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Children's Objective Physical Activity by Location: Why the Neighborhood Matters

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Abstract

Knowledge of where children are active may lead to more informed policies about how and where to intervene and improve physical activity. This study examined where children aged 6–11 were physically active using time-stamped accelerometer data and parent-reported place logs and assessed the association of physical-activity location variation with demographic factors. Children spent most time and did most physical activity at home and school. Although neighborhood time was limited, this time was more proportionally active than time in other locations (e.g., active 42.1% of time in neighborhood vs. 18.1% of time at home). Children with any neighborhood-based physical activity had higher average total physical activity. Policies and environments that encourage children to spend time outdoors in their neighborhoods could result in higher overall physical activity.

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Background

Regular physical activity for children has far-reaching health benefits, including reducing risk for chronic disease and obesity (19). Physical activity in informal settings, like outdoor neighborhood play, has additional benefits for physical and mental creativity (28) and provides more physical activity than many structured activities (e.g., some organized sports; 16). Knowledge of where children are active (e.g., neighborhood, home, school) and facilitators and barriers to physical activity in various settings can lead to evidence-based policy and interventions (5).

Past studies examining where children are active typically have relied on retrospective parent report of both physical activity and its location, and results are inconsistent. Grow et al. found that the most common physical activity locations (per parent-report) were swimming pools, small public parks, playgrounds, play fields/courts, and large public parks (11). In another study, parents reported the most frequented locations for their children's physical activity were their own yard or apartment complex, a park or playground, school grounds during after-school hours, and a friend or relative's home (3). Similarly, 74% of Australian parents of school-aged children reported their own yard or home was the primary place for their child's physical activity (29).

Demographic correlates of youth physical activity seem to differ by type of activity and setting. Wall et al. found that physical activity declined with age in both organized and free time settings; girls' physical activity declined sooner (ages 10–11 for free time) than boys' (ages 14–15 for free time). They also found that physical activity in organized sports settings is significantly lower for nonwhite youth and youth with less educated parents (30). In a study of Australian children, parents in high socioeconomic status (SES) regions reported their child played in their backyards and neighborhoods less and in private recreation facilities more, compared with lower SES families. Children living in middle SES areas spent more time playing in parks, and children living in low SES regions spent more time playing in public recreation facilities relative to their respective counterparts (32).

The extant research is limited because of its reliance on retrospective self- or parent-reports of physical activity and its location. This could be associated with problematic recall, social desirability bias, and challenges with aggregation and location categorization (e.g., "how many times did your child frequent a public open space that is not a park in the past week?"). In addition, some studies (3,11) have focused primarily on locations that are conducive to physical activity without exploring other locations in which physical activity may not be the only purpose (e.g. school [15,16,29]). Having a more objective measure of physical activity and concurrent report of all locations could improve the quality of evidence about where children are active and inform future investment decisions within communities. To our knowledge, no previous studies have simultaneously used an objective physical activity measure to explore all locations that a child may frequent and the extent to which they are active in these locations.

The current study aimed to determine where children ages 6–11 are physically active using accelerometer and parent-reported place log data and to examine variations by child demographic factors. The second aim was to determine if physical activity levels differ between children who are active in their neighborhood (neighborhood active) vs. children who are not (nonneighborhood active).

Methods

Study Design

This study used baseline data from an observational cohort study, Neighborhood Impact on Kids (NIK), which examined neighborhood, family, and individual factors related to body mass, physical activity, and nutrition behaviors (22). Participants were children ages 6–11 in King County, Seattle, WA, and San Diego County, CA. Neighborhoods were selected based on their neighborhood physical activity and nutrition environments, and children were recruited from these neighborhoods (described below).

This study was approved by the Institutional Review Boards at Seattle Children's Hospital and San Diego State University.

