

The Impact of Playworks on Students' Physical Activity by Race/Ethnicity: Findings from a Randomized Controlled Trial

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Background: The Playworks program places coaches in low-income urban schools to engage students in physical activity during recess. The purpose of this study was to estimate the impact of Playworks on students' physical activity separately for Hispanic, non-Hispanic black, and non-Hispanic white students. **Methods:** Twenty-seven schools from 6 cities were randomly assigned to treatment and control groups. Accelerometers were used to measure the intensity of students' physical activity, the number of steps taken, and the percentage of time in moderate-to-vigorous physical activity (MVPA) during recess. The impact of Playworks was estimated by comparing average physical activity outcomes in treatment and control groups. **Results:** Compared with non-Hispanic black students in control schools, non-Hispanic black students in Playworks schools recorded 338 more intensity counts per minute, 4.9 more steps per minute, and 6.3 percentage points more time in MVPA during recess. Playworks also had an impact on the number of steps per minute during recess for Hispanic students but no significant impact on the physical activity of non-Hispanic white students. **Conclusions:** The impact of Playworks was larger among minority students than among non-Hispanic white students. One possible explanation is that minority students in non-Playworks schools typically engaged in less physical activity, suggesting that there is more room for improvement.

Keywords: accelerometry, intervention study, youth

Childhood obesity continues to be a significant health concern. In the past 30 years, childhood obesity in the United States has more than doubled in children and quadrupled in adolescents.^{1,2} By 2012, more than one third of children and adolescents were overweight or obese.² These rates are even higher in children from racial and ethnic minority groups.³ Further, few children, particularly children from racial and ethnic minority groups,⁴ meet the current physical activity guidelines recommendation of at least 60 minutes of moderate-to-vigorous physical activity (MVPA) per day.^{5,6}

Because children spend approximately half of their waking hours at school, schools provide an opportunity for interventions to target obesity and promote physical activity.⁷ Recess, in particular, has been recognized as an important part of a comprehensive school-based program for the promotion of physical activity.^{8,9} Furthermore, there is evidence that children from racial and ethnic minority groups are less physically active at recess than their non-minority counterparts and most in need of interventions to address this gap.¹⁰⁻¹² Recent research suggests that interventions aiming to increase physical activity during recess, such as Ready for Recess, the Playworks program, and social prompting or modeling interventions, may successfully increase physical activity in elementary school children.¹³⁻¹⁵ However, very little research has examined whether these interventions are specifically effective at increasing the physical activity of children from the racial and ethnic subgroups most in need of intervention.¹⁶ To our knowledge, only one study¹⁷ has examined the effect of a recess-based intervention on racial and ethnic subgroups; this study, which was conducted on fewer than 100 students from 2 Midwestern schools, showed that the Ready for Recess intervention was associated with a statistically significant

increase of 4.7 minutes in MVPA during recess, across all children. The impact at recess was slightly larger in minority children compared with non-Hispanic white children (4.7 vs 4.4 minutes of MVPA), but this difference was not statistically significant.¹⁷

The findings presented in this article are part of a larger evaluation that investigated the impact of Playworks across several outcome domains, including students' physical activity, school climate, and student behavior.^{14,18} Playworks operates in low-income urban schools. Full-time coaches are placed in these schools to provide students with organized recess activities and help them foster social skills such as cooperation and conflict resolution. Playworks was specifically developed for use in urban settings and is often used by schools with large minority populations, thus highlighting the need to test its effectiveness with this specific population. In the larger evaluation, we found that the Playworks intervention reduced bullying and exclusionary behavior during recess and the difficulty and amount of time it took teachers to transition to learning activities after recess. We also found that Playworks increased students' perceptions about the effectiveness of sports, games, and play on their behavior in class and had a positive impact on students' use of positive, encouraging language and teachers' perceptions of student safety at school and during recess. A separate, quasi-experimental study of Playworks showed that with each additional year of exposure, students reported significantly higher levels of physical activity frequency.¹⁹ Both of these studies did not evaluate the impact of Playworks within racial and ethnic subgroups.

