



Utilization and physical activity levels at renovated and unrenovated school playgrounds

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ABSTRACT

Objective. This study examined utilization and physical activity levels at renovated compared to unrenovated school playgrounds.

Methods. Ten unrenovated and ten renovated school playgrounds (renovated at least a year prior) in Cleveland, OH were matched on school and neighborhood characteristics. Using direct observation (SOPLAY), the number of persons attending each playground and their physical activity levels were recorded using separate counts for girls, boys, men and women. Each school was observed ten times for 90 min each time outside of school hours in 2005. Paired *t*-tests, Wilcoxon Signed Ranks tests, and regression analyses were completed to examine differences across school pairs.

Results. More persons overall including adults and children utilized the renovated playgrounds compared to the unrenovated playgrounds. The proportion moderately-to-vigorously active was not different between renovated and unrenovated playgrounds although the proportion of children, in particular boys, who were vigorously active was greater at the renovated playgrounds. Although utilization was higher at the renovated playgrounds, absolute utilization was low across all playgrounds.

Conclusions. This study suggests that playgrounds renovations may have the potential to increase the number of children utilizing the playground outside of school hours and may increase the proportion of children, especially boys, who are vigorously active.

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Introduction

A large number of children are not active at recommended levels, especially girls and minorities (CDC, 2003; CDC, 2004). Consequently, novel approaches are needed to increase physical activity in children. Accumulating research evidence indicates the built environment may inhibit or facilitate physical activity in adults and youth (Transportation Research Board, 2005; Davison and Lawson, 2006; Duncan et al., 2005; Humpel et al., 2004; Saelens et al., 2003; Sallis et al., 1998). Studies of built environment changes may provide reasonable evidence for a causal relationship between the built environment and physical activity (Transportation Research Board, 2005; Sallis and Glanz, 2006). However, only a few studies of built environment changes have been conducted and the results of such studies are mixed (Boarnet et al., 2005; Evenson et al., 2005; Merom et al., 2003).

To increase physical activity levels in children, several researchers have suggested increasing access to quality play spaces at school (Sallis et al., 2001; Stone et al., 1998; Wechsler et al., 2000). This study sought to determine whether renovated school grounds (including playgrounds) in an urban area could result in greater utilization rates

and higher levels of physical activity relative to matched unrenovated playgrounds that did not undergo renovations.

Methods

Using individually matched school pairs, this study examined ten schools that had been renovated for at least 1 year compared to ten matched unrenovated schools. The renovation project titled “School Grounds as Community Parks” provided for new playground equipment, an outdoor learning garden, and safety and site improvements (average cost for renovation was \$200,000 per site in US dollars). Hereafter these modifications are referred to as playground renovations. The focus of this study was on non-school hours because the research aim was to determine whether the built environment modifications would affect individuals’ leisure physical activity. Schools without a playground in very low income areas were selected in rank order for the renovations. Other additional sites were selected when total project costs were covered by ward allocations from members of City Council.

At the time of the study, 19 schools had been renovated. The ten renovated schools selected for this study were those for which an appropriate matched school was available. The unrenovated schools were chosen from the remaining elementary schools in the district

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that did not have renovated playgrounds as a result of this project but had functional playgrounds. All 20 playgrounds were located at neighborhood elementary schools, meaning the students who attended the schools lived in the surrounding area.

Renovated and unrenovated schools were individually matched on 5 school factors (See Table 1). In addition, the sizes of the school property and neighborhood characteristics were similar between renovated and unrenovated schools (See Table 1). Matched schools were observed at the same time to control for other influential factors including weather and unknown major events which could affect utilization of the school grounds. Observations were not completed when it was raining.

The study took place in Cleveland, OH. At the time of the project, the city's 414,500 residents were 53.8% African American, 38.7% White and 1.5% Asian and 4.5% other races. Hispanics of any race constituted 7.7% of the population. In the areas around the playgrounds (i.e., census tract where school was located), 39% of the children under seventeen lived in poverty. The participants in the study were children and adults who utilized the study playgrounds during the observation periods. This study was reviewed and deemed exempt by the first author's Institutional Review Board.

Direct observation via the System for Observing Play and Leisure Activity in Youth (SOPLAY) was used to determine the number of persons on the school grounds and their physical activity levels (McKenzie, 2002). SOPLAY methodology also documented whether there were any supervised or organized activity at the playgrounds. SOPLAY was designed to record physical activity levels in open environments and has been shown to be highly reliable in youth (McKenzie et al., 2000). Over repeated time intervals, target areas were scanned by the observers and activity levels were coded for each individual in the target area. Activity levels were classified as sedentary (e.g., lying down, sitting, standing), walking (hereafter referred to as moderately active), or vigorously active (i.e., more than walking).