Neighborhood Selection

Briefly, before participant recruitment, neighborhoods (defined as census block groups) were evaluated based on several built (e.g., walkability, proximity of higher quality parks) and nutrition (e.g., presence of a grocery store, number of fast food outlets) environment characteristics. Geographic information systems (GIS) profiles were developed using existing (e.g., parcel data on land use to create a land use mix measure) and study-created (e.g., park amenities and quality) variables. Neighborhoods were identified that met criteria for one of four neighborhood types whose environments were either deemed supportive or unsupportive of physical activity and/or nutrition: high physical activity environment (PAE)/high nutrition environment (NE); high PAE/low NE; low PAE/high NE; and low PAE/low NE. Details of neighborhood selection and participant recruitment methods are described elsewhere (8,22).

Participants and Recruitment

Between September 2007 and January 2009, households in the selected neighborhoods were identified through commercial marketing lists and were randomly selected within each quadrant for recruitment. To be eligible, children had to be between the ages of 6 and 11 years, have a parent or legal guardian willing to participate, and live with this parent in the selected neighborhood at least 5 days per week. Children had to be able to engage in moderate-to-vigorous physical activity and meet additional inclusion and exclusion criteria related to normal growth (22).

Recruitment was conducted by mail and telephone. Contact was attempted for 8,616 households. Among these, 7,094 had working residential phone numbers and 4,975 were screened for interest and eligibility. Among screened families, 944 were interested and eligible and agreed to participate. Among families agreeing to participate, 730 families consented and baseline data were collected. Of those, 701 had accelerometer data. Only participants who had both accelerometer and corresponding place log data (see below) were included in the present analyses, resulting in a sample of 682 children.

Measures

Physical Activity—Children's physical activity was measured by the MTI GT1M Actigraph accelerometer. The Actigraph has been validated and calibrated for use among children (9). Parents and children were instructed how the child was to wear the accelerometer, including wearing it for 7 complete days and only removing the accelerometer for swimming and sleeping. Upon return, the accelerometer was downloaded and screened for enough wearing time and malfunction. Children were asked to re-wear the accelerometer if it was not worn for at least 10 valid hours on at least 6 days, including one weekend day. A valid hour was defined as one that had no more than 20 min of consecutive zero counts. Of the 701 children with accelerometer data, 116 required re-wear (16.5% of the sample).

Accelerometers were initialized to sample and store activity counts beginning at 00:00:01 (i.e., 12:00:01AM) on the first day of expected wearing. Physical activity count data were captured in 30-s epochs. Nonwear time was defined as >40 epochs (i.e., 20 min) of consecutive zero counts. For wear time, counts were converted into activity intensity by using age-specific cut points (9), with moderate-to-vigorous intensity activity defined as 3+ METs, which is recommended by the Physical Activity Guidelines Working Group (19).

Total time at each location (described below) was created by a manual process and defined as the sum of accelerometer wear time at that location aggregated to minutes. Moderate-to-vigorous physical activity (MVPA) time in minutes was also aggregated for each location.

Average daily MVPA was calculated by summing only MVPA on days that had at least 8 hr of wear time and dividing by the total number of days that met that criterion. For this measure only, participants with at least 3 valid days of 10+ hours were included ($n = 667$). Children were classified as a neighborhood-active child if they accrued *any* MVPA in the ‘neighborhood’ location.

Location Categorization—Parents were instructed to complete a daily log of where their child went throughout each day their child wore the accelerometer. For each location, parents were asked to list the name and address. Parents provided the time their child arrived at each location and the time the child awoke and went to bed each day. Because this method requested reporting only arrival times, travel time between places was attributed to the place from which children left.

Place categories were created, informed by past studies (12,18) and food enumeration categories previously identified using Nutrition Environment Measurement Surveys (NEMS; 10,21). Categories were reviewed by the study team and revised, resulting in 17 place categories. For this analysis, 7 categories were aggregated into 2, resulting in 12 final categories: Home; School; Neighborhood; Others' Homes; Other Schools; Public, Outdoor Parks & Recreation Facilities; Public, Indoor Recreation Facilities; Private Recreation

Facilities; Service Locations; Nondescript Geographic Locations; Shopping; and Food Eateries. Descriptions of the 17 original and 12 final categories are in the Supplement.

