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Promoting Physical Activity in High-Poverty Neighborhood Parks

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Abstract

Although physical activity can help mitigate or prevent multiple chronic diseases, most people in the U.S., especially high-poverty minority groups, engage in insufficient levels of physical activity. To test ways to promote more physical activity in high-poverty area public parks we conducted a randomized controlled intervention trial. After completing baseline measures of park-based physical activity using systematic direct observation three times/day each month for six months and assessing preferences for park programming among 1,445 residents living within 1 mile of study parks, we randomized 48 parks in high poverty neighborhoods in the City of Los Angeles, California during 2013–2014 to four study arms: 1) free physical activity classes over a 6-month period, 2) a frequent user program where participants could win prizes based upon the number of visits they made to the park, 3) both the programs, and 4) neither one (control condition). We re-measured park use in 2014–2015 using the same methods during the six months the intervention programs were in operation.

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A total of 2,047 free park classes were offered attracting 16,718 participants. The frequent user programs enrolled 1452 individuals and prizes were awarded to 830. Residents in the two study arms with free classes were more likely to report being aware of and participating in park-based physical activity programs; however, overall observed park-based physical activity increased similarly across all study arms. The process evaluation uncovered several barriers to program implementation, including inconsistent scheduling of classes, partly due to safety concerns among instructors. Multiple social factors interfere with leisure time physical activity among low-income populations, suggesting modest interventions may be insufficient to overcome these issues. Although new park programs can attract users, new programs alone may be insufficient to increase overall park use in low-income neighborhoods at times when the programs are not taking place.

Keywords

Physical activity; parks; programming; poverty

Introduction

Parks are designed for moderate-to-vigorous physical activity (MVPA) and are the preferred site of leisure time exercise in many communities, particularly among high-poverty disadvantaged groups that cannot afford to join health clubs or may not have access to them (Cohen et al., 2007). Most localities maintain parks, and in urban centers the mean and median distance to a park is 0.7 miles and 0.5 miles, respectively (Wen, Zhang, Harris, Holt, & Croft, 2013). In Los Angeles, 55% of residents live within a half-mile of a neighborhood park (TPL, 2015).

Considering the high rates of chronic diseases and the importance of physical activity in their prevention and mitigation, one might expect neighborhood parks serving high-poverty populations to be especially well used. However, studies have documented lower rates of park use in high-poverty neighborhoods (Cohen DA et al., 2016; Cohen et al., 2012; Cohen et al., 2010). Several factors have been associated with lower rates of park use in high-poverty neighborhoods, including smaller park size and less programming and fewer outreach and marketing efforts (Cohen DA et al., 2016; Cohen et al., 2010). In addition, in high poverty areas there are significant concerns about safety (Foster & Giles-Corti, 2008), and high crime rates are likely a deterrent to park use. Yet concerns about safety are not unique to high-poverty area parks (Leslie, Cerin, & Kremer, 2010) and studies have indicated that safety concerns only partially explain differences in park use (Cohen et al., 2012; Cohen et al., 2010). A national study indicated that parks in high-poverty neighborhoods also offered fewer programs and organized activities than parks in higher-income areas and that these factors largely accounted for their lower use (Cohen et al., 2016b). However, the lack of park use and dearth of programming may contribute to a perception of lack of safety, creating a vicious cycle. Nonetheless, when parks in high-poverty neighborhoods offer events and activities, they can be just as busy as parks in higher-income areas (Han et al., 2014).

Given that limited park use in high-poverty areas is in large part attributable to the lack of organized and reliable portfolio of activities that meet the needs of local residents, we hypothesized that it would be possible to increase park-based physical activity and park use by offering more activities and programs. Moreover, we hypothesized that increasing programming could potentially activate the parks, promoting a generalization effect so that parks would be used more even when that programming was not taking place.

Programming can be introduced in several ways: scheduling classes for people to participate in activities at specific times or places or promoting more flexibility, so that individuals could participate at a time that is convenient to them. We anticipated that organized classes might be attractive to some, for example, with Zumba classes especially appealing to women who are less likely to engage in sports like basketball or soccer. Another approach, taken by many companies who want repeat visits from customers, is to provide incentives for people to continue to patronize the business. Thus, airlines offer frequent flyer miles, and coffee shops, car washes and restaurants sometimes offer discounts or products after a certain number of visits. We expected a system in which park users could earn points for visits and then trade them in (or redeem) for prizes might motivate local residents to visit their neighborhood park more frequently.

We conducted a randomized controlled trial (RCT) to test and compare whether additional park programming, a flexible incentive system based on frequent user model, or a combination of the two efforts would influence the pre-specified primary outcome, which was the amount of energy expended through physical activity in parks in high-poverty neighborhoods over a 6 month period. The secondary outcome was a change in the number of parks users. Because we also surveyed park users and local residents around each park, this study could be considered a cluster randomized trial, although the unit of analysis for the primary outcome was at the level of the park.

Materials and Methods

The RCT is registered in https://clinicaltrials.gov/ # NCT01925404 (enrollment flow diagram shown in Figure 1). After considering 86 recreation centers located in low-income neighborhoods and eliminating 6 ineligible parks, we randomly selected 48 (60%), optimizing geographical dispersion to avoid contamination that could occur if parks were too close. Parks were considered ineligible if they only provided specialized services or were in isolated housing projects and use by the general public was prohibited.