The aim of the current study was to evaluate the impact of the Playworks program on objectively measured physical activity in racial and ethnic subgroups in the context of the large randomized controlled trial previously mentioned, which was conducted in 27 schools across 6 major U.S. cities. In particular, this evaluation will answer the following research question: does Playworks have an impact on recess physical activity, measured as average number of accelerometer intensity counts per minute, average number of steps

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taken per minute, and average percentage of time spent in MVPA for non-Hispanic black, non-Hispanic white, and Hispanic students, and is the impact different across these groups?

Methods

The current study took place in elementary ($n = 11$) or combination elementary and middle ($n = 18$) schools during either the 2010–2011 or 2011–2012 school year. During the 1-year study period, treatment schools implemented Playworks, and control schools did not implement the program. The 29 study schools were all interested in the Playworks program but had never implemented it before and were located in 6 large urban cities geographically dispersed across the United States.

Study Design

The study used a randomized controlled trial design. The schools were randomly assigned to treatment ($n = 17$) and control ($n = 12$) groups. The advantage of random assignment is that any differences in outcomes between the groups can be attributed to the effect of the Playworks intervention. To improve the statistical precision of impact estimates, we conducted random assignment within matched blocks of schools that were similar in terms of school size, highest grade offered, student race/ethnicity, and the percentage of students eligible for free or reduced-price lunch.

Procedures

All schools were recruited by research staff to participate in the study. Notification letters were sent to parents of students in the study schools before data collection began, and parents had the opportunity to have their children excluded from the study. The research team visited each school for 1 week to collect accelerometer data during recess periods. Recess schedules varied across schools; most schools offered recess each day, with periods lasting an average of 33 minutes. A few schools provided students with more than one recess period. Some schools designed their schedules so that similar age groups began and ended recess at the same time, and other schools had overlapping periods with different grades and groups of students entering and exiting the play yard at different times. The time of day that recess was offered also varied, but most recess periods were in the morning or scheduled around lunch. The research team found that recess schedules provided by schools were followed loosely because of such factors as weather or other school events. Schools had different policies for what students were to do when inclement weather made outdoor recess impossible, including staying in the classroom to play board games, gathering in the gym for physical activity, or going to the auditorium to watch a movie.

During the week of data collection at each school, students in sampled fourth- and fifth-grade classrooms provided demographic data about their race/ethnicity and gender via survey and wore accelerometers for 1 or 2 days. Four classrooms (2 fourth-grade classrooms and 2 fifth-grade classrooms) were randomly selected from each school for accelerometer data collection. In schools that had fewer than 4 fourth- and fifth-grade classrooms combined, all classrooms were selected. One classroom from each school was also randomly selected to participate in a second day of accelerometer data collection. Including 2 days of data for a subset of students accounts for students' intraindividual variability in physical activity during recess as part of the analyses. The research team arrived

at participating classrooms at the beginning of the school day, described the function of the accelerometer, and then attached an accelerometer to each consenting student's hip using an elastic belt. Students were instructed to seek out someone from the research team if their monitor became loose during the day. The monitors were taken off at the end of the school day by a research team member, and physical activity data were uploaded to a computer. Each school provided information about the start and end time for recess periods for each grade, and accelerometer data measured during these scheduled recess periods were used for analysis. While the data collection team was on site in treatment and control schools, they confirmed the original recess schedules provided by schools; if necessary, they corrected the schedules based on when recess actually occurred during the week of data collection. The corrected version of the recess schedules were used when determining the start and end times for recess periods for the accelerometer analysis.

The Playworks Program

Treatment schools (with $n = 511$ student study participants) were each assigned one paid full-time Playworks coach for 1 school year. The Playworks program (www.playworks.org) places coaches in low-income urban schools to engage students in physical activity, foster their social skills related to cooperation and conflict resolution, improve school climate, improve their ability to focus on class work, and decrease their behavioral problems. The typical Playworks coach is a young adult who is experienced or interested in education, youth development, or sports. To ensure the quality of the coaches, the Playworks staff members train and then supervise coaches when they are first placed into a school.

