Health & Place 24 (2013) 203–209

Contents lists available at ScienceDirect

Health & Place

journal homepage: www.elsevier.com/locate/healthplace

Neighborhood perceptions moderate the association between the family environment and children's objectively assessed physical activity

Sara D'Haese [a,c,*], Anna Timperio [b], Jenny Veitch [b], Greet Cardon [a], Delfien Van Dyck [a,c], Jo Salmon [b]

[a] Faculty of Medicine and Health Sciences, Department of Movement and Sports Sciences, Ghent University, Watersportlaan 2, 9000 Ghent, Belgium
[b] Centre for Physical Activity and Nutrition Research, Deakin University, Burwood, Australia
[c] Research Foundation Flanders (FWO), Egmontstraat 5, 1000 Brussels, Belgium

ARTICLE INFO

Article history:
Received 8 May 2013
Received in revised form
25 September 2013
Accepted 26 September 2013
Available online 9 October 2013

Keywords:
Children
Environment
Family
Neighborhood
Physical activity

ABSTRACT

This study aimed to investigate whether parents' perceptions of the neighborhood environment moderate associations between the family environment and children's moderate- to vigorous-intensity physical activity (MVPA) outside of school hours. In total, 929 parents of 10–12 year-old children completed a questionnaire concerning the family environment, MVPA levels, and the neighborhood environment. Children wore an Actigraph (AM7164-2.2C) accelerometer. Compared with neighborhood environment factors, the family environment was more frequently associated with children's MVPA. Parental MVPA was positively associated with children's MVPA, but only among children whose parents reported a high presence of sporting venues. Having more restrictive physical activity rules was negatively associated with children's weekday MVPA in neighborhoods with high perceived stranger danger.

1. Introduction

Many children do not meet the physical activity guidelines of 60 min of moderate- to vigorous-intensity physical activity (MVPA) per day (Janssen and Leblanc, 2010; Verloigne et al., 2012b). Therefore, the promotion of children's MVPA has become an important public health aim. In order to develop effective interventions to promote children's MVPA, it is necessary to better understand potential determinants of this behavior (Baranowski et al., 1998).

From an ecological perspective, it is important to focus not only on individual factors in relation to physical activity, but also on the social (e.g. family) and physical (e.g. neighborhood) environment (Sallis et al., 2008). Previous research has examined the direct relationship between children's family and neighborhood environments and their physical activity levels. A systematic review found that parental physical activity and parental social support were positively associated with 4–12 year-old children's physical activity (Van Der Horst et al., 2007). A more recent review also concluded that parents play an important role in 6–11 year-old children's physical activity (Edwardson and Gorely, 2010). Based on cross-sectional evidence, maternal modeling was positively associated with children's MVPA (Trost et al., 1999; Vilhjalmsson and Kristjansdottir, 2003) and fathers' modeling positively associated with children's leisure-time physical activity (Vilhjalmsson and Kristjansdottir, 2003; Shropshire and Carroll, 1997). A longitudinal study not included in the previous reviews, found that a positive parental attitude towards physical activity and parental encouragement at the age of 10 years were positively related to higher levels of physical activity at age 16 (Verloigne et al., 2012a).

Aspects of the physical environment, such as access and proximity to recreation facilities (Ding et al., 2011), safety (Carver et al., 2010) and parental anxiety about neighborhood safety (Weir et al., 2006) have also been associated with children's physical activity. However, there is evidence that the family environment may be a more important correlate of children's physical activity than the neighborhood environment (Crawford et al., 2010). Most of the existing research has examined direct associations between the family and physical environments and children's physical activity. However, these associations may vary

* Corresponding author at: Faculty of Medicine and Health Sciences, Department of Movement and Sports Sciences, Ghent University, Watersportlaan 2, 9000 Ghent, Belgium. Tel.: +32 92646369.
E-mail addresses: Sara.DHaese@UGent.be (S. D'Haese), anna.timperio@deakin.edu.au (A. Timperio), jenny.veitch@deakin.edu.au (J. Veitch), Greet.Cardon@UGent.be (G. Cardon), Delfien.VanDyck@UGent.be (D. Van Dyck), jo.salmon@deakin.edu.au (J. Salmon).

1353-8292/$ - see front matter © 2013 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.healthplace.2013.09.012

by situation or circumstance (Bauman et al., 2002; Kremers et al., 2006; Ball et al., 2006). For instance, associations between the family environment and children's physical activity may be stronger among families living in neighborhoods with attributes that are more supportive of physical activity. For example, it is possible that family factors such as the association between parental rules (e.g. child requiring supervision when being active outside) and children's physical activity, depends on the level of perceived stranger danger in the neighborhood. Understanding how families and neighborhoods interact in relation to physical activity can help to better understand the conditions in which family factors are most strongly associated with children's physical activity, and assist in identifying groups in need of targeted interventions.