The 48 parks were assigned by the project statistician (BH) to the four study arms using a blocked randomization procedure to ensure balance in all observed characteristics. Before the baseline observation in 2013–14, the 48 parks were first split into four cohorts with 12 parks in each cohort, so that 3 parks in each study arm started the intervention at a different season (summer, fall, winter and spring). Cohorts were checked on the following static characteristics to achieve balance: park size, population density, percent households in poverty and race/ethnicity composition within a 1 mile radius. This staggered schedule helped account for potential seasonal variation in park use. At baseline we assessed aggregated weekly park-based energy expenditure and the number of users in each park, and

conducted surveys of park users and neighborhood residents. Then the 12 parks in each cohort were randomized to one of the four study arms: (a) 4–5 free physical activity classes for adults per week (in addition to those already offered by the park), (b) a frequent user program for adults incentivizing park visits with lottery prizes up to $200, (c) both free classes and the frequent user program, and (4) a control, business as usual condition (no new free programs offered). Balance in all static characteristics as well as the observed park use outcomes at the baseline were checked among the four study arms to ensure the randomization was appropriate. Given a previous park-based intervention which resulted in a relative 7–12% increase in park energy expenditure and use with a modest investment of $4000 per park (Cohen et al., 2013), we limited the cost of the interventions not to exceed this amount, so it could be replicable if found to be effective.

Class offerings were informed by the baseline surveys previously conducted with randomly-selected park users and households within 1 mile of each park; and for each park, we created a list of activities that park users and residents preferred. In consultation with the park director and taking into account the availability of instructors within the City of Los Angeles Department of Recreation and Parks, a schedule of classes was developed. These included a variety of fitness classes, such as Zumba, aerobics, and line dancing. Classes were chosen to not duplicate or occur simultaneously with current existing classes in each park. An investment of $3,000 per park or about $30 per one-hour class was provided to the City Department of Recreation and Parks to pay qualified instructors and schedule the classes.

For the frequent user program, we developed a brochure describing the prizes that park users could potentially win by visiting the park between 8 and 20 times per month. People who registered for the program simply had to sign in with a special ID number assigned at registration. Participants could earn one point per 24 hour period and an additional five points for registering for a class the park offered. Promotional items including water bottles, back packs, t-shirts, and gift cards were distributed via lottery to eligible participants each month. Prize levels were categorized as bronze, silver and gold, with the higher-priced items requiring more points. Each month those who accrued 8 points were eligible for a bronze prize, 12 points a silver prize and 20 points a gold prize. A grand prize of $200 plus four $50 discount prizes for other park programs was available after 6 months to any park user who accrued at least 75 points during that period. Total costs for prizes were about $1000 per park.

We marketed the programs similarly across each of the intervention arms. We provided 3 large colorful banners in the frequent user and free class arms and 4 in the combined arm, advertising the offerings. These were posted on exterior fences and recreation buildings to maximize their visibility. Each park also had flyers available with more details about each of the activities and when they would take place. Brochures for the frequent user program included pictures of prizes that could be won. Flyers were also posted on bulletin boards about the programs. In addition, we sent informational materials about the new programs to all local community and faith-based organizations, the local city councilperson’s office and the local neighborhood council. We also shared details with the LA County Dept. of Public Health and they circulated the information among their local networks. In addition, where

parks had an email list of park users, the information was sent as an email blast. We budgeted $800–$1000 per park for these banners, posters, flyers and mailings.

We considered the interventions as potentially sustainable, as the costs were generally within the existing budget capacity of many community-based organizations, philanthropies, and potentially, of the City parks system itself.

Measures

We used the System of Observing Play and Recreation in Communities (SOPARC) to measure park aggregated park-based energy expenditure and the number of park users (McKenzie, Cohen, Sehgal, Williamson, & Golinelli, 2006). SOPARC provides aggregated counts of park users by demographics and physical activity levels and characterizes the area contexts in which they are observed. The tool uses momentary time sampling to record observations and has evidence for both reliability (McKenzie TL, Cohen DA, Sehgal A, Williamson S, & Golinelli D, 2006) and validity (Evenson, Jones, Holliday, Cohen, & McKenzie, 2016; Han et al., 2015). In contrast to the manner in which SOPARC was initially implemented, conducting all the observations three times a day on four days of a single week, we conducted baseline observations three times on one day per month during six months before and follow-up observations for six months during the intervention period, scheduled during the same seasons as the baseline observations. Observation were not scheduled to coincide with times when classes were in session. During both baseline (2013–2014) and interventions periods (2014–2015) we observed parks during three weekend days and three weekdays. The rationale was to obtain a more robust assessment of park use over a longer period of time, rather than to reflect what occurred in a single week.

Parks were mapped and divided into target areas defined as smaller spaces for observation. To help ensure high quality measurement, all data collectors must have met an accuracy of ≥80% for assessing all the key variables (number of park users, gender, age group, and physical activity level). Users were enumerated by apparent gender, age group [child (0–12), teen (13–19), adult (20–59), or senior (60+)], physical activity, and race/ethnicity (Hispanic, African American, White, and Asian or others). Physical activity categories were defined as sedentary (lying down, sitting, or standing inactively (from here referred to as “sedentary”), moderate (e.g., locomotion at a walking pace), and vigorous (movement greater than a brisk walk).