The Playworks program comprises 4 main components^{14,18}:

1. Organized recess activities. During recess, the coach assigned to each school encourages involvement in organized and inclusive activities such as four-square, Simon says, wall ball, and basketball and provides a common set of rules for each game. In addition, the coach models conflict resolution tools, such as RoShamBo (rock-paper-scissors), which aim to reduce the number of conflicts that arise, enable youths to resolve their own disputes quickly, and create an environment of positive play. Although not formally part of the Playworks program, other adults, such as playground monitors, were also often present at treatment and control schools during recess to monitor the children.
2. Junior coach program. Older students (ie, fourth- and fifth-grade students and some older students in K–8 schools) serve as role models and facilitators during recess. They receive monthly training in leadership and conflict resolution skills from the school Playworks coaches so they can lead other students in games and help resolve student conflicts.
3. Class game time. In addition to the recess activities described above, the coach meets with individual classes during the school day (at times other than recess) to play games such as four corners, hot potato, and red light-green light. The coaches lead these games with the goal of fostering teamwork and positive play. After the students learn the rules, they can play the games on their own during recess. Classroom teachers are required to be present and are encouraged to play alongside their students.
4. After-school activities. Playworks also offers an after-school program, sports leagues, and school staff trainings, but the current study did not focus on this component.

The first 3 components were carried out at all study schools assigned to the treatment group.

Playworks also includes coach training and supervision:

- **Training.** Each year, new coaches receive 109 to 120 hours of training; returning coaches receive 65 to 80 hours. Before the school year, coaches receive roughly 30 hours of training; they receive an additional 16 to 24 hours within the first 2 weeks of the school year. The remaining hours are spread out over the course of the year (Playworks staff, personal communication, September 8, 2014).
- **Supervision.** Playworks program managers, who spend time on-site at schools, observe the coaches and provide feedback. They usually visit the coaches for at least 2 to 3 hours each week (Playworks staff, personal communication, September 8, 2014).

Playworks' central office in Oakland, California provides direction to the independent regional hubs that carry out the program. According to Playworks, the total cost of providing its program to a single school was \$61,200 in the 2010–2011 school year and \$64,600 in the 2011–2012 school year, based on national estimates.¹⁸ However, the cost of the program is subsidized through donations and grants. With these subsidies, study schools paid on average \$24,353 for the program.

Control Group Schools

The 12 schools assigned to the control condition (with $n = 405$ student study participants) were not offered Playworks during the study year but were instead put on a waiting list to implement Playworks in the following year. These schools were asked to carry out recess as they normally would in the absence of the study. Recess periods were observed at both treatment and control schools using the SOPLAY observation tool,²⁰ which allows collection of physical activity information on students within zones in the recess play space to understand how they differed. Compared with treatment schools, control schools had less availability of games at recess, fewer adults involved in organizing recess games, and less use of equipment during recess. There were similarities between the 2 groups of schools in terms of the role of playground monitors at recess. Playground monitors at treatment- and control-group schools engaged with students in similar ways and for a similar amount of time—playing with students, intervening in conflict, and encouraging students with positive messaging.

Participants

The study participants consisted of 916 students (312 non-Hispanic black students, 207 non-Hispanic white students, and 397 Hispanic students from 101 fourth- and fifth-grade classrooms in 27 study schools) who reported their race and ethnicity in the student survey and wore accelerometers for at least 10 minutes during their recess periods on 1 or 2 school days. Students from one study school did not participate in the accelerometer data collection. This school and the school with which it was matched during random assignment were dropped from the accelerometer analysis, leaving 27 schools from the original sample of 29 schools. In these 27 schools, the response rate for accelerometer data collection was about 66% overall in both treatment and control groups. Students were considered nonrespondents if they did not obtain written parental consent (about 30%), or if they either refused to participate, were absent during data collection, had an accelerometer malfunction,

or if we did not have data indicating their race/ethnicity and gender (about 5%).

