

## Factors affecting the use of urban green spaces for physical activities: Views of young urban residents in Beijing



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### ABSTRACT

Urban green spaces hold great potential for promoting an active life style that allows urban residents to achieve important health benefits. The type of urban green space that is most effective to reach these goals is still unclear. In this study we used an online survey to investigate the ways in which young, urban residents in Beijing, China use urban green spaces for physical activities. We analyzed the factors that affect the residents' satisfaction levels when participating in physical activities in urban green spaces by using ordinal logistic regression. Responses from the 1062 survey participants indicated that low-intensity activities (e.g., walking, sightseeing) were the most common activities. The living context, quality of vegetation, and accessibility of urban green spaces had a significant effect on residents' satisfaction levels. For a compact city like Beijing, we recommended plans that focus on increasing the link among existing urban green spaces and improve the maintenance of residential green spaces in order to increase the use of urban green spaces for physical activities.

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### Introduction

Inactive life style and the health consequences for urban residents are a global health issue. In the United States, urban sprawl was associated with increased obesity in urban youth due to a decrease in their physical activities (Ewing et al., 2006). In China the percentage of male adolescents who were overweight increased from 5.3% to 19.3% between 1991 and 2011, correlating with increased urbanity (Gordon-Larsen et al., 2014). Even in the least developed sub-Saharan Africa countries, a rapid increase in the rates of obesity and overweight was documented in urban areas (Popkin et al., 2012). Various prevention measures have been proposed in order to reduce obesity among urban residents (Khan et al., 2009; Moore et al., 2013). One of these measures is providing urban green spaces that encourage residents to be more physically active (Karjalainen et al., 2010).

Urban green spaces are known as places where people can improve their health through engaging in physical activities since the time of ancient Greece (Ward Thompson, 2011). Recent studies provided evidence that supports this long-held view. For example the increased likelihood of being physically active had been associated with increased green spaces in residential areas of

eight European cities (Ellaway et al., 2005). Similar findings were reported in North America and other parts of the world (Tzoulas et al., 2007; van Herzele and de Vries, 2012). More activities in urban green spaces bring health benefits to urban residents. Reductions in cardiovascular disease, overweight, poor general health, and poor mental health in New Zealand have been related to green spaces via physical activities (Richardson et al., 2013). In California, children living with 500 m of parks were found to be more active and less likely to become obese (Wolch et al., 2011).

However, not all urban green spaces are equally effective in promoting physical activities. A thorough understanding of the key characteristics that encourage urban residents to use urban green space is important for planning and managing these spaces. Surveys of people who use urban green spaces revealed a wide range of influencing factors, including the quality of vegetation (Zhang et al., 2013), adequacy of facilities (Sugiyama and Ward Thompson, 2008), accessibility of green spaces (Cohen et al., 2007), safety concerns (Jansson et al., 2013), and maintenance and management (Tzoulas and James, 2010). Surveys also showed that the social context determined by demographic factors (Sanesi and Chiarello, 2006; Wende et al., 2012) and the socio-economic backgrounds of users (Jim and Shan, 2013; Schipperijn et al., 2010) had a strong influence on the use of urban green spaces. These studies laid the foundation for understanding the relationship between the features of urban green spaces and their usage. Nevertheless, due to limited resources most surveys have been conducted at a few

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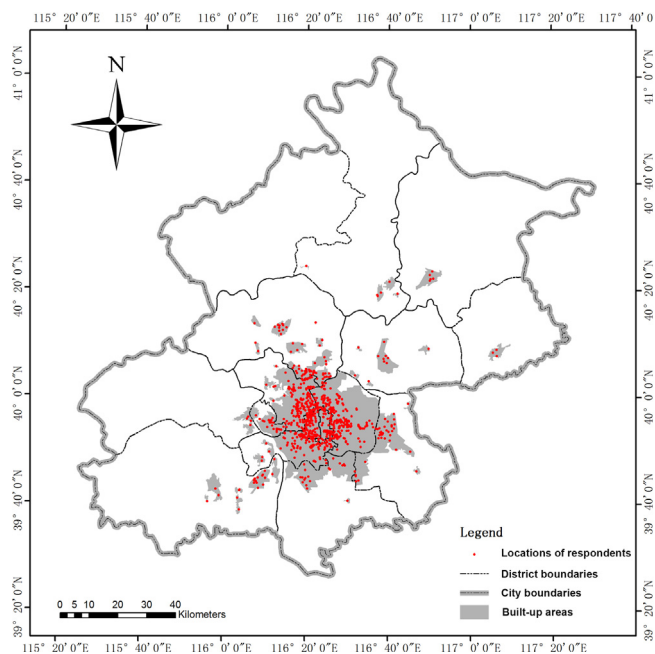


Fig. 1. The study area and the distribution of the 1062 respondents.

selected sites and included only small groups of participants, which affected the generalization of the findings (Eriksson and Nordlund, 2013; Sugiyama and Ward Thompson, 2008; Wende et al., 2012). A lingering question is: To what degree do people interviewed in the study represent residents of an entire city? Obviously information gathered from a survey covering more people will better guide managing agencies to design and build urban green spaces that can serve the interests of the general public.

