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Site and neighborhood environments for walking among older adults ☆

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ABSTRACT

Walking has significant health and mobility benefits for older adults. Previous environment–walking studies have focused on neighborhood environments, overlooking proximate site-level characteristics. This study examines both the neighborhood and site-level environments.

A survey was conducted with 114 older adults from five assisted-living facilities in Houston, TX. A subset of 61 participants' environments was examined using Geographic Information Systems (GIS). Multivariate analyses identified positive correlates of walking at the site level including yard landscaping and corner-lots, and neighborhood-level correlates including walking destinations, safety from crime, and sidewalks. Both site-level and neighborhood environmental supports appear important in promoting walking among older adults.

1. Introduction

Population aging is a global phenomenon and is increasing at an accelerating rate. In the U.S., baby boomers began turning 60 in 2006, and older adult populations (65 years and older) are expected to increase from 35 million in 2000 to 71.5 million in 2030 (FIFARS, 2008). Older adults tend to require more healthcare services than other population groups. As a result, escalating healthcare cost is one of the major challenges facing this aging society (Smeeding and Butler, 2000).

Physical activity has preventive effects for many chronic diseases common among older adults, such as diabetes, cardiovascular disease, obesity, and depression, and thus slows functional declines in later life (CDC, 1996; Wang et al., 2002). It also contributes to older adults' psychological well-being by improving their self-efficiency and providing social opportunities (Booth et al., 2000; Hovell et al., 1989). However, it is estimated that more than 60% of older Americans do not meet the CDC's recommendation of at least 30 min of physical activity on five or more days per week (DHHS, 1996). Vigorous or structured activity programs such as gym-based exercise are generally difficult to adopt or sustain, especially among older adults. Moderate and habitual physical activities like walking are preferred and recommended. In fact, several studies found walking to be the most popular type of physical activity among all adults (Bryan and Katzmarzyk, 2009; DHHS, 1996). Walking is a versatile physical activity that can be added to one's daily routine and does not require special equipment or training. Walking can help older adults remain healthy and reduce the demand for healthcare resources and services (DHHS, 2001).

Physical activities, like any other human behaviors, are the product of reciprocal interactions between humans and their environments (Lawton and Nahemow, 1973). The influence of residential environments on behaviors is believed to be greater for older adults than for younger adults. Older adults usually spend more time at home (increased exposure to the environment) and they are more vulnerable to environmental constraints (increased environmental docility). Residential environments can be viewed from multiple spatial scales, ranging from the building interior and yards to the larger neighborhood context.

Increasing studies on environment–walking relationships have focused primarily on neighborhood-level variables. Land-use mix, residential density, and environmental safety have been shown to be associated with neighborhood walking (Frank et al., 2005; Humpel et al., 2002; Schilling and Linton, 2005). Further, studies have reported that the availability and attractiveness of pedestrian-friendly and utilitarian destinations influence walking (Giles-Corti et al., 2005; King et al., 2003; Lee and Moudon, 2006). Finally, completed sidewalks, signalized and marked crosswalks, and road-side benches or seating have been shown to contribute to walking (Huston et al., 2003; Strath et al., 2007; Suminski et al., 2005). Most of the aforementioned findings are from studies focusing on the general population. Only a few studies examine older adults. For example, older adults, who lived close to parks, were found to have higher-levels of walking (Mowen et al., 2007). Popular walking destinations among older adults include post offices, restaurants, banks, groceries,

☆ This paper addresses a research gap between architecture and urban planning, by investigating the relationship between site-level characteristics and walking among older adults.

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convenience stores, parks, and malls (Kealey et al., 2005; Michaela et al., 2006). Some destinations, such as drugstores and religious institutions, are more preferred among older adults as compared to younger adults (Lee, 2008). Moreover older adults living in a neighborhood with higher-levels of social cohesion and/or lower levels of socioeconomic deprivation were found to engage in more physical activity (Annear et al., 2009; Fisher et al., 2004; King, 2008). In terms of the physical ability to walk, older adults in general are considered incapable of walking as fast or long as younger adults. However, they were found to walk as much as their counterparts, possibly because they have more time to walk (Lee, 2008). Despite some evidences suggesting differences in the environmental correlates of walking among different population groups, it is still not clear if the known environment–walking correlates from the general adult studies remain valid for older adults. More empirical evidences on the specific environmental supports of older adults' walking are needed to promote healthy aging.