Place log reports of locations children visited while wearing the accelerometer were categorized using a systematic method. First, the two categories ‘home’ (including participants' front/back yards) and ‘school’ were each identified with only one parent-reported address. Second, parents were given explicit instructions to record ‘in the neighborhood’ for periods of time that their child was active in the area around their home or neighborhood but not at a specific place (no address needed), and they were provided with examples such as ‘walking around the block’. Place log entries that met the criteria for these 3 categories were coded without need for additional verification approaches.

Three primary approaches were employed for categorizing locations in the remaining 9 categories. First, several location names were easily categorized using the descriptions in the Supplement(e.g., doctor's appointment categorized as service location and Boys & Girls Club as indoor public recreation facility). Locations that included day trips and large geographical locations without descriptive place information were categorized as nondescript geographic location (e.g., Downtown Seattle). Second, for food locations that were in the NEMS categories, locations were categorized to match. Third, for locations that were ambiguous or not immediately identifiable, Google and Google Maps were used to identify location categories by entering the parent-reported location name and address. For example, if a parent listed the location “Michael's,” it is not immediately clear if this is a location of someone's home or an arts and crafts shopping location. To clarify this, the exact address was entered into Google Maps to determine if a residence was located there or a commercial store. Using these methods, all locations for each participant were categorized. The first author categorized all places.

Linking Accelerometer Data with Location—To link children's accelerometer data to parent-reported place logs, MeterPlus v.4.2 (a software program often used in accelerometer research) was employed to “cut” the accelerometer data to match the parent-reported day and arrival time at each place. Nonoverlapping times were programmed into MeterPlus for each location listed in the place log. For example, if on a given day a parent reported that her or his child woke up at home at 7:00 a.m., arrived at school at 9:00 a.m., came home at 3:15 p.m., and went to bed at home at 8:45 p.m., then three separate time filters were created from 7:00 a.m. to 8:59 a.m., 9:00 a.m. to 3:14 p.m., and 3:15 p.m. to 8:45 p.m. and linked to the place categories of home, school, and home, respectively. From this, nonwear, sedentary, light, moderate, and vigorous accelerometer wear times were aggregated within the given timeframe of each place and then aggregated to each place category.

Individual-Level Covariates—Demographic variables assessed by parent-reported survey included child's age, sex, race/ethnicity (categorized into non-Hispanic white, Hispanic, and non-Hispanic nonwhite), highest education in the household (seven categories with less than seventh grade to completed graduate school), and household income (categorized into <$50k, $50–100k, and >$100k).

Prior Parent Crime Victimization—A dichotomized variable was created from two survey questions asking if parents had ever been a victim of crime in their neighborhood and if they knew someone who had been a victim of crime in their neighborhood with responses on a four-point Likert scale ranging from *strongly disagree* to *strongly agree*. Prior victimization was present if parents responded with *somewhat agree* or *strongly agree* to either or both questions. This variable was created based on previous work by Foster et al. (6).

Collective Efficacy—Created by Sampson et al., a summary collective efficacy score was used, based on 11 items (24). Items were reverse coded where necessary, and the summary score was the average of parent survey questions including “people in my neighborhood can be trusted” and how likely would neighbors respond if “they witness a crime in progress.”

Self-Selection of Neighborhood—Three items from the parent survey to represent the importance of choosing to live in a walkable neighborhood were averaged to create a self-selection score: closeness to shops and services, ease of walking, and closeness to recreation facilities (23).

Parents' Perceptions of Neighborhood—Averaged summary variables from the Neighborhood Environment Walkability Scale for Youth (NEWS-Y), previously found to be reliable, were used to assess parent perceptions of the neighborhood built and social environment (20). The perceptions included: neighborhood aesthetics, traffic safety, land use mix access, street connectivity, and bike and pedestrian infrastructure. In addition, recreation facility availability and land use mix diversity were assessed by totaling the number of recreation facilities and destinations (respectively) within a 10-min walk of the family's home. These parent perception variables have been used previously (11,20).

Parents' perceptions of neighborhood crime were measured with nine questions. A factor analysis was performed with an oblique rotation (assuming any factors that loaded were correlated with one another), resulting in two factors with eigenvalues greater than 1.0. These factors were titled *stranger danger* and *general crime and disorder*. Complete results have been reported elsewhere, but *stranger danger* was found to have good internal consistency (alpha = .84) and *general crime and disorder* had acceptable internal consistency (alpha = .77; Kneeshaw-Price et al., unpublished data, 2012). Ratings were averaged to create summary variables for each factor, with higher scores indicating a higher concern of that crime factor in the neighborhood.