We also conducted intercept surveys with 3,213 park users and with 2,973 local residents living within 1-mile of the parks, half at baseline and half during the intervention period. Park users were selected based on a quota system in which we specifically sought respondents based on gender (50% male) and observed activity level (⅓ of whom were seen engaged in MVPA prior to being asked to participate in the survey). Using ArcGIS, the household sample was identified within the buffers so that ⅓ of the sample lived within ¼-mile of the park, ⅓ within ¼-½ mile, and the remainder with ½ to 1 mile of the park’s mailing address. A SAS procedure called PROC SURVEYSELECT was used to randomly select addresses within each buffer. Field staff enrolled participants using verbal consent and asked respondents about their park use, physical activity behavior using two items on

frequency and duration from the Minnesota Hearth Health Program (Jacobs, Ainsworth, Hartman, & Leon, 1993), and awareness of and participation park-sponsored classes and activities. We then compared survey responses between baseline and follow-up using a difference-in-differences analysis across study arms. Baseline survey refusal rates were 58.5% for park users and 17.5% for household respondents. Because the household sample is a population-based sample (as opposed to only those who use the park), we are presenting results only for this group. The institutional Human Subjects Protection Committee approved the study and an oral consent procedure for the surveys.

Process Evaluation

In each intervention park that provided new classes or frequent user programs, we assessed the presence of banners and flyers each time we conducted observations using SOPARC. We also documented the number of intervention classes offered and their attendance. For parks with the frequent user program, we documented the number of people who registered to participate as well as the number of times they signed in, and we tracked the number of individuals who were eligible for prizes based upon meeting the quota of park visits.

Data analyses

We first conducted descriptive analyses of park characteristics, park baseline observation data, and characteristics of resident survey respondents. To obtain community level population data we used census data and GIS methods to calculate population density and socio-demographic characteristics of the population within a one-mile radius of each park (USCensus, 2010a, 2010b). We calculated the violent crime rate in the park neighborhoods (1-mile radius around the study parks) using a City of Los Angeles Police Department publicly available dataset (DataLA, 2016). We also summarized process measures for the intervention by study arms. We then conducted formal statistical analyses of park use outcomes and survey data. The primary pre-specified outcome was estimated energy expenditure in parks from the SOPARC observations using MET scores, the ratio of work metabolic rate to standard resting metabolic rate. We assigned MET levels of 1.5 for sedentary, 3 for moderate, and 6 for vigorous activity as identified by Ainsworth et al (Ainsworth et al., 2000). The secondary outcome measure was the number of observed park users. Survey outcomes included self-reported park use (number of visits in past seven days, duration of park visits, awareness of park programs, having participated in park programs), perception of park safety, and number of weekly exercise sessions.

We fitted difference-in-differences (DID) models between the two measurement waves and four study arms (Yang & Tsiatis, 2001). The effect of the intervention was modeled as the wave by study arm interaction. All models used random effects to account for intra-class correlation within each park as well as fixed effects to account for observation times (time of day, weekend versus weekdays). This approach can eliminate temporal trends unrelated to the intervention and is particularly suitable for this study due to the relatively long observation periods. We also included indicators for park cohorts to account for potential seasonal effects. We used negative binomial distributions in the DID models due to the sizable heteroscedasticity in park use outcomes (Cohen et al., 2012). Effects of the intervention were presented in the scale of multiplicative scale (i.e., % changes) in these

models. We also examined the outcomes by two age groups (youths versus adults). In analyzing survey outcomes, we controlled for respondent-level covariates to reduce estimation biases because randomization was not at the individual level, including gender, age, education level, obesity status, address buffer (<.25 mile, .25 to .5 miles, and .5 miles to 1 mile to park), self-rated health, perception of park safety, primary language, and having children under 18 years old. All statistical models were fitted in SAS 9.4. We also conducted sensitivity analyses using robust standard errors for park clustering effects and alternative scale for transformed mean outcomes (log or logit) wherever appropriate. The main findings were not sensitive to alternative model specifications.

Statistical power—This study was powered to detect a small to medium standard effect size under the regular setting of two-sided p-value<0.05 and power>0.80. With 12 parks in each study arm and the extensive repeated measurements in each park (18 hourly observation per wave for two waves), we can detect a difference of 0.34 times standard deviation (SD) between any two arms when the intra-class correlation is no greater than 0.10. Based on historic data from previous studies (average park use 55 persons/hour, SD=35, approximately)(Cohen et al., 2013) meant that we could detect an additional 11.9 persons/hour. Because most survey outcomes were categorical, we used a two-sample z-test for calculating the detectable effect size for survey analysis. With 20 surveys in each wave and in each park's neighborhood, we could detect a difference of 15 percentage points for a binary outcome with a baseline prevalence between 20% and 80%. The detectable effect size is even smaller if the baseline prevalence rate is very high or very low (e.g. <20%, or >80%).

Results

Park and Population Characteristics

Park size averaged 8.4 acres, but ranged from 1.5 to 25.8 acres. All parks had full-time staff and they had an average of 8.1 physical activity areas/facilities, which included play areas, indoor classrooms or gyms, multi-purpose fields, and outdoor basketball and tennis courts. At baseline, we observed an average of 1,414 persons per park over 6 days (i.e., 18 observation visits). Of these, 66% were male, 30% children, 16% teens, 51% adults, and 3% seniors. On average, 33% of park users were engaging in MVPA when observed (See Table 1).

The population density within 1 mile of each park averaged 52,310 people, with 68.7% of residents being Latino, 11.7% African American, 9.0% Asian, 9.0% non-Hispanic white, and 1.6% other. There were no significant differences across study arms (Table 1).

