Original Contribution

Perceived Safety of Area of Residence and Exercise: A Pan-European Study

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The authors examined the association between perceived safety of neighborhood and likelihood of exercise among adult residents of eight European cities. Data were collected by a survey of neighborhood, housing, and health conducted by the World Health Organization in 2002 and 2003. Baseline category logistic regression models were fit to estimate the association between perceived safety and exercise, accounting for demographic and place-of-residence characteristics. Among women, perception of safety was associated with a 22% (95% confidence interval: 1.00, 1.54) and a 40% (95% confidence interval: 1.03, 1.91) elevation in the odds of occasional and frequent exercise, respectively. Among men, perception of safety was associated with a 39% elevation in the odds of occasional exercise, but there was no association with frequent exercise. If these findings were replicated, they would suggest that health promotion efforts could target residential areas without the need to identify specific persons.

It is increasingly evident that certain characteristics of area of residence are not merely predictors of material well-being but also independent predictors of health and health behaviors (1–3). Given this gathering consensus, it is useful to better understand health behaviors in the context of characteristics of area of residence, in particular, perceived safety of area of residence and its correlates.

Exercise is an important health behavior to examine in this context. Physical inactivity is second only to smoking with regard to negative health consequences (4). It is linked with high blood pressure, back pain, atherosclerosis, coronary heart disease, and diabetes, many of which can be attributed to the link between physical inactivity and obesity (3–5). In Europe, the prevalence of obesity is steadily increasing, a trend that appears to be associated with an increasingly sedentary lifestyle (6). In turn, obesity and a sedentary lifestyle are both linked to lack of access to parks and other aesthetically pleasing public spaces (7–13).

The link between perceived safety, a key characteristic of area of residence, and the likelihood of engaging in exercise has been investigated in a number of studies of adults. However, findings from these studies remain inconclusive (1). Several investigations have found no association. These include three studies of walking and moderate activity (8, 14, 15). They also include a series of eight related studies of perceived safety and moderate physical activity conducted among convenience samples of women residing in urban or rural areas across the United States (9, 16–22). Six other studies report positive associations between perceived safety and walking or other moderate physical activity (23–28). Three of these studies examined gender differences (24, 26, 28). Two found that perception of safety was positively associated with physical activity only among women (26, 28), and one found an association only among men (24).

Using data from a survey conducted by the World Health Organization, we examine below the association between perceived safety of place of residence and the likelihood of exercise among adult residents of eight European cities. Previous studies, including three European studies, have produced inconclusive results. This study utilizes combined data from the eight cities to gain a more comprehensive understanding of the association in Europe. We also examine...
area-level correlates of perceived safety in order to identify appropriate targets for possible interventions. We hypothesize the following: 1) that those who perceive their residential areas as safe are more likely to exercise than those who do not and 2) that this association is stronger among women.

MATERIALS AND METHODS

Data were collected in the winter and spring of 2002/2003 by the World Health Organization’s large analysis and review of European housing and health status (hereafter referred to as “LARES”) project, a cross-sectional survey of place of residence, housing conditions, and health (29). This survey was undertaken in eight cities: Angers, France; Bonn, Germany; Bratislava, Slovakia; Budapest, Hungary; Ferreira do Alentejo, Portugal; Forli, Italy; Geneva, Switzerland; and Vilnius, Lithuania. The sample in each city was randomly generated from resident registries or, in the cases of Angers and Ferreira do Alentejo, from the local tax and the national health insurance registries, respectively (30). The number of residents sampled reflected city size and expected participation rate. Response rates varied across cities. For example, in Forli, 50 percent of the households participated and 96 percent of the residents of those households completed the health questionnaire; in contrast, the corresponding figures in Vilnius were 63 percent and 83 percent, respectively. In all the cities, with the exception of Bonn and Bratislava, households or residents of certain quarters were under- or overrepresented (31).

Once a residence was selected, trained inspectors visited that household to administer the survey. The survey included three components: 1) a questionnaire on housing conditions administered only to the resident who received the inspector and whose answers were used as a proxy for other occupants of the dwelling; 2) a health questionnaire, administered to all occupants of the dwelling; and 3) the inspector’s assessment of the dwelling and the immediate environment.

The perceived safety of the area of residence was assessed by a single item: “Do you feel safe returning to your home when it is dark?” Responses of “yes” and “to some extent” were combined to indicate “feeling safe,” and a response of “no, not at all” indicated “feeling unsafe.” Responses were collapsed because the association between exercise and the report of “feeling safe to some extent” was similar in magnitude and direction to the association between exercise and the perception of “feeling safe.” This item has been used in other surveys (32).