Neighborhood-Level Covariates

Neighborhood Physical Activity Environment—Neighborhoods were dichotomized into high or low physical activity environment based on the neighborhood quadrants in the study design (combining nutrition environment levels).

Neighborhood Socioeconomic Status—Median household Income at the census block group (measured as a continuous variable) was used to estimate neighborhood SES from the 2000 US Census.

Data Analyses—All analyses were conducted using STATA 11 *SE*. Percentage of time engaged in MVPA at each location was calculated by dividing MVPA minutes at each location by total minutes at each location. Average daily MVPA at each location was assessed by dividing MVPA minutes at each location by number of days the accelerometer was worn.

Physical activity by location was also examined with stratification by age-sex (age divided into 6–8 years vs. 9–11 years), race/ethnicity, and parent-reported household income. Separate analyses of variance (ANOVA) were executed with post hoc testing to examine any differences among the four age-sex groups, three race/ethnicity categories, and three household income categories. With 12 tests (one for each location) for these comparisons, Bonferroni corrections were employed to account for the multiple comparisons with alpha = .05 divided by the number of tests (i.e., 12) to yield a significance criterion of p <.004 for these differences. Analyses for race/ethnicity and household income were not statistically significant, with p > .004 for all physical activity by location statistics, and were not reported.

To assess if any neighborhood MVPA was associated with average daily MVPA, a multilevel linear random effects model with two levels (i.e., child, and census block group as the clustering variable) was performed. This analysis was performed twice, once with all average daily MVPA as the outcome, and the other as average daily MVPA with neighborhood MVPA subtracted out to see if neighborhood-active children significantly differed from nonneighborhood-active children even if their neighborhood MVPA was removed. Demographic, neighborhood, and parent perception variables served as covariates in these models. There were 568 unique census block groups in the current sample, with an average of 1.2 and range of one to five children living within each block group. County (i.e., King and San Diego) was originally included in these models but did not significantly differ. Therefore County was excluded as a covariate in these analyses; analyses provided herein are with all participants. Significance levels within these multivariate models were set at alpha < .05.

Results

Table 1 presents demographics and average daily moderate-to-vigorous physical activity (MVPA) of the study sample. Majority (~97%) of the children met physical activity recommendations of at least 60 min each day.

To assess interrater reliability of location categorization a study team member independently categorized n = 649 places from 150 days from randomly selected participants. There was 97.2% interrater agreement and kappa = 0.96 (p < .0001) with the original location categorization. In a sensitivity analysis, places that were identified as *home* were excluded because this location was seen most frequently and easiest to code, resulting in 299 nonhome places. This subset had 94.7% inter-rater agreement and kappa = 0.94 (p < .0001).

Time spent at each location and MVPA by location are provided in Table 2. Children spent the majority of their time in their own home, with almost half (47.5%) of their total wearing time there. Overall, 19.4% (SD=7.0) of children's total accelerometer wearing time was spent in MVPA. Eighteen percent of home time was spent in MVPA. Children spent about 18% of school time in MVPA. Interestingly, although children averaged $<1\%$ of their time in their neighborhood, over 42% of neighborhood time was spent in MVPA.

Of all the MVPA children accrued, 43.9% (SD=17.5) or about 63 min was accrued at home, followed by 27.6% (SD=17.8) or almost 38 min at school, and 7.2% (SD=8.8) or roughly 10 min at others' homes. For locations conducive to MVPA such as public, outdoor parks and recreation facilities and the neighborhood, 4.8% (SD=7.3) and 1.4% (SD=4.2) of children's total MVPA, respectively, were in these locations.

About 24% (n = 162) of the total sample accrued any MVPA in their neighborhood (i.e., neighborhood-active children). Average daily neighborhood MVPA for all children was approximately 2 min, and neighborhood-active children had 8.8 (SD=10.8) minutes of neighborhood MVPA. In addition, approximately 54% of the children reported any time at public, outdoor parks & recreation facilities, 38% in private recreation facilities, and 17% in public, indoor recreation facilities.