Table 1
Characteristics of schools and surrounding neighborhoods

| | Renovated schools | Control schools |
|---|-------------------|-----------------|
| Total school enrollment | 466 | 419 |
| Percentage of school students that are African American | 63% | 69% |
| Percentage of school students that are Hispanic | 12% | 7% |
| Percentage of children 17 and under living in poverty ^a | 37% | 41% |
| Grades in school | | |
| Pre-K/K to 5th grade (# of schools) | 9 | 9 |
| Pre-K/K to 7th grade (# of schools) | 1 | 1 |
| Average size of school grounds (sq ft) | 133,023 | 134,781 |
| Population of children 17 and under per square mile ^a | 2413 | 1900 |
| Total number of free recreation centers and pools ^b | 6 | 6 |
| Total number of commercially available physical activity resources ^c | 1 | 5 |
| Mean number of parks/green spaces per neighborhood ^d | 3.5 | 3.4 |
| Connectivity | | |
| Alpha index ^e | 0.40 | 0.41 |
| Beta index ^f | 1.79 | 1.80 |

Data collected in 2005 from 10 renovated and 10 unrenovated schools in Cleveland, OH.

^a Based on census tract of school.

^b Total number in .75 network mile based on data obtained from the city's Planning Department.

^c Total number in .75 network mile based on information obtained from InfoUSA and Internet Yellow pages.

^d Mean number in .75 network mile based on data obtained from the city's Planning Department.

^e Alpha index (Cohen et al., 2006b) - Number of circuits or loops relative to number of possible circuits or loops using a .75 mile distance.

^f Beta index - Ratio of streets to intersections using a .75 mile distance.

Each school pair was observed ten times; five times in the early evening at 4:30–6:00 pm or 6:30–8:00 pm and five times on the weekend at 10:30–12:00 am, 12:30–2:00 pm, or 2:30–4:00 pm. All observations took place during lighted hours. Each observation period was 90 min. A scan of each target area was completed every 10 min thus resulting in nine unique scans per target area per observation period. The 10 min time segment was chosen to allow sufficient time for the observers to travel to each target area. For the purposes of this study, all target areas (up to 6 areas, mean 3.75) were combined to represent all activity at the school grounds. Separate scans were completed for girls, boys, men and women in each target area. Observations were collected in May–July, 2005.

Eleven observers conducted all observations after completing training sessions. Training included classroom lectures over the course of several days taught by the creator of SOPLAY. Observers were shown how to use each section of the code sheet and how to discriminate between activity levels. Prerecorded videotapes of adolescents being physically active were used for coding practice during the classroom training. In addition, practice field observations were completed for over a week. During the study, reliability assessments were completed at 15% of the observation periods by having a third observer complete an independent observation. Across all outcome categories, reliabilities were high (intraclass correlation coefficients from .71 to .97).

The characteristics of the playgrounds were assessed during the same time period using the Environmental Assessment of Public Recreation Spaces (Saelens et al., 2006). The presence of ten different play features (e.g., at least one feature to slide down, at least one feature to climb up/through) was similar between the renovated and unrenovated playgrounds (mean=5.7 and mean=4.7 respectively; $p=.15$). However, the total number of each of the features allowing for multiple credit (e.g., where 2 slides would count as 2 features) was three times as high at the renovated playgrounds compared to the unrenovated playgrounds (mean=45.2 and mean=15.5, respectively; $p=.001$). The renovated playgrounds also had more safety features than the unrenovated playgrounds ($p=.05$). Safety features included attributes such as appropriate ground surfaces and reasonable bar heights. Other playground characteristics examined including condition and cleanliness were not different between renovated and unrenovated playgrounds.

Two outcomes were calculated for each observation period including: 1) the average number of persons at the playground; and 2) the proportion active. The average number of persons at the playground was derived by averaging the counts of persons at the playground over the 9 scans in each observation period. The proportion active represents the number of persons in the category of interest (e.g., vigorously active) divided by the total number of persons at the playground for the observation period. The proportion active was calculated three ways: those who were vigorously active, moderately active or at least moderately active (either moderately or vigorously active). Each of these outcomes was calculated for all persons (i.e., total) and separately for adults, children, boys and girls. The total number of observation periods was 200, with 100 observation periods at renovated school grounds and 100 observations at unrenovated school grounds. Two observers per school conducted the observations (one collected data on girls/women; the other boys/men). Three observers were utilized during the reliability assessments, which occurred throughout the study period.

Statistical analysis

Two types of analyses were performed to examine whether the number of people utilizing the playgrounds were significantly different between renovated and unrenovated playgrounds. First, paired *t*-tests were completed with three outliers recoded to the 90th percentile and the outcomes transformed by taking the square root of the value because of the skewed distribution. As a supplemental

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