Physical Activity Outcomes

Three outcome variables were used to measure students' recess physical activity: (1) average number of intensity counts per minute, (2) average number of steps per minute, and (3) average percentage of time spent in MVPA. These variables were constructed using data from accelerometers (GT3X; ActiGraph, Pensacola, FL), which are monitoring devices worn on the body that allow researchers to objectively measure the intensity, frequency, and duration of physical activity. The cut points used to measure time spent in MVPA were based on Evenson cut points, which were found to be the most reliable in a comprehensive study involving youth.²¹ (We also conducted a separate analysis using cut points from Edwardson and Gorely²² that yielded similar findings.) Students' accelerometer wear time was divided into 5-second epochs; if the intensity counts recorded during a given epoch were greater than or equal to 191, that epoch was identified as time spent in MVPA. Although 15-second, 30-second, and 1-minute epochs are typically used to measure time spent in MVPA, recent research suggests that the shorter 5-second epoch lengths used here are more appropriate for measuring physical activity in children because their activity can be more spontaneous, might last only a matter of seconds, and is not always picked up using longer epochs.^{22–25}

Data Analysis

To answer the research question posed earlier, we focused our analyses on estimating the impacts of Playworks on the average number of intensity counts per minute, the average number of steps per minute, and the average percentage of time spent in MVPA during recess for 3 racial and ethnic subgroups: (1) non-Hispanic black students, (2) non-Hispanic white students, and (3) Hispanic students. We did not estimate impacts for students in other race and ethnicity categories because the small number of students in those groups prevented us from estimating reliable impacts.

The impact of Playworks was estimated for each of the 3 race/ethnicity subgroups by using regression models to compare the average outcomes in treatment and control group schools. We also estimated school and student characteristics using regression models to populate Tables 1 and 2, respectively. The models included random assignment block indicator variables to account for the blocked design and school-specific random error terms to account for school-specific effects not attributable to the treatment. The impact models also included accelerometer wear time, gender, and grade level as covariates. These covariates were included because there was a large range in accelerometer wear time (16–61 minutes across students) and because previous research suggests that interventions may have a different effect (1) on boys than on girls and (2) on students in different age groups.²⁶ The modeled outcomes measure students' average number of intensity counts per minute, average number of steps taken per minute, and average percentage of recess time spent in MVPA, controlling for the fact that some students were at recess for different lengths of time during the school day. If we had used total number of intensity counts, total number of steps taken, and total number of recess minutes in MVPA, it would have resulted in disproportionately large outcomes for students with longer recess periods.

Generalized estimating equations (GEE) were used to account for clustering of students within schools. Because GEE

Table 1 Characteristics of Study Schools^a

| Characteristic | Treatment (n = 16) | Control (n = 12) | Difference |
|--|--------------------|------------------|------------|
| Percentage of schools receiving Title I funding | 86.7 | 84.2 | 2.5 |
| Mean number of students per teacher/classroom | 16.3 | 16.3 | 0.0 |
| Mean number of students per school | 494.0 | 562.3 | -68.3 |
| Mean percentage of students eligible for free or reduced-price lunch | 81.0 | 83.1 | -2.1 |
| Mean percentage of students who are the following race/ethnicity | | | |
| Non-Hispanic black | 40.7 | 38.3 | 2.4 |
| Hispanic | 25.6 | 32.3 | -6.7 |
| Non-Hispanic white | 17.0 | 12.9 | 4.1 |
| Other | 16.7 | 16.5 | 0.2 |

^a Source: Common Core of Data (CCD) from the 2009–2010 school year (25 schools) and 2010–2011 school year (3 schools). Data were unavailable for one treatment school that was new in 2011–2012.

