

*Applied Research Brief: Nutrition; Youth*

# Impact of California Children's Power Play! Campaign on Fruit and Vegetable Intake and Physical Activity among Fourth- and Fifth-Grade Students

Angie Keihner, MS; Nila Rosen, MPH; Patricia Wakimoto, DrPH, RD; Lauren Goldstein, PhD; Sharon Sugerman, MS, RD, FADA; Mark Hudes, PhD; Lorrene Ritchie, PhD, RD; Kate McDevitt

## Abstract

**Purpose.** Examine the impact of the Children's Power Play! Campaign on fruit and vegetable (FV) intake and physical activity (PA).

**Design.** Study design was a cluster randomized, controlled trial.

**Setting.** Forty-four low-resource public schools in San Diego County, California, were included in the study.

**Subjects.** Study subjects comprised a total of 3463 fourth/fifth-graders (1571 intervention, 1892 control), with an 86.9% completion rate.

**Intervention.** Throughout 10 weeks, activities were conducted during/after school, including weekly FV/PA lessons and PA breaks; biweekly classroom promotions/taste tests; posters displayed in/around schools; and weekly nutrition materials for parents.

**Measures.** Self-reported FV intake (cups/d) and PA (min/d) were collected at baseline and follow-up using a diary-assisted, 24-hour dietary recall and Self-Administered Physical Activity Checklist.

**Analysis.** Multivariate regression models adjusted for demographics and cluster design effects were used, with change as the dependent variable.

**Results.** Intervention children, compared with controls, showed gains in daily FV intake (.26 cups,  $p < .001$ ) and PA time at recess/lunch (5.1 minutes,  $p = .003$ ), but not total daily PA minutes.

**Conclusion.** Power Play! can help schools and community organizations improve low-income children's FV intake and PA during recess/lunch.

**Key Words:** Nutrition Education, Nutrition Assessment, Fruits And Vegetables, Physical Activity, Child, School, Prevention Research. Manuscript format: research; Research purpose: intervention testing; Study design: randomized trial; Outcome measure: behavioral; Setting: school; Health focus: nutrition/physical activity; Strategy: education, skill building/behavior change; Target population age: youth; Target population circumstances: income level

## PURPOSE

In the United States, obesity disproportionately impacts low-income, black, and Hispanic children.<sup>1,2</sup> Eating fruits and vegetables (FV) and engaging in physical activity (PA) promote healthy weight and encourage lifelong healthy habits.<sup>3</sup> However, many children do not meet FV/PA recommendations.<sup>3,4</sup> Children from low-income households face disproportionate barriers to adopting healthy lifestyles.<sup>5</sup> Public health interventions promoting nutrition and PA are needed to mitigate barriers.

The California Department of Public Health's *Power Play! Campaign (Power Play!)* targets low-income fourth/fifth-graders to achieve FV/PA recommendations. *Power Play!* demonstrated significant gains in FV consumption in 1995.<sup>6</sup> In 2005, PA was integrated; the revised classroom lessons demonstrated improvements in psychosocial factors related to FV/PA.<sup>7</sup> The current

Angie Keihner, MS, is with the University of California CalFresh Nutrition Education Program State Office, Davis, California. Nila Rosen, MPH, is with Informing Change, Berkeley, California. Patricia Wakimoto, DrPH, RD; Lauren Goldstein, PhD; Mark Hudes, PhD; and Lorrene Ritchie, PhD, RD, are with the Nutrition Policy Institute, Division of Agriculture and Natural Resources, University of California, Berkeley, California. Sharon Sugerman, MS, RD, FADA, is with the Center for Wellness and Nutrition, Public Health Institute, Sacramento, California. Kate McDevitt is with the Center for Community Health, Department of Pediatrics, University of California, San Diego, California.

Send reprint requests to Angie Keihner, MS, UC CalFresh Nutrition Education Program State Office, One Shields Avenue, 1103 Meyer Hall, Davis, CA 95616; akeihner@ucdavis.edu.

This manuscript was submitted November 25, 2014; revisions were requested February 2 and June 21, 2015; the manuscript was accepted for publication June 28, 2015.

