Urban Forestry & Urban Greening 21 (2017) 60–73

Contents lists available at ScienceDirect

Urban Forestry & Urban Greening

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

Urban park pathway design characteristics and senior walking behavior

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ARTICLE INFO

Article history:
Received 11 January 2016
Received in revised form
12 September 2016
Accepted 23 October 2016
Available online 25 October 2016

Keywords:
Design characteristics
Pathway
Seniors
Urban park
Walking

ABSTRACT

Urban parks are easily available settings for seniors to engage in daily physical activity. As a type of low-cost physical activity, walking can bring seniors multiple health benefits. Among all park facilities, park pathways are most significantly related to physical activity. The present study examined the links between specific park pathway design characteristics and senior walking within urban park, through observations and interviews. This study was conducted in two neighborhood parks in Beijing, China. On-site observations were utilized to collect data on senior walking behavior (dependent variable) and pathway design characteristics (independent variable). We calculated the average number of observed seniors in all observations to represent usage of each pathway segment. Interviews were conducted to explore pathway design characteristics preferred and disliked by senior users. ANOVA analyses and correlation analyses revealed that seniors prefer pathways that have soft or even pavement (plastic track and bricks), benches, flowers, and light fixtures. Also, seniors are attracted to pathways that are long, between 3–3.9 meters wide, and without connection with activity zones. In addition, results suggest other pathway design characteristics, such as being along a water body, having shade, providing lateral visibility and visual connection with water, and without visual connection with landmarks may also encourage senior walking. By providing park pathways preferred by seniors, designers can create park environments that are supportive of senior walking, and ultimately contribute to improving senior health and life quality.

1. Introduction

Regular physical activity has multiple health benefits (DHHS, 2000; Julie et al., 2011). Existing research indicates that urban parks are important built environments that promote physical activity (McCormack et al., 2010). Two sets of associations between urban park and physical activity have been identified. One is the relationship between the presence of urban park and higher overall physical activity levels at neighborhood level (Cohen et al., 2006; Coombes et al., 2010), the other is the link between park visit and higher levels of physical activity in general (Cohen et al., 2007; Giles-Corti et al., 2005). Urban park characteristics at multiple levels can encourage physical activity, including the neighborhood level (Baran et al., 2014; Coombes et al., 2010; Giles-Corti et al., 2005; Stahle, 2010), the overall park level (Golicnik, 2008; Kaczynski et al, 2008; McCormack et al., 2010; Sugiyama et al., 2010) and the park activity zone level (Cohen et al., 2007; Floyd et al., 2008; Kaczynski et al., 2008). At the activity zone level, park facilities are more essential than park amenities in encouraging physical activity (Kaczynski et al., 2008). A higher physical activity intensity is also related to higher use of playgrounds, courts, and paths (Cohen et al., 2007; Floyd et al., 2008). Specifically, among all park facilities, trails and pathways have the most significant relationship with physical activity (Corti et al., 1996; Kaczynski and Henderson, 2007; Kira, 2006). Kaczynski et al. (2008) found that parks with a paved trail are more likely to be used for physical activity than those without a paved trail; They also called for further examination on track's role in facilitating senior usage.

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http://dx.doi.org/10.1016/j.ufug.2016.10.012
1618-8667/

Practiced by people of all ages worldwide, walking is an easily accessible physical activity (Bassett et al., 2008) and is the most popular leisure-time physical activity among US adults (DHHS, 1996). Walking can improve physical health (Lee and Buchner, 2008), social confidence (Eyler et al., 2003), and is the most susceptible activity to influence (Saelens et al., 2003). In addition, benefits of walking can be maximized by providing built environments that facilitate walking. Regular moderate physical activity can help senior citizens maintain their health (Chodzko-Zajko et al., 2008) and improve their strength (DHHS, 2000). However, older individuals usually have lower activity levels compared with other adults and children (Hagstromer et al., 2010). By the age of 75, one in three men and one in two women do not engage in regular physical activity (DHHS, 2000). For seniors, walking can bring mobility benefits (Wang and Lee, 2010) and is a low-cost, low-impact way to maintain health (Cunningham et al., 2005). Although the senior population is among the least active population segments, studies about their physical activity remain limited (Cunningham et al., 2005).

Seniors have identified urban parks as preferred settings to engage in physical activity (Tinsley et al., 2002). Extant studies suggest that park design characteristics have important role in users' perceptions and behaviors (Nordh et al., 2009; Peters et al., 2010). Particularly, park size (Baran et al., 2014; Sugiyama et al., 2010), presence of a track (Cohen et al., 2007), and shading (Lu, 2010) are related to activity in general. However, at the activity zone level, few studies have examined the links between park environmental characteristics and physical activity. Moreover, the research focusing on the senior population in this area is almost non-existent. How the physical characteristics of parks affect the physical activity of senior citizens is a particularly important topic because this population is most likely to be influenced by environmental characteristics (Cunningham et al., 2005).

