



Neighborhood and family perceived environments associated with children's physical activity and body mass index



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ABSTRACT

Background. A growing body of research has been examining neighborhood environment related to children's physical activity and obesity. However, there is still not enough evidence from Latin America.

Objective. To investigate the association of neighborhood and family perceived environments, use of and distance to public open spaces with leisure-time physical activity (LTPA) and body mass index (BMI) in Argentinean school-aged children.

Methods. School-based, cross-sectional study with 1777 children (9 to 11 years) and their parents, in Cordoba city during 2011. Children were asked about LTPA and family perceived environment. Parents were asked about neighborhood perceived environment, children's use of public open spaces and distance. Weight and height were measured for BMI. We modeled children's LTPA and BMI z-score with structural equation models with latent variables for built, social and safety neighborhood environments.

Results. Parents' perceived neighborhood environment was not related with children's LTPA and BMI. Children's perceived autonomy and family environment were positively associated with LTPA. Use of unstructured open spaces and, indirectly, the distance to these, was associated with LTPA among girls. Greater distance to parks reduced their use by children.

Conclusions. Policies to increase children's LTPA should include access to better public open spaces, increasing options for activity. A family approach should be incorporated, reinforcing its role for healthy development.

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Introduction

Over the past few decades, Latin America has been profoundly affected by globalization, urbanization, economic changes and epidemiological transition. These processes have interacted in multiple complex ways producing significant changes in community socio-environmental characteristics and population health patterns, including those related with physical activity (PA) and obesity (Uauy et al., 2008).

A growing number of studies are examining features of the built and social neighborhood environments related with children's PA. Although

studies are often difficult to compare because of the varying built and social environmental and PA measures used, there is consistent evidence that better access to physical activity resources (Ding et al., 2011) and a more supportive family environment (Edwardson & Gorely, 2010) are associated with higher children's PA. However, there are still questions about the association with other features of the social environment, such as perceived safety (Ding et al., 2011).

Public health research and action need to be based on evidence from research on community environment and its association with health-related behaviors. However, much of the evidence currently available was generated in Europe, North America and Oceania, and the context-specific nature of these findings limits their application in Latin America (Fermino et al., 2013; Arango et al., 2013). Fortunately, in recent years, Brazil and Colombia have advanced in this field, not only in research, but also in the implementation of policies, but there is still not enough scientific information on policies in other Latin American countries.

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In 2001, Argentina joined the Healthy Municipalities and Communities initiative, a Latin American strategy encouraged by the World Health Organization and the Pan-American Health Organization, aimed at promoting participatory health. This involves supporting local government in establishing healthy public policies and promoting active community participation, supportive environments, and healthy lifestyles (Pan American Health Organization, 2005). Joining the initiative was an important step for Argentina toward considering the environment where people live as a significant factor in people's health. However, most actions so far have focused only on individual-based approaches, especially diet and PA, and strategies to create supportive environments for health are infrequent (Anon., 2008). One reason may be the lack of evidence on which community socio-environmental characteristics have most influence on Argentines' health-related behaviors, which would help in advocating for supportive environments.

Studies about leisure-time PA and neighborhood environment in Latin America have mainly focused on the built environment (Arango et al., 2013; Bauman et al., 2012) and have been conducted among adults (Bauman et al., 2012). It has been acknowledged that perceptions related to the environment and their association with PA are expected to differ according to age (Bauman et al., 2012). Moreover, it is reasonable to expect that parents' perceptions about the environment play a role in children's leisure-time PA, though findings are inconsistent on this topic (Ding et al., 2011). Evidence suggests that parental warmth and involvement, emotional support, appropriate granting of autonomy, and clear, bidirectional communication are positively associated with more healthy behaviors in children and adolescents (Newman et al., 2008). Supportive and encouraging attitudes from parents seem to be important influences on 6–11 year-old children being physically active (Edwardson & Gorely, 2010).

Another aspect that needs to be further investigated is whether leisure-time PA and/or community socio-environmental characteristics have some influence in children's body mass index (BMI) (Pate et al., 2013; Safron et al., 2011). Systematic reviews tend to report weak to modest relationships between school-aged children's PA and overweight/obesity, with many risk estimates being non-significant (Pate et al., 2013; Safron et al., 2011; Janssen & LeBlanc, 2010; Wilks et al., 2011).

The purpose of this study was thus to investigate the association of neighborhood and family perceived environments with leisure-time PA and overweight/obesity in Argentinean school-aged children. We hypothesized that: (a) a negative parental perception of the built, social and safety attributes of the neighborhood would be negatively associated with children's use of parks and unstructured open spaces and their leisure-time PA; (b) children's perception of autonomy and family environment would be positively associated with the use of these spaces and leisure-time PA; and (c) children's leisure-time PA would correlate negatively with their overweight/obesity status.