Self-reported exercise was measured by a single item: “Which statement do you think best describes your amount of sport or physical exercise?” Responses of “I have never done sport/physical exercise” and “I used to do sport/physical exercise” were collapsed to create a category of “no current exercise,” responses of “I frequently do sport/physical exercise on a moderate level” and “I frequently do sport/physical exercise on an intense level” were collapsed into a category of “frequent exercise,” and responses of “I occasionally do sport/physical exercise” remained their own category.

Gender, age, education, marital status, disability status, family size, and city of residence were included in the analysis as possible confounders (32–34). This analysis focused on adult participants 18–65 years of age (34). Educational-level responses of “secondary first stage” and “secondary second stage” were collapsed into “secondary education” to yield four categories: “no education,” “primary school,” “secondary school,” and “post-secondary schooling.” Marital status was categorized as “married,” “single,” and “widowed/divorced/separated.” Disability status was included as a dichotomous variable. Family size reflected the number of permanent residents of the dwelling: “one or two people,” “three people,” “four people,” and “five or more people.” The city of residence for each respondent was also included in the analysis to control, to the extent possible, similarities among residents of the same city. Employment status was initially included in the analysis, but it was strongly colinear with education, so it was removed.

The following housing and area-related characteristics were also included in bivariate analyses (35): floor level (second floor or below, third to sixth floor, seventh floor or above), housing tenure (own or rent), and years of residence (0–5, 6–15, 16–25, ≥26); neighborhood type (“panel block,” “apartment building,” “semidetached house,” “detached house”); presence of graffiti (0, 1–2, 3–5, ≥6); housing location (“urban,” “suburban,” “rural”); amount of litter (five-point Likert scale); and access to green space. All variables, except graffiti, had significant bivariate associations with exercise and were included in the multivariate analyses.

For multivariate analysis, a baseline-category logit model, rather than a proportional odds model, was fit because the proportional odds assumption was violated. The baseline used was “no exercise.” We followed a stepwise procedure for the modeling. Initially, all variables that evinced a bivariate association with exercise were included in a model. Then, each variable, except age, gender, marital status, and education, was removed from the model one at a time. Variables whose exclusion resulted in at least a 10 percent change in the coefficient for perceived safety were retained in the model as confounders. Analyses were conducted in SAS, version 9.1, software (SAS Institute, Inc., Cary, North Carolina).

RESULTS

The sample included 5,700 respondents aged 18–65 years, of whom 6 percent (n = 362) had a missing value on one or more variables of interest. Consequently, the analytical sample included 5,338 respondents (table 1). Nonrespondents were similar to respondents with respect to age, sex, family size, marital status, residence in rural versus urban locales, perception of safety, and frequency of exercise. Nonrespondents were more likely than respondents to have less education. Among respondents, 41 percent did not exercise, 36 percent exercised occasionally, and 23 percent exercised frequently. The proportion of respondents who never exercised ranged from 75 percent (Ferreira) to 18 percent (Geneva), and the proportion of respondents who
<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Angers, France</th>
<th>Bonn, Germany</th>
<th>Bratislava, Slovakia</th>
<th>Budapest, Hungary</th>
<th>Ferreira do Alentejo, Portugal</th>
<th>Forli, Italy</th>
<th>Geneva, Switzerland</th>
<th>Vilnius, Lithuania</th>
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<tr>
<td></td>
<td>(n = 5,338)</td>
<td>(n = 505)</td>
<td>(n = 538)</td>
<td>(n = 630)</td>
<td>(n = 675)</td>
<td>(n = 635)</td>
<td>(n = 12)</td>
<td>(n = 431)</td>
<td>(n = 1,212)</td>
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<td></td>
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<td>Safe</td>
<td>4,347</td>
<td>81.4</td>
<td>458</td>
<td>90.7</td>
<td>489</td>
<td>90.9</td>
<td>461</td>
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<td>991</td>
<td>18.6</td>
<td>47</td>
<td>9.3</td>
<td>49</td>
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<td>169</td>
<td>26.8</td>
<td>161</td>
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<td>54.3</td>
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<td>54.1</td>
<td>340</td>
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<td>16</td>
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<td>38.9</td>
<td>174</td>
<td>27.6</td>
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* SD, standard deviation.
perceived their area of residence to be unsafe ranged from 39 percent (Vilnius) to 5 percent (Ferreira).