Table 3 presents descriptive statistics of physical activity by location stratified by age-sex. There were no statistically significant differences between any of the age-sex groups for how children divided their total time at the various locations. There was a general trend in most locations that younger boys relative to their older and female counterparts spent a higher proportion of their time in MVPA, followed by younger girls and then older boys, with older girls typically having the lowest percentages of active time.

Conducting a multilevel regression with average daily MVPA as the outcome and neighborhood-active status as the exposure of interest, neighborhood-active children had on average 11.2 min more of daily MVPA relative to nonneighborhood-active children (p = .001), after accounting for all other covariates. When neighborhood MVPA was removed from total MVPA and the analysis performed again, there was no longer a statistically significant difference between neighborhood-active and nonneighborhood-active children's average daily MVPA (p = .51). To further examine why this difference was present, exploratory *t* tests were conducted to determine if there were differences in MVPA by neighborhood-active status at other specific locations that may contribute to neighborhood-active children's higher average daily MVPA. Specific locations selected were school; public, outdoor parks and recreation facilities; indoor public recreation facilities; and private recreation facilities. No significant differences were found between neighborhood-active and nonneighborhood-active children's average daily MVPA at any of the three primarily recreation facility locations. However, there was a significant difference between their average daily school MVPA, with neighborhood-active children accruing *less* daily MVPA at school, with an average of 33.8 min of MVPA each day relative to 39.1 min for nonneighborhood-active children (p = .03).

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Conclusions

Present findings indicate that these 6- to 11-year-old children accrue most of their moderate-to-vigorous physical activity (MVPA) at home and school, where they spend most of their time. Veitch et al. suggested that parental rules and concerns with unsupervised physical activity in nonhome locations may account for this. They found that parents of 6- to 8-year-olds viewed their children as less independent than parents of 9- to 10-year-olds, with the latter parent group more likely to allow their children to walk to a friend's house or play in a park unsupervised (29). Consistent with these findings, we found that children ages 9–11 spent more time at other schools and in their neighborhoods and had higher absolute MVPA in these locations relative to 6- to 8-year-old children suggesting increased independence with age.

Despite the fact that children accrued most of their daily MVPA at home and school, the percentage of time at home and school being active relative to other locations was low, about 18% in each location, similar to previous findings (15,16). In contrast, the highest percentage of time spent being active in any location was the neighborhood, higher than locations primarily oriented toward physical activity such as private and public recreation facilities (∼30–32% of time being active). Neighborhood time was most similarly active to time spent in public outdoor parks and recreation locations (∼40% of time being active). However, children spent little to no time in the neighborhood surrounding their homes. Walkable, smart growth developments are designed to provide more socially cohesive neighborhoods and physical activity opportunities in neighborhoods (7). This may be particularly important for children, as such communities may also ease parental concerns about safety, with other children out in the neighborhood and other adults available to supervise (29). Neighborhood and public outdoor park and recreation were the only location categories in the current study that were exclusively outdoor locations. Higher rates of children being active outdoors versus indoors have been documented elsewhere (2,4).

Being neighborhood active was associated with higher average daily MVPA, consistent with others' findings of associations between vigorous physical activity and parent report of children's higher use of the neighborhood being active (3). Mackett et al. found that children ages 10–13 expended more calories per minute (as measured by accelerometer) in informal play settings, such as neighborhoods, than at home, school, or organized club sports (16). The additive effect of neighborhood MVPA on overall MVPA suggests that neighborhood MVPA is not substituting for MVPA in other places.

