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Access to parks and physical activity: An eight country comparison

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ABSTRACT

Several systematic reviews have reported mixed associations between access to parks and physical activity, and suggest that this is due to inconsistencies in the study methods or differences across countries. An international study using consistent methods is needed to investigate the association between access to parks and physical activity.

The International Physical Activity and Environment Network (IPEN) Adult Study is a multi-country cross-sectional study using a common design and consistent methods. Accelerometer, survey and Geographic Information Systems (GIS) data for 6181 participants from 12 cities in 8 countries (Belgium, Brazil, Czech Republic, Denmark, Mexico, New Zealand, UK, USA) were used to estimate the strength and shape of associations of 11 measures of park access (1 perceived and 10 GIS-based measures) with accelerometer-based moderate-to-vigorous physical activity (MVPA) and four types of self-reported leisure-time physical activity. Associations were estimated using generalized additive mixed models.

More parks within 1 km from participants' homes were associated with greater leisure-time physical activity and accelerometer-measured MVPA. Respondents who lived in the neighborhoods with the most parks did on average 24 min more MVPA per week than those living in the neighborhoods with the lowest number of parks. Perceived proximity to a park was positively associated with multiple leisure-time physical activity outcomes. Associations were homogeneous across all cities studied.

Living in neighborhoods with many parks could contribute with up to 1/6 of the recommended weekly Having multiple parks nearby was the strongest positive correlate of PA. To increase comparability and validity of park access measures, we recommend that researchers, planners and policy makers use the number of parks within 1 km travel distance of homes as an objective indicator for park access in relation to physical activity.

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1. Introduction

Sufficient regular physical activity, at least 150 min of moderate-intensity aerobic physical activity throughout the week as recommended by the World Health Organization (WHO, 2010), reduces the risk of non-communicable diseases such as type 2 diabetes, coronary heart disease, hypertension, depression, and breast and colon cancers, and increases life expectancy (Lee et al., 2012). Worldwide, 23.3% of adults (15 years and older) are not sufficiently active (Sallis et al., 2016a), with proportions ranging from 15% in southeast Asia to about 32% in the Americas and the eastern Mediterranean (WHO, 2014).

Different domains of physical activity, such as leisure and active transportation, are influenced by many factors, and ecological models of behavior (Sallis et al., 2006) have frequently been used in designing studies to understand these multiple influences. Within several fields there has been considerable interest in possible associations between physical activity and presence or access to parks and other urban green spaces. Having parks in their neighborhood provides residents with the space or facilities for physical activity, which is one of the mechanisms that could explain observed associations between residential green space and better health outcomes (Dadvand et al., 2016; Hartig et al., 2014; Sugiyama et al., 2008).

Positive associations between various types of physical activity have been reported for perceived distance to the nearest park (Jáuregui et al., 2016a;Toftager et al., 2011; Schipperijn et al., 2010), amount of green space close to home (Kaczynski et al., 2009; Kaczynski et al., 2014), size of the nearest park (Giles-Corti et al., 2005; Kaczynski et al., 2008; Schipperijn et al., 2013), number of nearby parks (Cohen et al., 2006; Kaczynski et al., 2009; Kaczynski et al., 2014), and presence of certain park features such as walking paths and sports facilities (Kaczynski et al., 2008; Schipperijn et al., 2013).

2017 However, reviews by Ekkel and de Vries (2017), Lachowycz and Jones (2011), and Kaczynski and Henderson (2007) showed the evidence for a positive relation between parks and physical activity as well as other health related outcomes was inconclusive, and results were difficult to compare directly because of the wide range of measures and methods used to determine park access and physical activity. The review by Lachowycz and Jones (2011) reported inconclusive results when comparing findings from studies conducted in different countries and continents. For example, of the 13 reviewed studies conducted in Europe, six did not find a significant association between parks and physical activity, three found a positive association, and four found mixed associations. All three review papers argued for more comparable measures to be used. A recent paper based on a European WHO workshop recommended using a 300 m (m) maximum Euclidian distance to the boundary of urban green spaces of a minimum size of 1 ha, when estimating the accessibility of urban green space (Annerstedt van den Bosch et al., 2016). This recommendation has, however, already been criticized in the review by Ekkel and de Vries (2017) as the evidence for this recommendation was limited.