In the realm of park-based activity, several inventory tools have been developed to measure park environment characteristics (Bedimo-Rung et al., 2006; Giles-Corti et al., 2005; Kaczynski et al., 2012; Saelens et al., 2006). However, few studies have investigated the influence of park characteristics on physical activity from a design perspective. Consequently, the results of studies that utilize these tools are ineffective in informing design practice (Masters, 2012; Sailer et al., 2007). For instance, although empirical research indicates that paved trails in parks can facilitate physical activity (Kaczynski et al., 2008), designers are more interested in the specific characteristics of these trails, such as pavement type (i.e., brick or plastic), trail form (i.e., straight or curving), or if there should be benches along the pathway. Those findings that address specific design characteristics are more likely to be applied in design practice, thus facilitate the building of health-promoting environments.

Although park pathways have been identified as important settings to encourage physical activity (Kaczynski and Henderson, 2007; Kaczynski et al., 2008), the characteristics of these pathways have been neglected in previous research (Cohen et al., 2007; Kaczynski et al., 2008). In China, urban parks are among the most visited areas for outdoor activities, and walking is identified as the most popular activity within Chinese urban parks (Zhang et al., 2013). On the other hand, most Chinese cities are highly dense with scarce land for urban parks, thereby necessitating the building of urban parks that are supportive of physical activities. How urban parks in highly dense contexts are used for different activities, i.e., walking, must be investigated to develop effective park design and planning strategies.

To address these knowledge gaps, this study explores the links between the design characteristics of urban park pathways and walking behavior of senior citizens within parks. We examined two neighborhood parks in Beijing, China. Data on pathway design characteristics and senior walking behavior were collected through on-site observations. We also conducted interviews with senior park users to determine their preferred and disliked pathway characteristics. This study intends to expand our understanding of the connections between park pathway design characteristics and senior walking behavior, thus provide practical insights for building health-promoting park environment that support senior walking.

2. Conceptualization of urban park pathway design characteristics

Six conceptual areas have been identified from the urban park and physical activity literature (Bedimo-Rung et al., 2005), namely, features, conditions, access, aesthetics, safety, and policies. Aesthetics refers to the design characteristics of parks, including their spatial layout, landscape, and visual appeal (Bedimo-Rung et al., 2005). This definition is applicable to the present study. In this study, park design characteristics refer to all spatial and visual physical attributes that shape a park environment.

Walking in parks is primarily considered as leisure walking (Ding et al., 2011); However, it could also be considered as utilitarian walking, if the primary motivation is to reach a destination within the park (Handy, 1996), such as an area in which an activity can be performed. Recreational walking is closely related to the characteristics of the immediate environment (Handy, 1996). Accordingly, we assume that the design characteristics of pathways are important in facilitating the leisure walking of the elderly. Apart from immediate environment characteristics, destinations are significant in encouraging utilitarian walking (Handy, 1996). In this study, destinations refer to activity zones where seniors can engage in activities, such as group aerobics and dancing.

To conceptualize the pathway design characteristics, we review the theories and models in the fields of architecture (Ching, 2007), urban environment (Cervero and Kockelman, 1997; Ewinget al., 2006; Handyet al., 2002; Lynch, 1960), landscape quality assessment (Daniel and Vining, 1983; Kaplan and Kaplan, 1989; Sheppard, 2004), and park design practices (Eckbo, 2009; French, 1973; Rutledge, 1971, 1981; Waterman, 2009). Accordingly, we conceptualize pathway design characteristics at three levels, including pathway attributes, pathway surroundings and pathway connection with activity zones (Fig. 1). Pathway attributes refer to the features of the pathway itself within or along its boundaries, such as pavement, width, and presence of benches. Pathway surroundings include the park environment around the pathway, comprising spatial and visual dimensions, such as degree of enclosure and visual connections with water. Pathway connection with activity zones refers to whether the pathway segment can direct users toward an activity zone. Based on extant studies, we utilized 15 variables to measure pathway characteristic at the above three conceptual levels. Table 1 reports the variable definitions and their expected links with senior walking.

3. Research design and methods

3.1. Study sites and unit of analysis

The study was conducted in two neighborhood parks located in Beijing, China: Rendinghu Park (9.6 ha) and Yuetan Park (8.12 ha) (Figs. 2 and 3). Located in the same central district (Xicheng district) of Beijing City, these two parks have similar contexts in terms of density and residents' social-economic status (Jiao et al., 2013). By the end of 2013, average annual income for residents in Xicheng district is 43,000 RMB (6615 US dollar), in comparison with 40,000 RMB (6154 US dollar) for all residents in Beijing (Beijing Municipal Statistics Bureau, 2014). As other central districts, Xicheng district has a relatively high population density, which is 25,000 people per