These findings raise questions about why neighborhoods are underutilized by children for MVPA despite being easily accessible and affordable. Adult supervision may be a critical factor, particularly if parents have limited time to supervise outdoor play because of work or other commitments, leading children to spend less time in unstructured locations like the neighborhood (1,28,29). Opportunities for physical activity in structured formats outside of the neighborhood may be increasing for children, in turn decreasing the amount of time available for unstructured activity in the neighborhood (25,28). These opportunities may not be as active however. In the current study, the percentage of MVPA time spent at private and public indoor recreation facilities was lower than for time within neighborhoods. Leek et al. found that in children's organized sports practices lasting approximately 100 min on average, less than half of the total time during practice was spent in accelerometer-measured MVPA and about 30 min was completely inactive (14). Spending more time in the neighborhood may lead to more MVPA relative to time spent in other locations perceived as active (16). Other leisure-time, particularly sedentary activities such as screen time, may attract children to stay at home rather than at these other more active locations (1,3). With the highest percentage of time spent in the home though, interventions that increase the appeal of play just outside the home but in the neighborhood have potential to shift many children outside and provide opportunities to increase children's physical activity and unstructured play.

Study strengths included an objective physical activity measure and examining the relationship between place-based physical activity and several individual factors. We used a novel approach to examine where children were active by integrating accelerometer data with daily parent logging of child whereabouts, rather than relying on retrospective recall. These findings added place categories beyond those previously studied (3,11,15,16) and included locations that were not inherently physical activity-based (e.g., food eateries, service locations).

Limitations of this study included the cross-sectional design, which means causality cannot be inferred. Second, our sample was relatively affluent and well-educated and sampled only West Coast metropolitan areas in the United States.

The parent-reported place logs are subject to limitations of accuracy and completeness. An example of this limitation is often when recording arrival times, parents entered times that may in fact be rounded (e.g., 10:30 a.m. vs. 10:32 a.m.), and therefore small amounts of time may be misattributed to other locations. Reporting may also be inaccurate because children in the age group of this study sample are not with their parents all day. Moreover, place logs only asked for arrival time at each location, and therefore any travel time from place to place would be included in the place that preceded the next location. For example, if a child walked from their home to school in the morning, the walking would have been captured in the *home* category. Mackett and Paskins found that children who engaged in active travel were more active at the location they traveled to versus children who arrived by car (16). Motorized travel time also would have been captured in location categories and ascribed to sedentary time. Incorporating active travel as an additional category of physical activity by location measures would likely benefit future studies. Investigators are beginning to use global positioning systems (GPS) in tandem with accelerometers to better understand where people are active and objectively document travel modes (13).

In the current study, nearly all of the children met or exceeded MVPA guidelines, which is in significant contrast to much lower levels noted in previous studies (e.g., 26). A large reason for this is the current moderate activity criteria of 3+ METs. One MET is equivalent to the amount of energy expended at rest, and higher METs are indicative of increased energy expenditure. For youth, trends of using 4+ METs as the cutoff for moderate activity is growing (3,26,27). Still, there remains no set consensus and 3+ METs criteria for youth remains a valid approach (14,17,31), and it is recommended by the Physical Activity

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Guidelines Working Group (19). In addition, our average daily MVPA estimates are similar to those obtained by Nader et al. (17). Furthermore, even using 4+METs criteria, children aged 6–11 years are an active age group and have on average daily MVPA levels that surpass 60 min recommendations, with Troiano et al. reporting 95.4 min for boys and 75.2 min for girls in this age group (26). Finally, the Freedson age-based cut points used in the current study have been found to have excellent accuracy in classifying sedentary, light, and MVPA (27).The primary finding of this study was that the proportion of time children are physically active was highest outdoors in the neighborhood or in public parks (about 40%), though they spent very little time there (1–3%). By contrast, children spent almost 75% of their time at home or school, but less than 20% of this time was spent active. Thus, a reasonable recommendation based on current results is to encourage and support parents to find ways to increase the amount of time their children spend outdoors in the neighborhood or public parks. Additional qualitative and community-based participatory research may provide insight into factors deemed most relevant by parents that could be targeted for change in interventions to increase their children's physical activity outdoors in the neighborhood and public parks.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1
Demographic Characteristics of Study Sample