The International Physical Activity and the Environment Network (IPEN) Adult Study (Sallis et al., 2016b; Kerr et al., 2013), provides a unique opportunity to analyze comparable cross-country data on both parks and physical activity. The main aim of the present paper was to estimate the strength and shape of associations of perceived proximity to parks and a number of Geographic Information Systems (GIS) based park access measures with accelerometer-based overall moderate-to-vigorous physical activity (MVPA) and multiple domains of self-reported leisure-time physical activity (LTPA).

2. Methods

2.1. Study design and neighborhood selection

The methods for the IPEN Adult Study have been described in detail elsewhere (Kerr et al., 2013). IPEN Adult is a multi-country cross-sectional study using a common design and consistent methods and included participants from 17 cities in 12 countries: Australia (Adelaide, AUS), Belgium (Ghent, BEL), Brazil (Curitiba, BRA), Colombia (Bogota, COL), Czech Republic (Olomouc and Hradec Kralove, CZ), Denmark (Aarhus, DEN), Hong Kong/China (HK), Mexico (Cuernavaca, MEX), New Zealand (North Shore, Waitakere, Wellington, and Christchurch, NZ), Spain (Pamplona, SP), the United Kingdom (Stoke-on-Trent, UK), and the United States of America (Seattle/King County, Washington and Baltimore, Maryland region, USA). To maximize variance in neighborhood walkability (a construct that indicates how conducive for utilitarian walking a neighborhood is, with components including residential density and mixed land use; Frank et al., 2010) and socioeconomic status (SES), IPEN study procedures involved identifying similar neighborhoods across cities stratified as follows: higher walkable/higher SES, higher walkable/lower SES, lower walkable/higher SES, and lower walkable/lower SES. Using GIS, neighborhood walkability index scores (Adams et al., 2014; Frank et al., 2010) were created for small geographic areas (neighborhoods) in each city. The neighborhoods were delineated based on the locally available “administrative units” that were more or less equivalent to US Census block groups, with between 500 and 3000 inhabitants. Neighborhoods that met criteria for the four strata were selected in each city, and participants were recruited in a balanced fashion from each neighborhood to control for seasonal effects and other confounders.

2.2. Participant recruitment

In the selected neighborhoods, households were randomly identified using databases from commercial and government sources. One adult in each selected household was asked to complete a survey and wear an accelerometer to objectively measure physical activity. All participants provided informed consent, and ethical approval was obtained from local institutional review boards in each country. The data collection dates ranged across cities from 2002 to 2011.

2.3. Participants

The IPEN Adult study comprised 14,222 adults aged 18–66 years from 17 cities in 12 countries. Five out of 17 study sites did not collect objective physical activity data, relevant GIS data and/or self-reported LTPA data (Adelaide, AUS; Bogotá, COL; Hradec Kralove, CZ; Hong Kong, HK; Pamplona, SP). Of 8568 participants from the remaining 12 cities in 8 countries (Ghent, BEL; Curitiba, BRA; Olomouc, CZ; Aarhus, DEN; Cuernavaca, MEX; North Shore, Waitakere, Wellington, and Christchurch, NZ; Stoke-on-Trent, UK; Seattle/King County, Washington and Baltimore, Maryland region, USA), 1808 did not wear an accelerometer because they did not consent to this part of the study or were not asked to do so. To be included in the current study, participants needed to have accelerometer data for at least 10 h per day, for at least four days. They furthermore needed to have valid GIS data and complete survey data for all relevant variables. The socio-demographic characteristics of the final sample used in this paper (N = 6181) with valid accelerometer, GIS, and survey data by study site are presented in Table 1.

When compared to participants who did not wear accelerometers or had fewer than four valid days of accelerometer data, those who had at least four valid days with sufficient wear-time were more likely to be older ($p < 0.001$), married or in a de facto relationship ($p = 0.005$), employed ($p = 0.012$), hold a tertiary degree ($p < 0.001$) and live in higher income areas ($p = 0.002$).

2.4. Outcome measures

A recent study based on IPEN Adult data has shown that self-reported and objectively measured physical activity essentially are two