Methods

Design, population and sample

A cross-sectional study was carried out in a population of 4th to 6th grade children – ages 9 to 11 years – of municipal primary schools in Cordoba city, which is the capital of Cordoba province, located in the center of Argentina and its second largest city, with 1.3 million inhabitants in an area of 576 km². It has a centralized urban distribution characterized by wide urban fragmentation with the highest proportion of poor people located in the outskirts of the city.

The study was conducted between September and December 2011. All the municipal primary schools are in the outskirts of the city, in medium to low socioeconomic neighborhoods (e.g., 6 to 28% of heads of household have completed high school) (Population census of Cordoba, 2008). The children were thus mostly from families with these socioeconomic characteristics.

Considering a population of 4820 children enrolled from 4th to 6th grade in city municipal schools, an expected prevalence of 50% (due to multiple

outcomes with heterogeneous expected prevalence), a sampling error of 3.5 percentage points, confidence interval of 95%, and a design effect of 2.0, a sample size of 1349 students was estimated for this survey. The sample was increased 15% (n = 1552) to enable control for confounding factors in association analyses and then 50% (n = 2328) due to refusals and missing.

For the sampling process, all municipal primary schools existing in 2011 (n = 37) were stratified into two groups: those with more than 75% of parents with at least elementary education completed (n = 20) and those below this cut-off (n = 17). 10 schools were randomly selected from the first group and nine from the second. The sample included all fourth to sixth-grade students and their primary adult caregivers (usually mothers). The 19 schools selected yielded a potential pool of 2424 students.

Parents were called to the school for a meeting with the research team, given an explanation of the study, and then written informed consent was obtained from those who agreed to participate and let their children participate. If parents did not attend the meeting, they were sent a note explaining the study, the informed consent and the questionnaire to be completed. Children were also asked to assent to participate, regardless of their parents' consent.

When both agreed to participate, parents completed a self-administered questionnaire after the meeting or at home. Children also completed a self-administered questionnaire that was read aloud by a member of the research team in the classroom, so that everybody completed it at the same time. Meanwhile, children who had no signed consent or did not assent to participate continued with school tasks assigned by the teacher.

Measures

Neighborhood and family perceived environments. Parents' gave information about the availability of different recreational sites in the neighborhood where the children lived, the distance from their homes in blocks – as distance is usually reported in Argentina, corresponding to approximately 100 m – and the frequency with which children used them for PA (never, once a month or less, once every other week, and once per week or more). For this analysis, we focused on distance to and frequency of use of parks and unstructured open spaces, such as streets, cul-de-sacs, and open land.

In addition, parents' perception of barriers to children's PA in their neighborhood of residence was examined through a Neighborhood Environment for Physical Activity Survey, cross-culturally adapted from the "Active Where?" Survey of the Robert Wood Johnson Foundation's Active Living Research (Anon.). Ten barriers were considered: (1) availability of places to be active in, (2) activity options, (3) equipment availability, (4) adult supervision, (5) general neighborhood safety, (6) traffic safety, (7) lighting, (8) presence of other children, (9) presence of other people, and (10) children's feelings. A four-point scale assessed each question: strongly disagree, somewhat disagree, somewhat agree, and strongly agree. Three latent variables were generated from these items to represent parents' perceived built and social environments and safety for PA of the neighborhood (see Supplementary Tables 1 and 2).

A latent variable representing the children's perceived autonomy and family environment was generated using the autonomy, parent relations and home life, and financial resources domains of the KIDSCREEN-52, Argentinean version (Berra et al., 2009). Children were asked fourteen 5-point scale questions and the KIDSCREEN-52 protocol was used to define the values for each domain (see Supplementary Tables 1 and 2).

Children's leisure-time physical activity. Children were asked about the frequency and duration of moderate and vigorous leisure-time PA, using the PA section of the 2006 Spanish version of the "Health Behavior in School-aged Children" survey questionnaire (Booth et al., 2001). Examples of PA within each level of intensity were provided to make the differences between them clear. Children were asked about weekly frequency (never, once a week, two to three days a week, four to six days a week, and every day) and daily duration (none, less than half an hour, half an hour, one hour, and more than one hour) in each intensity. The leisure-time PA in each intensity was determined separately, combining the frequency and duration in a discrete score ranging from 0 (lowest leisure-time PA) to 4.

Body mass index z-score. Trained staff measured weight and height with a digital scale and a portable height rod. Children wore light clothes, without sweaters, jackets or shoes, during the procedure. Body mass index (BMI) was defined as weight in kilograms divided by the square of height in meters, and z-scores were calculated according to the WHO 2006 standards (WHO Multicentre Growth Reference Study Group, 2006) using WHO AnthroPlus software.

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