



Physical and social home environment in relation to children's overall and home-based physical activity and sedentary time



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ABSTRACT

Background. Given the obesity epidemic, it is critical to understand factors associated with youth physical activity and sedentary behavior at home, where youth spend significant time. We examined relationships between these child behaviors and home environment factors.

Methods. Data were obtained from 713 children aged 6 to 11 in Washington and California 2007–2009. Multivariate regression analyses controlling for socio-demographics examined associations between parent-reported home environment factors and child's accelerometer-measured moderate-to-vigorous physical activity (MVPA) and sedentary time, overall and at home, and parent-reported child screen time.

Results. Children averaged 47.2% of time at home, which included 43.6% and 46.4% of overall MVPA and sedentary behavior, respectively. Parental support for physical activity and having a basketball hoop were positively associated with MVPA and negatively associated with sedentary behavior. Combined parental support and a basketball hoop was associated with even higher MVPA. Children with fewer bedroom media devices and more fixed play equipment had lower overall sedentary behavior and screen time than either factor alone. Findings were similar regardless of weight status.

Conclusions. Physical and social home environment variables, especially when combined, were related to more child MVPA and less sedentary behavior. Results support addressing multiple home environment factors in childhood obesity prevention.

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Introduction

Preventing childhood obesity is an important goal in addressing the global obesity epidemic (Caballero, 2007). Understanding how home environments, where children spend significant time, influence children's activity behaviors could lead to evidence-based interventions (Birch and Davison, 2001; Maitland et al., 2013). Children's activity encompasses both physical activity and sedentary behavior, each of

which has different associated influences and health implications (Davison and Lawson, 2006; Fairclough et al., 2009; Gebremariam et al., 2013; Marshall and Ramirez, 2011). Several physical and social environment factors at home have been identified as correlates of children's physical activity and sedentary behavior (Marcus et al., 2012; Roemmich et al., 2007; Saelens et al., 2002). An international review found that the most important, positive correlates of youth physical activity were related to social environments parents create: parents' own physical activity, their activity with youth, and their logistical support (e.g., transporting children to activities) (Verloigne et al., 2012). Additional studies confirmed associations of parent support and having family and/or friends to participate in activity with youth physical activity (Jimenez-Pavon et al., 2012). Timperio et al., 2013; Verloigne et al., 2013; McMinn et al., 2011; Dunton et al., 2012. Less is known about the physical environment factors at home, such as sports equipment, that are most supportive of youth physical activity, as studies have been inconclusive (Ferreira et al., 2007).

Abbreviations: BMI, body mass index; NIK, Neighborhood Impact on Kids Study; METs, metabolic equivalents; MVPA, moderate-to-vigorous physical activity.

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Regarding correlates of sedentary behavior, parental media rules (e.g., limits on media use) have been found to be inversely correlated with sedentary behavior in the majority of studies from around the world (Verloigne et al., 2012). Parents' sedentary time, sedentary activity with a parent, and number of TVs in the home were additional home environment correlates of youth sedentary time (Verloigne et al., 2012). Multiple studies reported that the presence of media devices in the bedroom was associated with more self-reported screen time (Granich et al., 2011; Wiecha et al., 2001; Tandon et al., 2012). However, there have been inconsistent associations reported between media in the bedroom and overall sedentary time when assessed by accelerometer (Atkin et al., 2013a, 2013b; van Sluijs et al., 2010).

Research on environments and activity for children remains limited, with inconsistent results and methodological limitations, such as lack of objective measures and measures of activity in specific locations (Maitland et al., 2013). In particular, few studies have evaluated home environment variables with home-based physical activity and sedentary behavior, as compared to these outcomes overall. Though stronger associations of home environments are expected with activity behaviors at home, it is useful to determine associations with total daily activity behaviors to investigate the possibility of compensation. Though virtually all studies examined home environment variables separately, there is a reason to believe that the combination of variables will have stronger relations with activity-related behaviors (Birch and Davison, 2001; Golan, 2006). Ecological models demonstrate that health behaviors have multiple levels of influence with interactive effects across domains, including physical and social environment (Sallis et al., 2008).

The present study used objective measurements of moderate-to-vigorous physical activity (MVPA) and sedentary behavior in a large sample of children to test the following hypotheses: 1) physical environment (i.e., presence of physical activity equipment and media devices) and social environment (i.e., parent support for physical activity and rules for media use) variables are related to MVPA and sedentary behavior, both overall and at home, while controlling for demographic factors, and 2) social and environmental factors interact with each other to have additive impact on MVPA and sedentary behavior.

Methods

Participants

Participants were part of the Neighborhood Impact on Kids (NIK) Study, a longitudinal, observational cohort study of children aged 6 to 11 and their parents in Seattle/King County, Washington and San Diego County, California (Frank et al., 2012; Saelens et al., 2012). NIK was designed to evaluate the association of neighborhood and home environmental factors with children's and parents' weight status and weight-related behaviors. This study was approved by the institutional review boards at Seattle Children's Hospital and San Diego State University.