Table 2 Descriptive Statistics for Participating Students

| Student Type and Characteristic | Treatment | Control | Difference |
|--|-------------|-------------|------------|
| Non-Hispanic black students (n = 312) | | | |
| Percentage of female students | 52.4 | 49.8 | 2.6 |
| Percentage of fourth-grade students | 48.0 | 54.1 | -6.1 |
| Mean (SD) number of minutes students wore the accelerometers during recess | 32.9 (11.7) | 27.4 (13.6) | 5.4 |
| Non-Hispanic white students (n = 207) | | | |
| Percentage of female students | 50.5 | 57.8 | -7.3 |
| Percentage of fourth-grade students | 67.2 | 64.6 | 2.6 |
| Mean (SD) number of minutes students wore the accelerometers during recess | 31.4 (10.5) | 36.6 (11.4) | -5.2 |
| Hispanic students (n = 397) | | | |
| Percentage of female students | 57.8 | 51.6 | 6.2 |
| Percentage of fourth-grade students | 59.4 | 49.4 | 10.0 |
| Mean (SD) number of minutes students wore the accelerometers during recess | 34.1 (11.9) | 32.3 (18.0) | 1.8 |

automatically accounts for any correlations among students below the level of clustering (schools), the standard errors also reflect nesting of students within classrooms. Before estimating the model, averages of the outcomes for students who wore accelerometers for 2 days were calculated. Sampling weights were used to account for both nonresponse and the selection probabilities of students into the accelerometer sample, ensuring that students included in the analysis represented all eligible students in the participating schools.

Results

Table 1 provides characteristics of the study schools assigned to the treatment and control groups. A majority of schools in both groups had large low-income student populations and received Title I funding. Students at both treatment and control schools were primarily minority students, and a majority qualified for free or reduced-price lunches. Table 2 provides characteristics of the students in the study schools. There were no significant differences between the treatment and control groups in terms of accelerometer wear time, gender, or grade level after accounting for the blocked design and school-specific effects.

Our research question set out to determine whether Playworks has an impact on physical activity for non-Hispanic black, non-Hispanic white, and Hispanic students. Statistically significant differences were found between the treatment and control groups on average number of intensity counts per minute during recess, average number of steps taken per minute during recess, and average percentage of time spent in MVPA during recess for non-Hispanic black students (Table 3). Relative to control-group students, treatment-group students in this race/ethnicity subgroup had, on average, 338 (95% confidence interval [CI], 155–522) more intensity counts per minute, took 4.9 (95% CI, 1.4–8.3) more steps per minute, and spent 6.3 percentage points (95% CI, 3.1–9.6) more time in MVPA. All of the impacts were large, with effect sizes ranging from 0.37 to 0.53. There was one statistically significant difference for Hispanic students. Treatment-group Hispanic students took, on average, 5.4 (95% CI, 0.4–10.3) more steps per minute than control-group Hispanic students (Table 2). The effect sizes for Hispanic students across all outcomes were modest, ranging from 0.21 to 0.34. There were no statistically significant differences for non-Hispanic white students; the 95% confidence intervals for differences between treatment- and control-group means for intensity counts, steps, and time spent in MVPA for non-Hispanic white students all contained 0.

Table 3 Physical Activity of Participants in Race and Ethnicity Subgroups by Treatment Condition

| Outcome | Treatment Mean | Control Mean | Difference (95% CI) | Effect Size |
|--|----------------|--------------|------------------------|-------------|
| Non-Hispanic black students (n = 312) | | | | |
| Mean number of intensity counts per minute | 1224.9 | 886.8 | 338.1 (154.6 to 521.6) | 0.51 |
| Mean number of steps per minute | 26.9 | 22.0 | 4.9 (1.4 to 8.3) | 0.37 |
| Mean percentage of recess time spent in MVPA | 20.4 | 14.1 | 6.3 (3.1 to 9.6) | 0.53 |
| Non-Hispanic white students (n = 207) | | | | |
| Mean number of intensity counts per minute | 1250.3 | 1185.0 | 65.4 (−205.9 to 336.6) | 0.06 |
| Mean number of steps per minute | 28.2 | 29.2 | −0.9 (−8.5 to 6.6) | −0.07 |
| Mean percentage of recess time spent in MVPA | 19.7 | 19.2 | 0.5 (−5.3 to 6.2) | 0.03 |
| Hispanic students (n = 397) | | | | |
| Mean number of intensity counts per minute | 1310.5 | 1097.7 | 212.8 (−73.9 to 499.4) | 0.21 |
| Mean number of steps per minute | 31.9 | 26.5 | 5.4 (0.4–10.3) | 0.34 |
| Mean percentage of recess time spent in MVPA | 21.6 | 17.2 | 4.4 (−0.3 to 9.0) | 0.32 |

Abbreviations: CI, confidence interval; MVPA, moderate-to-vigorous physical activity.