Characteristics of Household Survey respondents—Across the study arms at baseline, household respondents were predominantly female (60–64%) and across study arms had an average age of 42–44, with 36–40% working full time, 15–16% part time, and nearly ⅓ stay-at-home parents; 72% were Latino, 10% African American, and 6% white. The majority had a high school education or less and only 16.5% had an AA degree or higher. Respondents had an average of 1 child at home (53% had no children and among those with children, the average number was 2. See Table 2). Among respondents, 30% reported having at least one medical problem, with only about 8% reporting having been

diagnosed with weight problem, even though 13% reported having been diagnosed with diabetes and their average calculated BMI was 26.6 kg/m^2, which is overweight. More than half the residents had lived in the neighborhood five or more years. There were no significant differences in the characteristics of household respondents across study arms.

Process evaluation and program participation

Free classes: On average parks offered 85 classes over the 6 months of the intervention, but that varied considerably and ranged from 54 to 122 (See Table 3). At the beginning of the intervention, two instructors arrived at their designated parks but refused to go into the recreation center to teach classes because of safety concerns. In these parks, it took a considerable time to find replacements willing to teach in these settings. In other parks, schedules were frequently changed or cancelled because of special events, holidays, and instructors' personal reasons. Due to the limited number of available instructors, it was not possible to find backup instructors in time to keep the schedule. The number of participants in classes varied, with some having none at all and others drawing as many as 65. Finally, although a total of 2,047 free park classes were offered and they attracted 16,718 participants, we did not achieve our desired goal of 100 classes per park.

Frequent user program: An average of 63 persons per park signed up for the frequent user program, and this ranged from 5–137 across parks. Among participants, 73% were female, 23% ages 18–29, 47% ages 30–44, 19% ages 45–59, and 11% above age 60. The racial/ethnic distribution reflected the local population with 72% Hispanic, 10% Asian and 12% African American. The average number of sign-ins per park was 786 with a range from 57–1833 (Total of 7,860 sign-ins for 10 parks). One park assigned to the frequent user program chose not to implement it and another park reported over 10,000 sign-ins, which we did not consider credible. These two parks were excluded from the counts of sign-ins. Excluding these two parks, a total of 1,452 people enrolled in the frequent user programs and prizes were awarded to a total of 830 individuals. (See Table 3)

We observed banners promoting the free classes and frequent user programs between 84–100% of the time each intervention park was visited. Flyers were available in the intervention park offices 55–74% of the time for the parks in the respective study arms.

Park use, program awareness and participation—Over time, park use increased but there were no overall differences between the control and treatment arms. When examining changes in park users by age group, we observed the largest increase in adults and seniors using parks in all study arms (Figure 2). However, in the DID analyses, the change in the number of adults and seniors was no different across the control and intervention arms.

Table 4 shows the changes in reports of park use and perceptions over time. Self-reports of park visits increased in both intervention arms but were not different from the control arm and the magnitude of increase was not statistically significant. We also did not see any differential increase in observed physical activity levels or in self-reported duration of physical activity among park users.

However, self-reports of participation in park-sponsored physical activity programs were significantly higher at follow-up among residents living near parks in the free classes study arm than residents in the control arm. When considering only participation in the free classes, the reach of the intervention was as high as 9% among park users and 3–4% among residents. With over 50,000 residents in a mile radius of the parks this translates to an average of 1500–2000 persons per study park. Reported reach was 0.8–1.4% for the frequent user program, which is much higher than the documented participation. (Table 3). Residents who reported participating in park-sponsored physical activity programs were more likely to be female, younger, live closer the park, and have children under age 18 than residents who did not report participating in park programs. Residents living near parks in the free classes study arm and the combined intervention study arm reported greater awareness of park programs than residents in the control arm or the frequent user arm.

Overall, age (younger), gender (male) and proximity (closer), and having children were positively associated with the self-reported frequency of park use, while being older, female, and living closer to the park were associated with a shorter duration of park visits. Speaking Spanish was associated with a significantly longer park visitation (nearly 25 minutes more per visit). Perception of park safety was associated with parks visits, duration of stay, awareness of park programs, and participation in them. Violent crime rates in the neighborhood did not significantly increase during the study period, but remained relatively high.

Discussion

While self-reported participation in the free classes increased in the respective treatment groups and a small percentage of residents, primarily women, took advantage of the frequent user program, none of the programs appear to have attracted new park users or increased park use when the classes were not in session. Our rigorous assessment did not support the hypotheses that making a modest investment to offer more programming would increase overall park use, beyond the program participants. This is in contrast to other studies where modest investments in park outreach and/or programming were associated with increased park use in higher income neighborhoods (Cohen et al., 2013), or where substantial investments in park renovations increased park use in high-poverty neighborhoods (Cohen DA et al., 2013; Tester & Baker, 2009). However, the former study with modest investments had a 2 year duration between intervention and follow-up and the latter study had a one year duration until follow-up, while this study only measured a 6-month period during the intervention. It’s possible that this time period was too short a time for the community to become aware of the programming and to alter their routine schedules so they could participate in the program. Our marketing budget was limited to posters, banners, flyers, email blasts, listings on the park websites, and informational schedules sent to local community based organizations. The presence of banners and posters has been associated with a 63% increase in the number of park users.(Cohen et al., 2016a) In another study, in-park signage explained 39% of the increase in park use after an intervention using community engagement.(Cohen et al., 2013) A larger marketing budget might have facilitated a greater physical presence outside of the park, which might have augmented the intervention response during its brief time window.

