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Perceived characteristics of the neighborhood and its association with physical activity behavior and self-rated health ☆

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ABSTRACT

The aim of our study was to identify perceptions of the residential environment and their association with physical activity for specific purposes and with self-rated health in an urban context. A representative survey of inhabitants of Graz (a mid-sized Austrian city) aged 15–60 years ($n=997$) was conducted. We found a perceived high social-environmental quality of the residential environment to be associated with higher levels of self-rated health and leisure time physical activity. Both leisure time physical activity and satisfaction with environmental quality were independently linked with self-rated health. Furthermore, a high level of satisfaction with the individual's local infrastructure may support the residents to engage in higher levels of physical activity for transportation, whereas the preferred mode of transportation may be gender-specific: men tend to use the bicycle while women walk. Our results suggest that local infrastructure facilities should be designed so as to ensure accessibility by both walking and cycling.

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1. Introduction

Poor housing is an important cause of a large number of health problems and has been an issue of public health and epidemiology since the 19th century (Krieger and Higgins, 2002). Beyond the condition of the housing unit itself, the physical and social environment of the home affect the health and health behavior of residents. While neighborhood-level effects on health have been described amply over the past decades, the role of the residential environment on health and health behavior is a relatively new field of research. During the last decade there has been growing interest in how the home environment shapes health behavior (Diez Roux, 2007; McCormack et al., 2004).

Which aspects of the physical and social environment may lead to better health and health-promoting behavior among residents? Several studies have revealed associations between neighborhoods of low socio-economic levels and poor individual health among the residents (Yen and Kaplan, 1999; Krieger and Higgins, 2002; Diez Roux, 2003; Do and Finch, 2008; Mujahid et al., 2008), particularly with regard to mortality due to ischemic heart disease (Chaix et al., 2007a,b, 2008; Stjärne et al., 2006). Similar associations were observed between architectural characteristics of the built environment and perceived health and health behaviors (Maas et al., 2006; Stronegger and Freidl, 2004; Takano et al., 2002; Collins et al., 2009). These associations persist even after adjustment for indicators of the individual-level socio-economic status (SES). Since there is a well-known correlation between socio-economic deprivation in living quarters and the SES of the inhabitants (Stafford et al., 2001; Krieger and Higgins, 2002; van Lenthe et al., 2007; Poortinga et al., 2008), individual-level SES is a main confounder and must be carefully taken into account when studying neighborhood-level effects (Do and Finch, 2008).

Homes and their environment are – besides the working place – the most important context of people's social life. To a certain extent they shape the individual's identity (Forrest and Kearns, 2001; Wen et al., 2007). Neighborhoods are the arena for establishing connections with other individuals, daily routine activities and consumption habits. They signify status and culture, and reflect values and identity (Baum et al., 2009; Browning and Cagney, 2002; Forrest and Kearns, 2001; Kearns Parkinson, 2001). Therefore, residential environments are one of the material and spiritual foundations of our behavior, including health behaviors such as physical activity (Rutt and Coleman, 2005; Sallis et al., 2009; Sugiyama et al., 2009).

Consistent positive associations between perceived and objectively measured environmental factors and physical activity behavior have been recently documented (Duncan et al., 2005;

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Giles-Corti and Donovan, 2002; Humpel et al., 2002, 2004; McCormack et al., 2004; Sallis et al., 2009). The general functionality of the neighborhood (e.g. traffic conditions, public transport, shops) and the availability, accessibility and convenience of facilities, have been shown to be positively associated with levels of physical activity in a number of studies (Annear et al., 2009; Aytur et al., 2008; Humpel et al., 2002; Titze et al., 2008; Tucker et al., 2009). Recent studies have demonstrated the importance of access to natural or "green" environments for the perceived general health status (Pretty et al., 2005; Nielsen and Hansen, 2007; Mitchell and Popham, 2008; Sugiyama et al., 2008). Restorative experiences as well as higher levels of physical activity have been suggested as explanatory factors because both may be facilitated by the presence of green spaces in the neighborhood (Maas et al., 2006, 2008).

However, environmental influences on physical activity are still among the least understood factors (Diez Roux, 2007; Humpel et al., 2002; Krieger and Higgins, 2002; Lee et al., 2007; Mujahid et al., 2008; Owen et al., 2004; Wen et al., 2007). The available studies show limited evidence for a relationship between the quantity of green space in the living environment and levels of physical activity (McGinn et al., 2007; Maas et al., 2008; Kaczynski et al., 2010). Evidence linking specific neighborhood features with health behavior or health outcome is mainly cross-sectional, weak, and partly incoherent (Messer, 2007).