Discussion

The limited research on racial and ethnic differences in physical activity during recess suggests that minority children are less physically active at recess than their nonminority counterparts and are therefore most in need of interventions to increase their activity.^{10–12} This study confirmed prior research that non-Hispanic black students in the control group were significantly less physically active than their non-Hispanic white and Hispanic counterparts in terms of the percentage of time spent engaged in MVPA. Non-Hispanic black students in the control group engaged in MVPA for an average of 14.1% of their recess time, whereas non-Hispanic white and Hispanic students in the control group engaged in MVPA for an average of 19.2% and 17.2% of their recess time, respectively.

There is even less research on racial and ethnic differences in the effect of recess interventions on physical activity. To our knowledge, only one other study¹⁷ has examined whether a recess intervention has different effects among children from different racial/ethnic groups in the United States. Although Siahpush and colleagues¹⁷ found no significant differences by race and ethnicity in the effect of Ready for Recess on MVPA during recess, their quasi-experimental study did find evidence that nonwhite students benefited more (approximately 10 additional minutes of MVPA) from the intervention than white students when considering the entire school day. In the present study, we set out to determine whether the Playworks program had an impact on physical activity during recess for 3 racial/ethnic groups: non-Hispanic blacks, non-Hispanic whites, and Hispanics. The study determined that Playworks provided large, significant benefits on the physical activity of non-Hispanic black students that were consistent across all 3 outcomes measured—intensity, steps, and percentage of time in MVPA.

These findings suggest that Playworks is a promising approach for increasing the physical activity of non-Hispanic black students. These findings are important because this subgroup of students has an increased risk for becoming overweight and obese³ and of not meeting national physical activity guidelines.^{4,27} Although the pattern was less consistent with a

significant impact for only 1 of 3 outcomes examined, the findings also suggest some benefit of Playworks for Hispanic students' accrual of recess physical activity.

One possible explanation for why the impact of Playworks on physical activity during recess was large and significant for minority students but not for non-Hispanic white students is that there was more room for improved physical activity engagement among minority students compared with white students. Non-Hispanic white students in non-Playworks schools were more active than Hispanic and non-Hispanic black students. Therefore, implementation of Playworks would not necessarily significantly increase the physical activity of white students because they are already physically active; it is more likely that they would keep the same activity levels or increase them marginally with program implementation. On the other hand, implementation of Playworks would be more likely to increase physical activity of minority students because there would be more room for growth among these students.

This study has several strengths. It used a rigorous randomized controlled-trial design and was conducted in a geographically diverse set of 27 schools from 6 major cities. Objective measures of physical activity data from accelerometers were used to assess the effect of the program on physical activity. Despite these strengths, some limitations existed, including the lack of baseline measures. Although baseline measures are not necessary to obtain unbiased impact estimates given the random assignment design, they would have provided even more power to detect impacts. In addition, we were able to collect data after only 1 year of implementation, but additional follow-up data collection periods would have enabled us to examine the longer-term impact of the program.

Conclusion

In this first randomized controlled trial of the Playworks program, we found large positive impacts on the intensity, steps, and percentage of time in MVPA among non-Hispanic black students and a significant impact on Hispanic students' number of steps. There were no significant impacts on non-Hispanic white students' physical activity during recess. One possible explanation for these

findings is that there is more room for improving physical activity among minority students compared with their non-Hispanic white counterparts. Future program efforts might include expanding the focus of Playworks on physical activity for all subgroups of students in the hope that students of all racial and ethnic subgroups involved in the Playworks program will experience increased physical activity during recess to the greatest extent possible.

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