Given the multiple barriers to park use that exist in high-poverty neighborhoods, a short duration of modest investments may be insufficient to have a robust impact on park use and park-based physical activity when the activities are not in session. The free classes attracted more than double the number of park visits than the frequent user program. The number of visits registered in the frequent user program was smaller than the number needed to detect a change in our study design. Although the marketing for the two programs was equal, awareness was also greater for the free classes. It's possible that the word "free" attracted more attention in communities where incomes are lower, even though the frequent user program was also free and gave away prizes to frequent visitors. Although it appears easier to participate in the frequent user program, which required a single visit to the office to register, as well as sign-ins during each park visit, more people preferred the classes, which required attendance on specific dates and times. Furthermore, the benefit of getting prizes may have been too distant in the future to make this aspect appealing, or the prizes were not sufficiently motivating. The social aspect and the availability of guided instruction are features that likely made the free classes superior to the frequent user program as far as attracting more park users.

Multiple barriers that reduced the likelihood that people will visit the park and impeded effective and consistent program implementation were identified. The interventions occurred in partnership with the Los Angeles Dept. of Recreation and Parks, at a time when resources were very limited. Compared to other large cities in California and the nation as a whole, the per capita investment in Los Angeles city parks was significantly less. Over the past seven years, the department lost a significant percentage of its staff, and turnover of park leadership was very common. In our study a single staff person was responsible for hiring all instructors for all city parks (our 48 study parks plus others). Furthermore, because of liability issues, hiring instructors quickly was difficult, as they needed to be vetted, fingerprinted, and carefully reviewed before they could be added to the city payroll. Because of these kinds of lags, the six month timeline for the program was likely too short. When instructors and classes were not available as scheduled, park users probably were discouraged from returning to the park to attend future sessions.

Although the classes and programs were scheduled to either meet stated preferences mentioned in baseline surveys or to allow for maximum personal flexibility, it's possible that other factors, like the limited days and times that classes were available were potentially problematic, an issue that could be better assessed by expanding the hours of service.

Although we did not see a statistically significant change in the rates of violent crime, perceptions of park safety declined in the intervention arms (significantly in the frequent user arm) which may have interfered with residents' willingness to take advantage of the programs. Safety and concerns about neighborhood gang violence emerged as a significant barrier to the use of many parks. In each study arm, except for the control arm, there were multiple shootings and incidences of homicide, including one near a study park that made national headlines. Violent crimes were lower in the control parks, although this did not reach statistical significance. Although violent crime was relatively high, it was ubiquitous throughout the study areas and stayed at a high level throughout the study period.

Other Barriers to Park Use in High-Poverty Neighborhoods

There may be larger, structural reasons that impede the success of park-based physical activity interventions in high-poverty neighborhoods. Multiple studies have shown that neighborhood aesthetics are an important factor associated with recreational walking (Giles-Corti et al., 2013; Leslie et al., 2010; Perez et al., 2016; Sugiyama et al., 2014; Sugiyama, Neuhaus, Cole, Giles-Corti, & Owen, 2012). In general, persons in lower income areas live in are less aesthetically attractive settings that have higher crime rates than higher income areas (Ou et al., 2016; Stark et al., 2014; Weiss et al., 2011). Consequently, residents may be less likely to be walking in the neighborhood and may not notice the availability of new programming and take advantage of it. A study by Saidj et al (Saidj, Jorgensen, Jacobsen, Linneberg, & Aadahl, 2015) found that housing characteristics also influence leisure time activity, with apartment dwellers engaging in 16% more sedentary behavior than those who live in houses. Apartments were the most common housing types around our study parks.

The larger built environment also influences whether people use a specific park. For example, people who live in areas with access to multiple parks are more likely to engage in leisure time physical activity than individuals who have access to only one park (Owen, Humpel, Leslie, Bauman, & Sallis, 2004). This may be due to the increased novelty provided by visiting different locations. In our study areas, the density of parks was relatively low (Wolch, Wilson, & Fehrenbach, 2005), so the availability of only a single park could be an externality that reduces overall use of parks and park programming. One study found a difference of engagement in leisure physical activity of 17 minutes per week between individuals who had access to multiple parks and multiple destinations versus those who lacked such access (Giles-Corti et al., 2013).

Furthermore, persons with a low income tend to devote greater proportion of their leisure time to electronic media than those of higher income (Coogan, White, Evans, Palmer, & Rosenberg, 2012; Smith, Ng, & Popkin, 2014). Electronic media can be safely enjoyed in the comfort of one’s home, and also offers nearly unlimited variety. Electronic media are heavily promoted and highly salient in Los Angeles. For park–based activities to compete, they would need to be as or more appealing than sedentary entertainment. Yet they could potentially compete, because of the social nature of physical activity in park settings, which may override many other barriers to being outdoors.

Limitations

This study is subject to a number of limitations. First, park observations were based on snapshot direct observations for aggregated activities, which are prone to various sources of measurement error and cannot trace an individual’s behavior over time. Although parks were observed repeatedly over time, the park use data did not necessarily represent the same set of park users. However, the statistical reliability of SOPARC at the aggregated level has been proved to be reasonably high. Second, resident surveys were completely based on self-reports and thus can be subject to reporting biases. The resident sample was a repeated-cross sectional sample rather than a longitudinal cohort. We can only test the effects at the aggregated park or neighborhood level, but cannot examine the potential changes in individual behavior.