In overall multivariate analysis (table 2), perception of safety was associated with a 27 percent elevation in the odds for occasional exercise, but it was not associated with the odds of frequent exercise. Men were 39 percent more likely to exercise frequently than were women. The amount of litter was inversely associated with the odds of both occasional and frequent exercise. Among women, perception of safety was associated with a 22 percent (95 percent confidence interval: 1.00, 1.54) and a 40 percent (95 percent confidence interval: 1.03, 1.91) elevation in the odds of occasional and frequent exercise, respectively. Among men, perception of safety was associated with a 39 percent elevation in the odds of occasional exercise, but there was no association with frequent exercise.

**DISCUSSION**

We examined the link between perceived safety of area of residence and the likelihood of exercise among residents of eight European cities. Consistent with previous work conducted primarily in North America, this study found that men exercised more frequently than did women, married persons were less likely to exercise than were single persons, and age was inversely associated with exercise.

Our key findings are twofold. First, we found an independent association between perceived safety and likelihood of exercise, confirming earlier findings from North American studies (23–25) and suggesting that health promotion efforts can target residential areas without needing to identify specific persons (36). For example, keeping a neighborhood clean and free of graffiti can also promote the perception that it is a safe place. This occurs, in part, because physical integrity and the absence of incivilities, such as litter and graffiti, signal residents’ ability to maintain order and safety in their neighborhood (37, 38). In our analysis, residence in an area with a large amount of litter or graffiti was inversely associated with perceived safety (data not shown). In turn, the amount of litter was inversely associated with the likelihood of exercise. In our analysis, the type of residential area was also linked with perceived safety. Living in a panel block estate or an area of multifamily dwellings was associated with a lower perception of safety relative to living in an area of single-family detached homes (data not shown). In Europe, particularly Eastern Europe, panel block housing has been associated with a variety of negative health outcomes (39). These buildings are the legacy of the socialist governments’ desire to produce
of residence. It is important to encourage those with a sedentary lifestyle to engage in occasional exercise, because it may be easier for people to begin and maintain beneficial activities such as bicycling and walking that take less time and effort than more intense exercise does (43, 44).

Moreover, the public health impact of targeting sedentary people rather than occasional exercisers is larger, as they are more prevalent in the population (e.g., 41 percent vs. 36 percent in this study).

The study’s limitations include the survey’s focus on exercise in general rather than on exercise near one’s residence. However, people often prefer to exercise outdoors, close to home, using freely available facilities (45). Moreover, exercise outside the area of residence would weaken the observed association, because characteristics of the area of residence would be less salient. Second, because respondents were chosen from resident registry lists, larger households were more likely to be selected. We attempted to minimize this bias by controlling for family size. Third, given the cross-sectional design of the study, it is impossible to conclude a cause-and-effect association. Fourth, the gender disparity is likely to be due to multiple factors, including a higher perception of safety among men than among women (83 percent vs. 79 percent) and probably men’s higher confidence in their ability to defend themselves. It is also possible that men who exercise frequently, because of their high motivation to exercise, are less sensitive to conditions of their area of residence. This would be consistent with earlier findings that perceived safety predicted change from low to moderate, but not to more rigorous, exercise levels (24).

From a public health perspective, the association between perceived safety and occasional exercise is more important than the association between perceived safety and frequent exercise. Occasional exercise is the first step in changing a sedentary lifestyle. It is important to encourage those with a sedentary lifestyle to engage in occasional exercise, because it may be easier for people to begin and maintain beneficial activities such as bicycling and walking that take less time and effort than more intense exercise does (43, 44).

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Finally, in addition to the qualities of the built environment, cultural attitudes toward exercise may impact behavior as well. For example, respondents from Ferreira do Alentejo, Portugal, reported both the lowest levels of perceived insecurity and the lowest levels of exercise. Portugal has the lowest levels of physical activity in Europe (44), which may suggest a normative climate that does not encourage exercise and which may explain the low rates of exercise despite high rates of perceived safety. We accounted for city of residence in the regression models, but cultural differences between cities deserve further examination.

A strength of this study is its sample size, which allowed consideration of a relatively large number of covariates. Another strength is that the survey was conducted throughout eight European cities, varying in their wealth, culture, and history (29). Most previous studies have been performed within one city or one neighborhood, resulting in relatively homogeneous samples. Moreover, the same survey methods and training of the surveyors were applied in all the cities. Finally, by not relying exclusively on the self-assessed perceptions of both health and environment, this survey is generally not subject to same-source bias.

The findings of this study suggest that public health officials can universally promote exercise by improving conditions of area of residence (36), efforts that may lower the growing rate of obesity. Improving place characteristics has the potential to affect entire populations on a relatively longer-lasting basis compared with individual-level interventions (46). Ultimately, if these findings are replicated and expanded upon, they would call for the cooperation of urban-planning, public policy, and public health officials.

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Conflict of interest: none declared.

REFERENCES