To our knowledge, no studies have examined the potential moderating role of the neighborhood environment on the association between the family environment and children's physical activity. This study aimed to determine the moderating effect of parental neighborhood perceptions on the relationship between the family environment and children's physical activity levels. Parental perceptions are examined because parents are most often the main decision makers with regard to their child's physical activity (Panter et al., 2008). The present study focused on MVPA outside of school hours during weekdays and during weekend days as it is likely that the neighborhood and family environments are most strongly related to children's physical activity during this period. We hypothesize that the perceived neighborhood environment moderates the relation between family environment and children's MVPA such that families living in supportive neighborhood environments may have stronger associations between family environment factors (e.g. parental modeling, parental support, etc.) and children's physical activity compared with those living in non-supportive environments.

2. Methods

2.1. Procedure

This paper involved secondary data analyses of baseline data collected as part of the Children Living in Active Neighborhoods (CLAN) study. The methods have been described in more detail elsewhere (Timperio et al., 2004; Telford et al., 2005). Briefly, 24 government schools in Melbourne, Australia were selected using stratified random sampling and recruitment took place in 19 of these schools (10 in high socioeconomic status (SES) areas, 9 in low SES areas). In total, 2096 families were invited to take part in the study and the parents of 929 children aged 10–12 years participated (response rate=44%). Parents completed a questionnaire at home. Data were collected between July and December 2001. The Deakin University Human Research Ethics Committee and the Department of Education and Training Victoria approved the study and all participating parents provided written informed consent for their own and their child's participation.

2.2. Measures

2.2.1. Sociodemographic information

Parents reported their highest level of education ('low' some high school or less; 'medium' high school, technical certificate or apprenticeship; 'high' university/tertiary qualification), marital status (single parent family; dual parent family), number of children living in their home, age and sex of the child who was participating in the study and their residential postcode. Parents also indicated who responded to the questionnaire (mother, father, grandparent, guardian or other). The Socio-Economic Index for Areas (SEIFA) Index of Relative Socio-Economic Advantage/Disadvantage (Australian Bureau of Statistics, 2003) was used to assign a SES score to the postcode in which each participant lived. A high score was indicative of a more advantaged neighborhood. For analyses, neighborhoods were stratified into quintiles of SES and included as a covariate.

2.2.2. Objectively assessed physical activity

Children were asked to wear a uniaxial accelerometer (Actigraph Model, AM7164-2.2C, Fort Walton Beach, Florida, USA) for eight consecutive days during waking hours, except during bathing and aquatic activities (Trost et al., 1998). Epochs were set at 60 s. Data measured on the first day of data collection were excluded from the analyses because of the incompleteness on this day and to exclude potential reactivity effects on the first day (Janz et al., 1995). Periods of consecutive zero counts of longer than 20 min represented non-wear time (Treuth et al., 2003) and were subtracted from each day to compute daily wear-time. Age-specific cutpoints were used (Freedson et al., 2005) with 4 METs representing moderate-intensity physical activity, given that brisk walking is associated with an energy cost of 4 METs (Trost et al., 2011).

Average minutes/day of MVPA per day outside school hours (before the first school bell and after the last bell until 9 pm on weekdays) and per weekend day were computed for all valid days. For the purpose of computing MVPA outside of school hours, a valid weekday was defined as having at least one hour of wear time between the last school bell and 6 pm. A valid weekday also included less than 300 minutes of vigorous-intensity physical activity across the entire day ($\geq$ 6 METS). This criterion was added to identify accelerometer malfunction. A valid weekend day was defined as at least eight hours of wear-time and less than 300 minutes of vigorous-intensity physical activity. Data from children with at least 3 valid weekdays or 1 valid weekend day were included in the analyses.

2.3. Family environment

2.3.1. Parental modeling of MVPA

The responding parent reported the total time (hours and minutes) that they usually spent engaging in vigorous-intensity physical activity (e.g. activity that made them breathe harder or puff and pant) and moderate-intensity physical activity for at least 10 min continuously (e.g. gardening, walking the dog, golf and lap swimming) in a typical week during their free time (Timperio et al., 2008). These items were modified from a valid (Timperio et al., 2002) and reliable (Brown et al., 2004) existing measure (test–retest reliability: ICC=0.65–0.69)(Cleland et al., 2011). The responding parent also reported this information on behalf of his/her partner. Vigorous- and moderate-intensity activities were summed to compute modeling. Modeling was determined separately for the mother/female carer and for the father/male carer.

2.3.2. Rules and restrictions regarding physical activity

Parents reported their agreement with the following statements on a 5-point Likert scale ranging from strongly disagree=1 to strongly agree=5: 'My child must be supervised while playing outside'; 'I don't allow my child to play outside after dark'; and 'I don't allow my child to walk/ride a bike on the street after dark'. These three items were summed (Cronbach alpha=0.50) and an average score was computed, with a higher score reflecting more rules and restrictions towards physical activity.

2.3.3. Parental social support for physical activity

Parents reported each parents' co-participation in physical activity with their child ('How often does the father/mother actively participate in physical activity with his/her child?'), direct social support ('How often does the father/mother provide support