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Short communication

Greenspace and wellbeing in Tehran: A relationship conditional on a neighbourhood's crime rate?

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ABSTRACT

Greenspace is widely regarded as supportive of wellbeing. One mechanism through which this relationship is reasoned to function is through psychological and physiological restoration. This study maintains that the link between greenspace and wellbeing depends on the crime rate in the neighbourhood. This is investigated by employing data from the Urban Health Equity Assessment and Response Tool-2 (Urban HEART-2) survey linked to Geographic Information Systems data. The results of spatial error model, estimated by Generalised Method of Moments estimation, reveal that greenspace is positively linked to wellbeing and that the crime rate is negatively linked to wellbeing. The findings also reaffirm earlier evidence indicating that link between greenspace and wellbeing is conditional on the crime rate in an individual's local area. Moreover, the results also indicate that this dependency is not experienced in a more pronounced way for females. The findings of this study point to the need for policy makers and planners who wish to promote the wellbeing of their citizens to address neighbourhood crime rates.

1. Introduction

Globally, greenspace is widely regarded as a crucial urban amenity (Rostami et al., 2016). Greenspace provides a number of benefits. It supports biodiversity conservation (Rupprecht et al., 2015). It provides aesthetic value. And it offers recreation opportunities and space for community activities (Anderson and Minor, 2017).

Alongside a litany of benefits, greenspace may also be regarded as a restorative environment like nature more broadly (van den Berg et al., 2015). Further, as a restorative environment greenspace can provide one with an escape from overly stimulating (Kaplan, 1995; Ulrich et al., 1991) and crowded places (Ambrey, 2016a; Ambrey and Fleming, 2014b; Arnberger, 2012; Kuo et al., 1998a,b). Importantly, it also offers the opportunity to rest one's directed attention and to function effortlessly. In this sense, greenspace may yield psychological benefits when an individual is mentally fatigued (Kaplan and Kaplan, 1989; Kaplan, 1995). Through this mechanism greenspace may be regarded as supporting one's mental wellbeing.

A growing body of literature is developing at the intersection of environmental psychology and urban planning which highlights this link between greenspace and wellbeing (cf. Frumkin et al., 2017). However, little of this research has explored how this link may depend on a neighbourhood's crime rate (Gatersleben and Andrews, 2013).

Crime, measured by the crime rate, represents an objective risk of victimisation. This can reasonably be expected to be positively, but imperfectly, related to fear of crime. Fear of crime, is a product not just of a neighbourhood's crime rate but also encapsulates an individual's emotional response to the chance of victimisation (Lorenc et al., 2012). Fear of crime shapes an individual's behaviours and experiences. It may lead an individual to avoid places, engage in precautionary behaviours, leave a neighbourhood (Becker, 1968) and feel a decreased sense of social solidarity (Adams and Serpe, 2000).

Moreover, the pathways between the crime rate in the neighbourhood, the physical environment (e.g. greenspace) and wellbeing are difficult to disentangle and not well-established (Lorenc et al., 2012). Coupled with this socio-ecological modelling challenge, there also remains a genuine need to quantify the role psychosocial factors (cf. Ambrey and Cartlidge, 2017) and how they may moderate the greenspace and wellbeing link (Lee and Maheswaran, 2011). In particular, there is a paucity of evidence on how the crime rate in the neighbourhood may moderate the link between greenspace and wellbeing.

This lack of evidence is especially apparent outside of the United States and the United Kingdom. Outside of Western societies few studies have sought to examine the interplay between greenspace and neighbourhood crime rates or equally, fear of crime. This can undermine the validity of the theories and evidence base upon which knowledge