Conclusion

Our study suggests that modest investments in park programming and outreach are insufficient to increase park use and physical activity in high-poverty neighborhood parks beyond the times when programming is offered. Because we have seen that special events do attract large crowds of people in these same public parks, perhaps larger investments are needed to create a stronger pull. Given the multiple barriers identified, various types of resources will be required to address them. In retrospect, expecting a generalization effect of new programming for overall park use was unrealistic for low-income neighborhoods.

Acknowledgments

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Research highlights

- A park-level RCT promoting physical activity compared free classes to a frequent user program
- 16,718 visits made to free classes; 7860 sign-ins in the frequent user program
- Reach, awareness and participation in programs was greater in parks with free classes
- On average, park-based physical activity increased, but there were no differences across the study arms

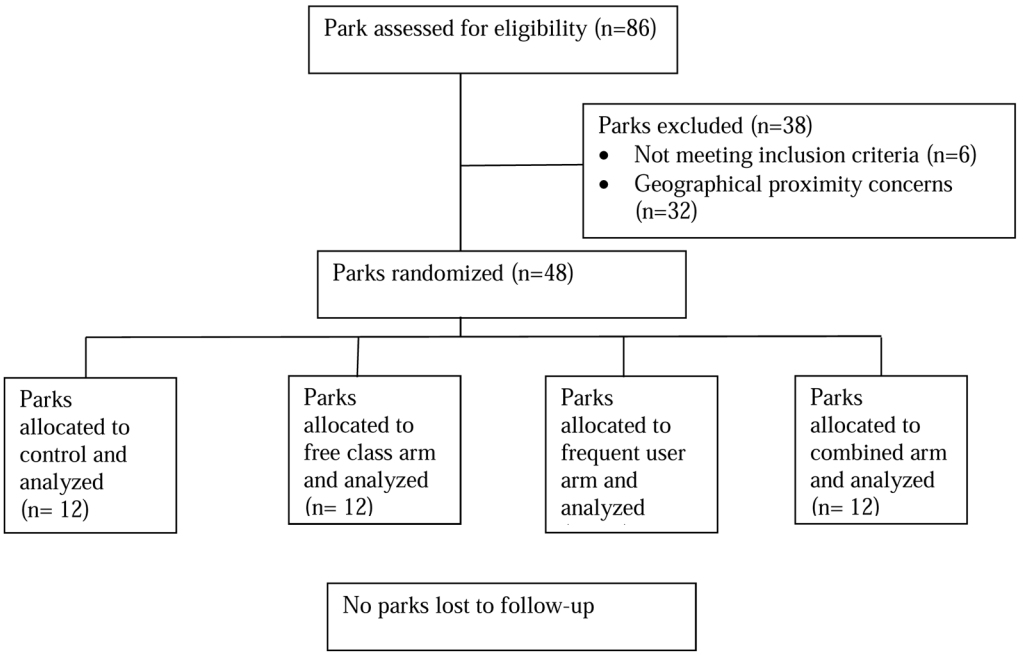

Figure 1. Consort Flow Diagram
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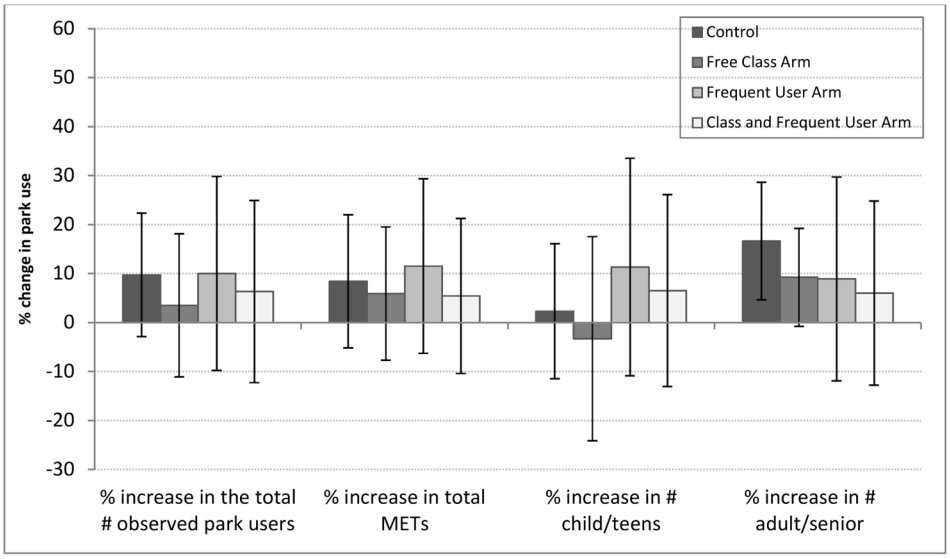

Figure 2. Changes in park use from baseline to follow-up by study arm with 95% confidence intervals

*No significant changes across the study arms were noted

Table 1

Baseline Park Characteristics (n=48)