Child Age, Mean (*SD*)	**9.1 (1.6)**
Child sex, n, (%)	
male	342 (50.2)
female	340 (49.9)
Child race/ethnicity, *n* (%)	
non-Hispanic white	462 (67.7)
Hispanic	116 (17.0)
non-Hispanic nonwhite	104 (15.3)
Highest education level in household[a], *n* (%)	
completed high school or less	35 (5.2)
some college	112 (16.7)
completed college	273 (40.7)
completed graduate school	251 (37.4)
Household income[b] (%)	
<$50k	92 (13.9)
$50–100k	245 (37.1)
>$100k	324 (49.0)
Neighborhood physical-activity environment (PAE), *n* (%)	
low PAE	329 (48.2)
high PAE	353 (51.8)
County, *n* (%)	
San Diego County	327 (48.0)
King County-Seattle	355 (52.1)
Child average daily MVPA, minutes, mean (*SD*)	144.0 (52.0)

Note. SD = standard deviation, PAE = physical-activity environment, MVPA = moderate-to-vigorous physical activity.

[a] *n* = 671 participants whose parents reported household education

[b] *n* = 661 participants whose parents reported household income

Table 2

Descriptive Statistics for 6- to 11-Year-Old Children's Physical Activity by Location

Location	**Average % of total time at each location (*SD*)**	**Average % of total time spent at each location engaged in MVPA (*SD*)**	**Average daily MVPA at each location, minutes (*SD*)**
Home	47.5% (15.4)	18.2% (8.3)	62.6 (36.7)
School	29.0% (17.1)	18.1% (8.2)	37.6 (27.4)
Others' homes	6.5% (7.8)	22.0% (13.2)	10.1 (13.8)
Service locations	5.8% (7.3)	16.6% (11.6)	8.0 (14.9)
Public, outdoor parks, and rec.	2.6% (4.1)	39.7% (20.1)	6.9 (10.9)
Shopping	2.4% (3.0)	19.1% (10.7)	3.2 (4.7)
Other schools	1.6% (4.0)	29.8% (19.5)	3.3 (8.1)
Food eateries	1.4% (1.9)	13.2% (11.2)	1.3 (2.3)
Private rec. facilities	1.4% (2.8)	30.1% (16.0)	3.1 (6.4)
Public, indoor rec. facilities	0.8% (3.2)	31.9% (17.4)	1.8 (8.0)
Neighborhood	0.8% (2.7)	42.1% (23.7)	2.1 (6.5)
Nondescript geographical locations	0.2% (1.7)	31.3% (23.4)	0.4 (3.7)
Total	100.0%		140.4 min[a]

[a]Total moderate-to-vigorous physical activity does not match that of Table 1, because valid day criteria differed between place-based MVPA estimates and total MVPA estimates (see Methods section).

Table 3

Descriptive Statistics for Children's Physical Activity by Location, Stratified by Sex and Age