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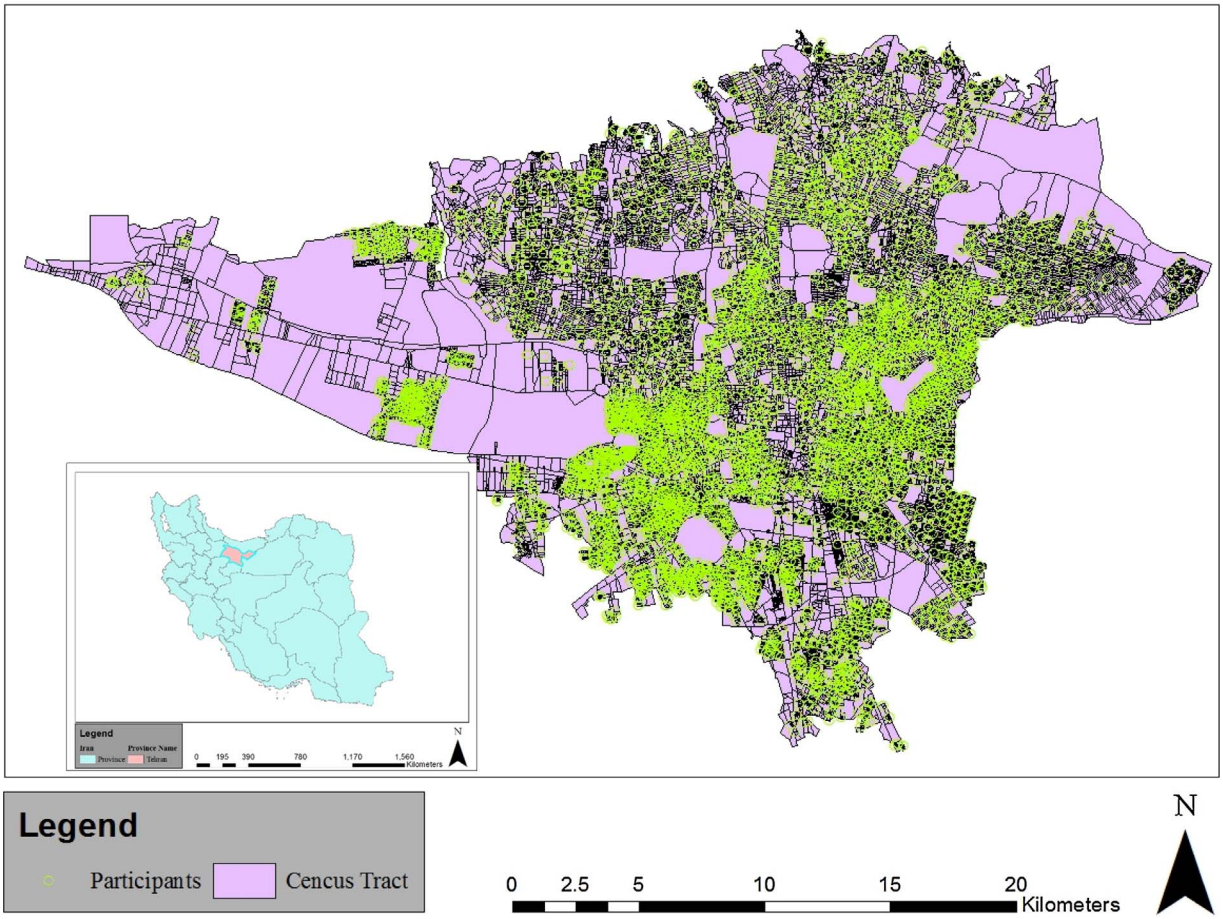

Fig. 1. Sampled participants in Tehran (inset map of Iranian provinces, Tehran in focus).

ultimately relies (Sreetheran and Van den Bosch, 2014).

Additionally, not only are investigations into the moderators of the greenspace and wellbeing link rare outside of Western societies; spatially explicit modelling techniques are also scarcely employed in studies of wellbeing (MacKerron, 2012). This is an important area in which the existing literature is left wanting. It is important because it can change whether or not hypotheses related to wellbeing are rejected. At present, the common 'correction' to standard errors used in wellbeing regressions relies on the assumption of within-cluster equicorrelation (cf. Moulton, 1990). That is, equal correlation among observations within clusters. However, for spatial phenomena such as greenspace the relation is likely to depend on proximity. As such, it is more appropriate to appreciate the decay in the spatial dependence of the phenomena over distance (Conley, 1999). This is in line with Tobler's law that: "Everything is related to everything else, but near things are more related than distant things." (Tobler, 1970, p. 236). This spatially explicit modelling approach, given what it can mean for hypothesis tests, has potentially significant implications for evidence-based planning and policy.

The purpose of this study is to utilise a spatial error model to investigate how the crime rate in the neighbourhood may moderate the link between greenspace and wellbeing for the case of Tehran. In doing so, this study adds to the existing stock of knowledge and highlights how the crime rate in the neighbourhood may diminish the psychological benefits of greenspace in Tehran. Specifically, this study investigates the following hypotheses:

H1: The percentage of greenspace in the neighbourhood is positively associated with wellbeing.

H2: The crime rate in the neighbourhood is negatively associated with wellbeing.

H3: The degree of the positive association between greenspace and wellbeing depends on the crime rate in the neighbourhood.

1.1. Theoretical background

The psychological benefits of greenspace are reasoned to stem from the stress reducing (Hartig et al., 1991; Ulrich et al., 1991) and the directed attention rejuvenating (Kaplan and Kaplan, 1989; Kaplan, 1995) characteristics of nature. According to psycho-evolutionary theory, because people have evolved over a long period in natural environments, "…people are to some extent physiologically and perhaps psychologically adapted to natural, as opposed to urban, physical settings." (Ulrich et al., 1991, p. 205). While according to Attention Restoration Theory the psychological and physiological benefits of greenspace reflect relief from cognitive demands due to the sense of being away, rather than reducing arousal per se. Other pathways through which greenspace may be thought to promote wellbeing include; by providing opportunities for social contact (Kuo et al., 1998a,b; Maas et al., 2009), by enhancing satisfaction, by enhancing attachment, by promoting a sense of responsibility and through reducing aggression (cf. Kuo and Sullivan, 2001; Groenewegen et al., 2006).

However, the psychological benefits of greenspace may be contingent on one's fear of crime in the neighbourhood. This fear of crime may be well founded given a neighbourhood's crime rate. However, where this is not the case, one's fear of crime may have unnecessary (cf. Warr, 1982) implications for one's utility, exaggerating the actual risk of victimisation (Ambrey et al., 2014) and altering an individual's behaviours and experiences.

For instance, an individual may change their behaviour to avoid an urban park or they make defensive expenditures (e.g. going to the gym