48 Parks	**Overall**	**Frequent User Program n= 12**	**Free Classes n= 12**	**Free Classes & Frequent User Program n= 12**	**Control n= 12**
Acres	8.4	6.1	9.0	8.0	10.3
Number of facilities	8.1	8	8	9	8
1-mile population estimate (average per park)	52,310	54,925	48,612	50,300	55,404
1 mile population per study arm	2,510,890	659,102	583,346	603,596	664,846
% households in poverty	27.2	27.2	27.5	26.0	27.1
Census population ethnicity					
% Hispanic	68.7%	58.9%	66.7%	78.8%	70.5%
Census reported population race					
% White	9.0%	11.1%	11.9%	3.3%	9.6%
% African American	11.7%	14.8%	8.6%	13.6%	9.9%
% Asian	9.0%	13.3%	11.0%	3.2%	8.4%
% Other/Multiple	1.6%	1.9%	1.7%	1.1%	1.5%
Baseline Observations					
Average # Park users	1,414	1,285	1,561	1,496	1,312
Average # Males	934 (66%)	823	1037	1023	851
Average # Females	480 (34%)	462	524	473	461
Average # Children	421 (30%)	411	494	404	374
Average # Teens	232 (16%)	172	225	272	259
Average # Adults	725 (51%)	679	813	770	638
Average # Seniors	36 (3%)	22	29	51	42
% engaging in MVPA	33%	34%	32%	34%	34%
Violent crime rate (crimes per 1000 population within 1-mile radius of parks)	74.7	73.7	77.6	70.8	66.8

Table 2

Characteristics of Residents from Baseline Surveys (n=1445)

	Park Study Arm			
	Frequent User Program (n=367)	**Free Classes (n=360)**	**Free Classes & Frequent User Program (n=352)**	**Control (n=366)**
Characteristics				
Male (%)	36.2	37.2	37.5	39.9
Female (%)	63.8	62.8	62.5	60.1
Average age (years)	44	44	42	43
Employment Status *(mark all that apply)*				
Working full-time (%)	36.4	40.3	39.4	39.5
Working part-time (%)	15.3	15.4	16.0	15.9
Self-employed (%)	6.3	7.0	6.0	5.5
Unemployed, looking for work (%)	3.8	4.5	8.0	4.9
Retired (%)	9.3	8.1	8.0	8.5
Disabled (%)	2.7	3.4	3.4	5.5
A student (full or part time) (%)	10.1	7.6	10.0	8.8
A stay-at-home parent (%)	34.0	31.9	30.3	29.6
Other (%)	0.3	0.0	0.0	0.0
Race/ethnicity				
Latino (%)	72.3	69.8	75.6	75.4
White (%)	6.0	8.1	13.6	13.1
Black (%)	10.1	19.3	6.0	5.2
Asian/Pacific Islander (%)	2.7	0.3	1.1	0.5
American Indian/Alaska Native (%)	0.0	0.3	0.0	0.3
Other Race/ethnicity (%)	8.8	2.2	3.7	5.5
Educational Level				
< High School (%)	29.2	28.7	30.0	33.6
High school graduate or GED (%)	36.1	36.0	34.6	32.8
Some college (no degree) (%)	18.2	16.0	15.3	14.0
AA and above (%)	16.5	19.4	20.2	19.6
Children under 18 (average) (%)	1.0	0.9	0.9	1.0
Health Conditions				
Asthma (%)	3.3	2.3	4.1	5.0
Diabetes (%)	13.3	13.1	11.6	14.6
High cholesterol (%)	10.2	13.4	9.9	13.6
Heart disease (%)	2.8	4.9	2.3	7.7
Hypertension (%)	15.2	16.0	11.3	19.9
Weight problem (%)	7.5	8.9	8.4	6.4
Length of time at current address				

	Park Study Arm			
	Frequent User Program (n=367)	**Free Classes (n=360)**	**Free Classes & Frequent User Program (n=352)**	**Control (n=366)**
Less than 1 year (%)	4.6	3.6	3.7	4.4
1 – 2 years (%)	8.2	10.3	9.7	6.3
> 2 years, but < 5 years (%)	37.4	32.7	35.3	34.4
Between 5 – 9 years (%)	20.2	24.6	24.5	24.9
10 years or more (%)	29.5	28.8	26.8	30.1
Screen time (average minutes per day)	168	170	170	175
Address buffer				
Lives < 0.25 miles from park (%)	32.4	33.6	32.1	33.3
Lives 0.25 – 0.5 miles from park (%)	34.6	32.8	34.1	33.6
Lives 0.5 – 1 mile from park (%)	33.0	33.6	33.8	33.1
Perceived park safety				
Very Safe (%)	18.0	14.0	18.6	14.4
Safe (%)	62.2	60.6	66.1	59.9
Not very safe (%)	11.2	18.6	10.7	17.4
Not safe at all (%)	8.5	6.8	4.6	8.3
Primary language is Spanish (%)	63.8	61.7	63.4	65.0
Obesity Status				
Normal (%)	37.7	38.8	40.8	36.7
Overweight (%)	43.7	42.0	39.4	43.6
Obese (%)	18.6	18.3	19.5	19.1
Severely obese (%)	0.0	0.9	0.3	0.6
Number of park visits in last 7 days	1.0	0.9	0.9	1.0
Duration of park visit (minutes)	87.8	92.4	87.8	83.9
Aware of any park-sponsored classes (%)	28.1	24.2	23.9	28.5
Ever participated in any park programs (%)	7.4	4.0	9.4	6.4
# Weekly exercise sessions	2.2	2.2	2.4	2.0

