaces in Italy and in the UK could alleviate the perception of thermal discomfort during such periods. Wanka et al. (2014) analysed stated behaviour of elderly residents during heat episodes living in and off heat islands of Vienna and found that the majority stayed in their apartments when it was hot because they perceived their homes to be cooler than the outdoors. Others went outdoors, mostly visiting green spaces. Similarly, Klinenberg (2002) observed that the elderly often stayed at home during the Chicago heat wave in 1995 because of less attractive and safe neighbourhoods and because of lacking social neighbourhood ties. These studies suggest that green spaces can be an important refuge for urban residents during heat periods if they are attractive, safe and cooler. However, the studies cannot answer the question of which green-space types the elderly prefer on hot days and if there are differences in their preference depending on heat-coping behaviours. The very few studies existing in the research field of heat-coping behaviours cannot provide a clear picture to what extent the heat, compared to personal, social and environmental factors, discouraged outdoor activities. Most of these studies relied on stated and not on revealed behaviours of urban residents.

1.3. Green-space preferences of elderly people

Several studies have investigated urban green-space preferences of different age segments. Most of these preference studies, however, did not specifically address the segment of those who are 65 years or older (Payne et al., 2002) or explore the heterogeneity among the elderly regarding recreation behaviour (Kemperman and Timmermans, 2006).

Studies suggest that the elderly have different preferences for social, managerial and physical aspects of urban green spaces compared to the younger generations. Arnberger and Eder (2011) analysed urban trail preferences of different age groups and found that elderly green-space visitors in Vienna have no specific preferences for the physical appearance of green spaces compared to the younger ones, while Payne et al. (2002) observed that the elderly preferred a recreation to a conservation function of urban green spaces. Kemperman and Timmermans (2006) showed that segments among Eindhoven residents over 65 years prefer urban parks that provide a large number of facilities including toilets and park benches. Jorgensen and Anthopoulou (2007) also found that the elderly visiting the Norfolk Heritage Park in the UK prefer seating opportunities, while other studies could not confirm this preference (Arnberger and Eder, 2011; Borst et al., 2008). A study in Vienna revealed the need of benches along access routes to green spaces providing resting points for the elderly (Doringer et al., 2009).

Observing animals and plants, or feeding animals, could attract the elderly to green spaces (Davis et al., 2012). Sang et al. (2016) found studying animals and plants was more important for the older than for the younger residents living in close proximity to green spaces in the city of Gothenburg. Little research has investigated the elderly's perception of traffic noise impacts on green spaces. Takano et al. (2002) found that the vast majority of older residents in the Tokyo metropolitan area were annoyed about traffic noise near their residences.

Green-space research also observed that social factors play a major role for green-space preferences of the elderly (Arnberger and Eder, 2011; Hung and Crompton, 2006; Robin et al., 2007). Most of these studies indicate that specific social aspects seem to be more important for them than for younger groups. Arnberger and Eder (2011) found that older visitors disliked, as did others, a trail with very high use levels; however, the elderly showed the highest dislike for a trail without any visitors. Hung and Crompton (2006) identified leisure constraints associated with the use of an urban park reported by elderly people in Hong Kong. Among the major constraints was crowding. The elderly are particularly concerned about the presence of dogs and incivilities such as aggressive visitor behaviour in public spaces (Arnberger and Eder, 2011; Robin et al., 2007; Sugiyama and Ward Thompson, 2008). Orsega-Smith et al. (2007) found that social support provided by friends was positively related to leisure time physical activities of older adults living in several US cities.

A managerial component is the presence of rangers or park wardens for security in green spaces. Although security in urban public green spaces is a major issue for the elderly (Hung and Crompton, 2006), Jorgensen and Anthopoulou (2007) could not confirm that the presence of ranger patrols in urban green spaces is preferred. It can be concluded that the elderly focus on specific managerial and social issues because of their greater perceived vulnerability – and less on environmental factors such as physical green-space qualities. It is not known whether similar green-space preference patterns of the elderly are also given for the context of urban heat.

1.4. Research questions

Heat can alter the behaviour of the elderly (Hajat et al., 2002; Gabriel and Endlicher, 2011; Wanka et al., 2014). The question arises as to why some elderly residents stay at home, while others visit green spaces. Individual constraints such as physical immobility may be a reason, but also the dislike of certain green-space qualities, absence of friends and sun-exposed access streets may discourage the elderly from visiting green spaces on hot days, or the perception that green spaces are always hotter than the apartment.