In this study we attempted to gain an understanding of urban green space features that affect their use for physical activities among young urban residents in Beijing, China. The main objectives of this study include: (1) to determine the type of physical activities in which young, urban, Beijing residents normally engage in green spaces; (2) to explore the factors that affect the perception of urban green spaces as places for physical activities, and (3) to recommend measures for improving the use of urban green spaces for physical activities.

## Methods

### Study area

The study was conducted in Beijing, the capital city of China. The city's boundaries lay between longitudes 115.25°–117.30°E and latitudes 39.28°–41.25°N (Fig. 1). The administrative area of the city is 16807 km<sup>2</sup> and the built-up area reached 1300 km<sup>2</sup> by the end of 2013. The latest census, in 2010, showed that Beijing had 16.86 million permanent residents. In this study young urban residents were defined as residents between the ages of 15 and 40 years old. This demographic group accounts for roughly 45% of the total population (Chen, 2011). Beijing has a large percentage of urban green spaces. The government's report showed that the urban green coverage of Beijing reached 46.8% while the urban green space per capita reached 15.7 m<sup>2</sup> by the end of 2013 (Beijing Municipal Bureau of Landscape and Forestry, 2014).

### Online survey

We used an online survey for two main reasons. First, Beijing's residents have good access to the internet. Beijing's netizen

population reached 14.6 million by the end of 2012 (Beijing Communications Administration, 2013). Second, we wanted to reach young urban residents, a group that is more tech-savvy therefore more likely to respond to online surveys than older residents. The online survey included three major steps: design the questionnaire, conduct the online survey, and screen the returned survey results.

The questionnaire was divided into five sections including both multiple-choice and open-ended questions. The first section asked for socio-demographic information (i.e., gender, age, occupation, and address). Questions in the second section were designed to find out the availability and accessibility of urban green spaces, including: availability of different types of green spaces near their residences, travel time to the closest park, type of green space which they regularly visited. Beijing's urban green spaces mainly include three types: residential green spaces, public green spaces, and parks. Residential green spaces are located in residential areas, usually inside the boundaries of a residential unit. Public green spaces include green spaces other than residential green spaces and parks (e.g., street landscapes, riparian woods, greenbelts). Parks are large public spaces intensively managed for recreational, ecological, and conservation purposes. A total of 355 parks have been registered with the municipal governments by 2013 (Beijing Municipal Bureau of Landscape and Forestry, 2014). The third section contained questions on the use patterns of green spaces (i.e., types of activities conducted in green spaces). The fourth section contained questions on the perceived quality of green spaces near the residents' residences. The respondents were asked to rate vegetation and facilities in the green spaces and report anything that discouraged them from using the spaces. The fifth section asked about the residents' perceptions of the suitability of the green space for physical activities. Respondents used a five-point scale ranging from "very unsatisfied" to "very satisfy" to report their overall experience of using the green spaces for physical activities (See supplementary file for details of the questionnaire). The internal consistency reliability of the questionnaire was tested by calculating Cronbach's  $\alpha$ . The estimated value of 0.76 indicated a good internal consistency.

The questionnaire was posted on the website of an online poll company ([www.sojump.com](http://www.sojump.com)). We used two measures to solicit responses from the general public. First, a small monetary incentive was offered to people who invited a certain number of people to participate in the survey under the condition that only one participant was allowed from each residence. Second, the poll company promoted the survey among residents in Beijing through social media and email solicitations. The survey was run from April to September in 2010.

After receiving the returned survey forms, we adopted the following criteria to decide whether a form should be included in further analysis. First IP addresses of the computers that respondents used to log on to the survey webpage were used to filter out respondents from outside of Beijing's urban areas. Second, we eliminated respondents that did not follow the instructions for completing the survey. Third, we eliminated respondents who did not provide a verifiable residential address and email account. Finally, respondents had to be from our targeted age groups. Survey forms that failed to meet the above criteria were excluded from further analysis. 1062 respondents, from a total of 2545, passed the quality check.

### Data analysis

Along with the information gathered through the online survey, we collected data on average housing prices of the residential units where respondents lived and the years that the residential units were built. We rated the safety of each residential unit

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