		Average % of total time at each location (SD)		Average % of total time spent at each location engaged in MVPA (SD)		Average daily MVPA at each location, minutes (SD)	
Location	**Age**	**Boys**	**Girls**	**Boys**	**Girls**	**Boys**	**Girls**
Home	6–8 years	48.1% (16.3)	48.7% (14.7)	23.8% (7.4)[c,d]	21.8% (7.2)[c,d]	83.4 (40.4)[c,d]	76.2 (33.8)[c,d]
	9–11 years	46.4% (15.7)	46.7% (14.9)	14.9% (7.1)[a,b]	12.4%(5.4)[a,b]	50.3 (31.2)[a,b]	41.0 (21.3)[a,b]
School	6–8 years	28.0% (17.6)	28.6% (16.7)	23.4% (8.5)[c,d]	20.4% (7.9)[c,d]	46.9 (33.5)[c,d]	41.4 (28.6)[d]
	9–11 years	29.6% (17.2)	29.9% (17.1)	15.9% (5.4)[a,b]	13.4%(6.9)[a,b]	34.4 (23.5)[a]	28.0 (18.4)[a,b]
Others' homes	6–8 years	6.1% (8.0)	6.4% (8.6)	27.3% (14.1)[c]	25.0% (13.0)[c,d]	12.6(18.7)	11.1 (13.8)
	9–11 years	6.5% (7.1)	6.9% (7.5)	20.7%(13.3)[a]	15.8% (9.3)[a,b]	9.2 (11.2)	7.7 (9.3)
Service locations	6–8 years	6.4% (8.9)	5.9% (7.0)	22.1% (12.4)[c,d]	19.4%(12.0)[c,d]	12.0(22.0)[c,d]	9.0 (15.4)
	9–11 years	5.4% (6.6)	5.4% (6.3)	13.7%(9.5)[a,b]	11.3% (8.9)[a,b]	6.2 (10.1)[a]	4.9 (7.2)[a]
Public, outdoor parks, and rec.	6–8 years	2.8% (3.9)	2.2% (4.6)	46.0%(19.9)[d]	43.5% (21.4)[d]	8.5 (11.9)[d]	5.8 (10.7)
	9–11 years	3.4% (4.2)	2.0% (3.3)	38.0% (18.1)	31.0% (18.2)[a,b]	8.9(12.1)[d]	4.2 (7.5)[a,c]
Shopping	6–8 years	2.3% (3.0)	2.8% (3.3)	23.8% (11.3)[c,d]	22.3% (10.7)[c,d]	3.8 (5.7)[c]	4.4 (5.9)[c,d]
	9–11 years	2.0% (2.8)	2.5% (2.7)	15.9% (8.8)[a,b]	14.3%(8.5)[a,b]	2.1 (2.8)[a,b]	2.4 (3.0)[b]
Other schools	6–8 years	1.2% (3.9)	1.0% (3.8)	38.8% (19.8)	28.6% (18.2)	3.4 (8.4)	2.0(7.1)
	9–11 years	2.3% (4.7)	1.7% (3.3)	30.3% (19.0)	23.5%(18.4)[a]	4.7 (9.3)	3.1 (7.4)
Food eateries	6–8 years	1.5% (1.9)	1.3% (2.0)	15.1% (10.7)	16.2% (13.3)[d]	1.8 (3.0)	1.3 (2.2)
	9–11 years	1.1% (1.5)	1.5% (1.9)	11.7% (12.0)	9.8% (7.0)[b]	0.9 (2.0)	1.1(1.9)
Private rec. facilities	6–8 years	1.2% (2.5)	1.4% (2.8)	34.2% (14.3)	34.7% (15.1)[c]	3.2 (6.5)	3.4 (6.0)
	9–11 years	1.3% (2.5)	1.7% (3.4)	24.9%(16.2)[b]	26.4% (15.9)	2.4 (4.8)	3.3 (7.9)
Public, indoor rec. Facilities	6–8 years	1.2% (4.4)	0.8% (3.6)	35.3% (17.2)	33.2% (19.5)	3.0 (11.9)	1.8 (7.0)

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Location	Age	Average % of total time at each location (SD)		Average % of total time spent at each location engaged in MVPA (SD)		Average daily MVPA at each location, minutes (SD)	
		Boys	Girls	Boys	Girls	Boys	Girls
	9–11 years	0.7% (2.5)	0.4% (1.7)	31.0% (16.5)	24.5% (14.0)	1.7 (6.3)	0.9 (5.4)
Neighborhood	6–8 years	0.6% (1.7)	0.6% (1.6)	49.8% (20.8)	45.7% (23.8)	2.0 (5.3)	1.7 (5.3)
	9–11 years	1.1% (3.7)	1.1% (3.0)	40.6% (22.7)	35.5% (25.0)	2.6(9.1)	2.1 (5.2)
Nondescript geographical locations	6–8 years	0.4% (2.7)	0.1% (1.2)	43.6% (22.0)	34.3% (27.0)	0.9 (6.3)	0.3 (2.6)
	9–11 years	0.2% (1.2)	0.2% (1.4)	28.3% (15.5)	11.0% (18.7)	0.4 (2.6)	0.1 (1.2)
Total	6–8 years	99.8%[e]	99.8%[e]			181.5 min	158.4 min
	9–11 years	100.0%	100.0%			123.8 min	98.8 min

[a]Significantly different from boys 6–8 years old.

[b]Significantly different from girls 6–8 years old.

[c]Significantly different from boys 9–11 years old.

[d]Significantly different from girls 9–11 years old, with $p < .004$ Bonferroni correction for multiple tests.

[e]Total not equal to 100% because of rounding.