The aim of the present study was to find associations, if any, between perceived characteristics of the urban residential environment on the one hand and specific modes of physical activity as well as self-rated general health on the other. A specific approach of the present study was that we identified, on an empirical basis, the dimensions of satisfaction with the characteristics of a living quarter, which are perceived as being relevant by the residents.

2. Methods

2.1. Study design

A cross-sectional survey was conducted among inhabitants of Graz (a mid-sized Austrian city) aged 15–60 years between September and October 2005. Self-reported data were obtained by means of computer-assisted telephone interviews (CATI). The protocol was approved by the ethics committee of the local medical university (No. 17-083ex05/06). The participants completed structured interviews including questions on neighborhood conditions, physical activity for specific purposes, and self-reported health. In order to avoid confounding due to individual-level SES, specific adjustments were performed using the variables nationality, number of children, and an index that included income, educational status, and professional status.

2.2. Participants

The aim was to conduct 1000 telephone interviews in a representative sample. In the first step, a random sample of telephone numbers was taken from the current electronic telephone directory of the city of Graz. In the second step, the selected telephone numbers were modified by replacing the last two digits with randomly generated digits ranging from 00 to 99 (method of randomized last digits, RLD). This procedure ensures access to private/secret telephone numbers that are not included in telephone directories. Up to five phone calls were made to conduct one interview. Respondents who were permanently unable to cycle due to health problems or had lived for less than 2 months in the surveyed area were excluded from the study. All 2951 telephone numbers were called. Toward the end of the telephone survey the interviewers discontinued interviews if the respondent did not contribute to a representative sample of the population of Graz (143,153 inhabitants aged 15–60 years) based on gender (male: 49.2%, female: 50.8%), three age categories (15–29 years: 30.3%, 30–49 years: 49.4%, 50–60 years: 20.3%), and two educational categories (with high school diploma: 39%, without: 61%). Therefore, 1509 interviews were stopped after the first questions about gender, age, and education. Four hundred and forty-four respondents refused to participate. One person was removed from the sample because he/she was a duplicate. Thus, the response rate was 69.2% among the eligible 1441 participants. The final sample consists of 997 subjects and shows the following composition with respect to gender (male: 490, female: 507), age (15–29 years: 303, 30–49 years: 491, 50–60 years: 203), and education (with high school diploma: 388, without: 609). Table 1 shows the descriptive characteristics of the final sample.

2.3. Environmental variables

The development of the questionnaire has been described in detail in a previous report (Titze et al., 2007). In short, based on a review of published studies on the environmental determinants of walking and cycling (Pikora et al., 2003; Saelens et al., 2003), a list of potentially important items (built environment, social environment, and personal items for physical activity) was generated. The final instrument included, among other items, questions on transportation behavior, general perception of the neighborhood, and perceived social environment. Ten items concerning the individuals' satisfaction with their living quarters and neighborhood were assessed on five-point rating scales ranging from 1 (strongly agree) to 5 (strongly disagree). The test–retest reliability of items had been tested in a previous study and had shown acceptable agreement (Titze et al., 2007).

The individual-level socio-economic status (SES) was assessed by a cumulative score which included educational status, occupational status and income, and was divided into quintiles ranging from 1 (lowest) to 5 (highest). Age was divided into five categories (sample percentages in parentheses): 15–20 (11.5%), 21–30 (21.6%), 31–40 (24.9%), 41–50 (24.1%), and 51–60 (17.9%) years. Educational status was described by five categories (sample percentages in parentheses): compulsory school (16.9%), apprentice training (26.9%), intermediate vocational degree (17.3%), high school diploma (22.3%), and polytechnic school/university (16.6%).

2.4. Dependent variables

Self-rated health was assessed on a 5-point Likert-type scale with responses ranging from "very good" to "very poor".

We assessed four modes of physical activity: leisure time physical activity, walking for transportation, cycling for transportation in summer and winter. Leisure time physical activity was assessed in minutes per week with reference to exercise or sports during the preceding 7 days. In order to compare people who exercise regularly with those who do not exercise regularly we defined an indicator variable "regular exercise" as follows: "no" if the person did not report to perform vigorous-intensity physical activity during the past 7 days (33.6% of participants) and "yes" if the person had undergone at least one vigorous-intensity exercise session during the past 7 days (66.4% of participants).

Transport-related physical activity was assessed by the question "How many times during the past 12 month did you, on average, use the following mode of transportation within the

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