Protocol

The present analysis used baseline data collected September 2007–January 2009. Attempts were made to contact a total of 8616 households, of which 4975 were screened for interest and eligibility, and 944 agreed to participate. Among families agreeing to participate, 730 consented and were enrolled. The present study sample consisted of 713 child–parent pairs who completed the parent survey and had valid accelerometer data. Details regarding recruitment and inclusion/exclusion criteria were previously published (Saelens et al., 2012).

Parents provided consent and children provided assent at a home or clinic visit. The parent completed a survey that assessed, among other things, access to media and physical activity equipment at home, children's sedentary behaviors, household rules and practices about physical activity and sedentary behavior, and sociodemographic information. The complete NIK survey is available at: <http://www.seattlechildrens.org/research/child-health-behavior-and-development/saelens-lab/measures-and-protocols>.

Measures

Physical home environment was assessed by parent report using items and scales with established moderate to high test–retest reliability. A Bedroom Media Score was generated by summing five items: presence of a TV, DVD/VCR, computer, video game system and/or hand held video game player in the child's bedroom (test–retest reliability ICC = .51–.96) (Joe and Carlson, 2010). A Fixed Play Equipment Score was generated by summing two items: presence of a basketball hoop and a fixed swing set (ICC = .53–.80) (Joe and Carlson, 2010). A Portable Play Equipment Score was generated by summing four items: presence of a bike, jump rope, sports equipment (balls, racquets) and/or roller skates (ICC = .60–.82) (Joe and Carlson, 2010). We also examined each scales' individual items to determine relative contributions.

Social environment was measured through three scales. The Parent Support for physical activity score summed how many days during a typical week a parent/household adult would 1) “watch child participate in sports or physical activity,” 2) “encourage child to do sports or physical activity,” and/or 3) “provide transport to a place where child can do physical activity or play sports” with responses of 1 = never; 2 = 1–2 days; 3 = 3–4 days; 4 = 5–6 days and 5 = daily. A cut-point of <5 and ≥5 was selected to indicate daily support on one item, or some support on more than one item, as compared to little or no support on any item. The Safety Rules Score summed “yes” responses on three rules (yes/no): “Stay close/within sight of house/parent,” “do not go into street,” “do not ride bike on street” (ICC = .61–.74) (Joe and Carlson, 2010). The Media Rules Score summed “yes” responses on two rules: “no TV before homework” and “<2 hours of TV per day” (ICCs = .57 and .73, respectively).

Screen time, sedentary time and physical activity

Parents reported their children's “typical weekday time” spent watching TV/DVDs, playing video games and using the Internet/other electronic media as: none, 15 min, 30 min, 1 hour, 2 hours, 3 hours, ≥4 hours per day (ICC = .66, .73, .72, respectively) (Marshall et al., 2002). Responses were summed to create a child screen time of average hours/day. Parents also reported on the frequency with which their child engaged in screen time with a parent, sibling or friends.

Child overall physical activity and sedentary behavior were measured by the GT1M Actigraph accelerometer (Pensacola, FL), which has been validated for children (Pate et al., 2006). Accelerometer data were collected in 30 second epochs. Participants were asked to wear the accelerometer for 7 days during waking hours. A valid day was ≥10 valid hours of wearing time, and a valid hour contained <20 minutes of consecutive zero counts. Data were included for children with at least 3 valid days. Valid data were converted to minutes engaged in sedentary behavior (<100 counts per minute) and MVPA (≥3 metabolic equivalents (METs) using Freedson age-specific cut-points with the participant's age rounded to half a year (Freedson et al., 1997). Overnight wear time was converted to “non-wearing time” using a previously published protocol to prevent overestimating sedentary time (Tandon et al., 2012). Accelerometer data were scored using MeterPlus version 4.0 (Santech, Inc., www.meterplussoftware.com).

Parents completed a place log to describe where their child wore the accelerometer, and time-stamped accelerometer data were matched to this log (Kneeshaw-Price et al., 2013). For this study, the “Home” category included one single location for each participant, including ‘front yard’ and ‘backyard.’ “Home” excluded homes of other parent/guardians, relatives, friends, or neighbors.

Child anthropometrics

Children had their height and weight measured by a trained research assistant. Using a digital scale, weight was measured until three of four consecutive weight readings were within 0.1 kg, with the average of these readings used. Using a stadiometer, height was measured multiple times until three of four consecutive measures were within 0.5 cm, and the average was used. Child overweight was defined as BMI ≥85th percentile and child obesity as BMI ≥95th percentile for age and gender using CDC 2000 growth charts (McMinn et al., 2011).

Analysis

All analyses were conducted using STATA software version 12. The relationship between children's home physical activity and sedentary environments and their total and home-based physical activity, sedentary behavior and screen time were examined using bivariate analyses and linear regression. Separate

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