Site-level environments, defined as environments within a residential property, such as porches and yards, are critical for older adults. Older adults spend most of their time at home, which is estimated to be 19.5 h per day on an average (Brasche and Bischof, 2005; Moss and Lawton, 1982). Site-level outdoor environments are the first places people enter when they go outside. As older adults become more environmentally docile and less environmentally proactive than younger adults, common site-level design features, such as entrance steps, can impede frail older adults' interactions with outdoor environments and even limit their mobility (Lawton, 1985, 1989; Lawton and Simon, 1968; Wang and Shepley, 2008). Pleasant indoor daylight, semi-enclosed transitional spaces, and paths connecting different outdoor areas have been shown to promote older adults' physical activities in their own yards (Wang et al., 2006). These site-level characteristics, including such factors as lot type (corner versus single frontage), landscaping, and shade and window views will likely be associated with neighborhood walking. However, previous empirical studies have not fully explored the detailed site-level environmental features as potential correlates of walking among older adults.

This study adds to the previous literature, by investigating both site- and neighborhood-level environmental features, in terms of their associations with older adults' walking behaviors. The hypothesis is that features in both environments are significantly associated with older adults' neighborhood walking, after controlling for personal and social factors. Findings of this study can offer insights into the intervention strategies and recommendations for residential site and neighborhood designs, to promote active living and health among community-dwelling older adults.

2. Methods

2.1. Theoretical rationales

The social ecological framework was used in this study to help conceptualize multi-level determinants of physical activities (McLeroy et al., 1988; Stokols, 1992; Zimring et al., 2005). This framework recognizes that human behaviors result from the reciprocal interactions between personal and environmental forces, and it has been widely used in studies dealing with environmental approaches toward health promotion. This paper considers personal, social, and physical environmental factors potentially associated with walking. The physical environment is the focus of this paper, and it is further divided into site- and neighborhood-level environments to examine their potential differences in promoting or hindering older adults' walking.

2.2. Study setting and population

A total of 114 survey participants were recruited from five assisted-living facilities in Houston, TX in 2006. Surveys were administered as an individual face-to-face interview or as a small group activity. Participants were screened by the facility caregivers to verify their cognitive competence for answering survey questions. Response rates were from 20% to 45% and the sample size ranged 20–30 depending on the facility. Types of sampled facilities included both type A (residents need minimal assistance with daily living) and type B (residents need higher-levels of assistance). Selected facilities ranged in size from 46 to 195 beds, representing all three size categories of assisted-living facilities in the U.S. (Hawes et al., 1999).

The average age of the 114 participants was 84.2 years (61–100 years); 81.6% were female; 93% were non-Hispanic White. The median of household income among participants ($30,000) was close to the median income of all older Americans in 2006 ($27,798); the median education level among participants (high school diploma) was also consistent with the median of older Americans (FIFARS, 2008). Ninety-eight out of the 114 participants were TX residents and 61 had previously lived in Houston, TX. The 61 participants were included in the part of this study that required GIS analyses, because other cities did not have sufficient GIS data. We refer to these 61 as the "GIS sub-sample" in this paper, to distinguish from the 114 survey samples.

2.3. Data collection

All data, except objective environmental data, were collected from the surveys. The outcome variables were the participants' former walking behaviors in their previous neighborhoods when they lived in their own homes. The key independent variables were participants' perceptions (from surveys) and objective measures (from GIS) of their previous residential environments at the site level and at the neighborhood-level. During the survey administration, participants were verbally instructed to focus on the time and locations that they lived immediately before moving to a senior-living facility, and a clear written instruction was also included in the questionnaire.

As the survey questions required recalling of past behaviors and perceptions, the issues of recall difficulty have been carefully examined to reduce their influence on the findings. First, previous empirical studies have shown that the length of valid recall of similar questions is up to 10 years in adults, which is well beyond the average of 2.4 years of facility stay in this study (Blair et al., 1991; Slattery and Jacobs, 1995). Blair and colleagues (1991) found in their study of 451 adults that long-term physical activity recall was reliable and the length of recall interval (from one to ten years) and the respondent's age did not influence recall accuracy, while activity type and gender did influence recall accuracy. They found that vigorous activities had higher recall accuracy than moderate or light activities, and women recalled all types of activities more accurately than men. Among the women participants, correlations between the recalled (captured five times, after 1–2, 3–4, 5–7, 8–9, 10 years from the baseline) and the baseline data were significant at the 0.05 level in most items. Slattery and Jacobs (1995) confirmed high reliability of long-term recall of physical activity, but for a shorter recall time of 2–3 years. Also, older and younger adults were shown to perform equally on long-term recall tests (Friedman et al., 1996). Friedman and colleagues reported a lack of age differences in long-term memory, after examining 40 young and 40 older adults.

Second, the length of facility stay, which varied from one month to 14 years, was not significant in the bivariate tests and in the multivariate statistical models predicting walking