Table 3

Process Measures

	Frequent User Program		Free Classes		Free Classes & Frequent User Program	
Implementation measures	**Average**	**Range**	**Average**	**Range**	**Average**	**Range**
# of classes offered per park over 6 months	--	--	85	54 – 118	86	56 – 122
# participants per class	--	--	8	0 – 47	8	0–65
# of persons enrolling in frequent user program	64	5 – 137	--	--	62	29 – 107
# of sign-ins	872	199 – 1,494	--	--	701	57 – 1,833
# of Grand Prize winners	2	0 – 5	--	--	2	0 – 5
# of Gold winners	7	0 – 22	--	--	5	0 – 15
# of Silver winners	16	11 – 40	--	--	9	0 – 25
# of Bronze winners	19	7 – 48	--	--	10	0 – 29
Banners observed in the park	98.8%	94.4 – 100	95.0%	55.6 – 100	100%	100
Banners promoting the frequent user program observed in park	90.8%	72.2 – 100	12.4%	0.0 – 76.5	89.5%	16.7 – 100
Banners promoting the free adult exercise classes observed in park	0.4%	0.0 – 5.3	84.1%	0.0 – 100	89.2%	33.3 – 100
Flyers observed in the park	77.2%	45.8 – 94.4	74.8%	44.4 – 100	82.4%	60.0 – 100
Flyers promoting the frequent user program observed in park	55.5%	12.5 – 88.9	7.5%	0.0 – 41.2	63.3%	22.2 – 95.8
Flyers promoting free adult exercise classes observed in park	0.5%	0.0 – 5.6	59.4%	27.8 – 89.5	74.3%	25.0 – 100
Follow-up surveys	**Frequent User Program**		**Free Classes**	**Free Classes & Frequent User Program**		**Control**
Attended a free adult exercise class (park users)	1 (0.25%)		26 (6.62%)	36 (8.82%)		1 (0.24%)
Attended a free adult exercise class (residents)	0 (0.00%)		11 (2.96%)	15 (4.13%)		0 (0.0%)
Signed up for frequent user program(park user)	8 (2.00%)		4 (1.02%)	16 (3.92%)		0 (0.0%)
Signed up for frequent user program (residents)	3 (0.81%)		0 (0.00%)	5 (1.38%)		0 (0.0%)

Table 4

Multiple regression analysis of resident survey data[a]

	# Park visits in last 7 days	Duration of park visit (minutes)	Aware of any park-sponsored classes *b*	Ever participated in park programs *b*	Perceiving park as safe *b*	# Weekly exercise sessions *b*
Intercept:	0.8(0.7)	106.4(21.6) ***	0.3(0.2)	0.27(0.11)*	0.79(0.16) ***	2.5(0.8)**
Follow up	−0.3(0.2)*	−1.3(4.2)	−0.03(0.04)	−0.03(0.03)	−0.01(0.03)	−0.2(0.2)
Free class arm	−0.2(0.2)	8.1(7.1)	−0.08(0.05)	−0.04(0.03)	**−0.02(0.08)**	−0.1(0.2)
Frequent user arm	−0.1(0.2)	4.4(7.0)	−0.02(0.05)	0.01(0.03)	**0.05(0.08)**	−0.1(0.2)
Class and frequent user arm	−0.1(0.2)	5.3(7.1)	−0.03(0.05)	0.05(0.03)	**0.09(0.09)**	0.1(0.2)
Free classes × followup	0.4(0.2)	−1.5(5.8)	0.11(0.06)*	0.11(0.04)**	−0.04(0.05)	0.1(0.3)
Frequent user arm × follow up	0.3(0.2)	4.3(5.7)	0.01(0.06)	−0.01(0.04)	−0.10(0.05)*	0.1(0.3)
Class and frequent user arm × follow up	0.3(0.2)	4.2(5.8)	0.12(0.06)*	0.00(0.04)	−0.08(0.05)	0.1(0.3)
Age:	−0.03(0.02)	−1.7(0.6)**	−0.01(0.01)	−0.01(0.00)**	−0.01(0.00)*	−0.1(0.0)*
Female	−0.2(0.1)**	−10.5(2.2) ***	−0.08(0.02) ***	0.02(0.01)	−0.03(0.02)	−0.5(0.1)***
Address buffer						
< .25 miles	0.7(0.1)***	−6.2(2.7)*	0.07(0.03)*	0.06(0.02) ***	**0.02(0.02)**	−0.1(0.1)
25 - .5 miles	0.3(0.1)**	0.2(2.8)	0.05(0.03)	0.03(0.02)	**−0.03(0.02)**	−0.2(0.1)
.5 - 1 mile	-	-	-	-	-	-
Perceived park safety:						
Safe	0.9(0.2)***	24.8(7.6)**	0.28(0.04)***	0.08(0.02)**	-	0.3(0.2)
Not very safe	0.8(0.2)***	14.8(7.8)	0.27(0.05)***	0.06(0.03)*		0.3(0.2)
Not safe at all	-	-	-	-	-	-
Primary language is Spanish	0.1(0.1)	7.7(2.9)**	0.02(0.03)	−0.03(0.02)*	0.15(0.02) ***	0.1(0.1)
Obesity status						
Normal	0.1(0.5)	−17.8(14.9)	0.00(0.12)	−0.16(0.08)*	0.09(0.10)	−0.1(0.6)
Overweight	0.0(0.5)	−16.1(15.0)	0.03(0.12)	−0.10(0.08)	0.11(0.10)	−0.1(0.6)
Severely Obese	-	-	-	-	-	-
Having children <18 years old	0.2(0.1)*	1.0(2.6)	0.09(0.02)***	0.04(0.02)**	0.04(0.02)	0.2(0.2)

[a]All models also controlled for cohorts, observation hours, days of a week, self-reported health, and education levels, as well as random effects for parks. They were not included in the table due to space limit.

[b]Effects for these outcomes are in probabilities

Statistical significance is denoted by *** $p<.001$, ** $p<.01$, * $p<.05$