Copyright © 2016 by American Journal of Health Promotion, Inc.  
0890-1171/00/\$5.00 + 0

DOI: 10.4278/ajhp.141125-ARB-592

study expands upon previous research by examining impacts on both FV and PA behaviors. Hypotheses were that participation in *Power Play!* improves FV intake and PA, compared with children not receiving the intervention.

## METHODS

### Design

A cluster randomized, controlled trial involving fourth/fifth-graders attending low-resource public schools in San Diego County was conducted. The Public Health Institute's Institutional Review Board approved the study.

### Sample

Power calculations were based on detecting a difference of .25-cup change in FV consumption between groups (5% type I error, 80% power, intraclass correlation of .033, and SD of 2.57 for change in FV intake<sup>6</sup>). Using 80% retention, 44 schools with 100 students per school were required ( $n = 4400$ ).

Of the 134 eligible low-resource schools (50% of students receiving free/reduced-price school meals), 44 San Diego County schools agreed to participate. Schools were grouped by district and then randomly assigned to the intervention ( $n = 22$ ) or control ( $n = 22$ ) group. From the baseline sample of 3987 students, 3463 students (1571 intervention and 1892 control) completed the follow-up (86.9% completion rate).

### Measures

Researchers obtained passive parental consent and student assent from all fourth/fifth-graders participating and collected identical measurements from study groups at baseline (winter 2011–2012) and follow-up (spring 2012).

In each classroom, students participated in a 45-minute motivational training session on completing a written 24-hour food diary and received a set of measuring cups/spoons. Students completed the diary with caregiver help. Using the diary and 2-dimensional/3-dimensional food models, a standardized 24-hour recall interview was conducted at school with each student. Food service managers confirmed school foods.

Following the motivational training session, researchers administered a 30-minute survey consisting of the Self-Administered Physical Activity Checklist<sup>8</sup> and self-administered questions on demographics. The Self-Administered Physical Activity Checklist was modified to be read aloud to the class, use fewer PA categories, and exclude PA intensity and sedentary activities. Children reported how many minutes they spent doing each activity yesterday: before school, during school (classroom, physical education, and recess/lunch), and after school.

### Intervention

The 10-week intervention included education during/after school and social marketing in the classroom, cafeteria, after-school program, home, and community settings. Teachers implemented a classroom FV/PA lesson each week (detailed description published previously<sup>7</sup>). Classroom lessons were reinforced with PA breaks, FV/PA promotions, and Harvest of the Month taste tests. Families were given bilingual (English/Spanish) materials with guidelines, recipes, and tips; and recipe samplings were held with cookbooks/stickers distributed. After-school programs also implemented FV/PA lessons and PA breaks. Lastly, posters were displayed in the classroom, in the cafeteria, at after-school programs, and in the community for visual reinforcement. Stipends of \$200/\$500 were provided to all participating teachers/schools, respectively.

### Analysis

Multivariate and logistic regression models assessed the impact on change in FV intake/PA from baseline to follow-up between study groups, adjusting for cluster design effects at the classroom and school levels. The baseline value for the outcome was included in each of these models along with demographic factors (i.e., gender, race/ethnicity, language spoken at home, age, and grade). All analyses were conducted using SAS version 9.3 (SAS Institute Inc., Cary, North Carolina).

## RESULTS

The sample was evenly split by gender and grade; age at baseline

ranged from 8 to 12 years, averaging  $9.74 \pm .68$  years. The primary race/ethnic group was Hispanic (41.4%) followed by other/mixed race (25.3%), non-Hispanic white (12.5%), Asian (9.1%), and non-Hispanic black (8.9%). Half of the children (48.9%) reported speaking English at home, whereas one-third (33.0%) used both English and Spanish. Students in the intervention group were less likely to report speaking English at home (45.1 vs. 52.1%,  $p < .001$ ), were slightly younger (9.68 vs. 9.81 years,  $p < .001$ ), and were more likely to be in fourth grade (52.6 vs. 46.7%,  $p < .001$ ), compared with control students.

Children's FV intake was similar between intervention and control groups at baseline (1.92 and 1.95 cups per day, respectively) and was more than a cup below the amount recommended.<sup>3</sup> The intervention group increased FV intake at follow-up, whereas the control group decreased FV intake, with a mean difference in change between groups of .26 cups ( $p < .001$ ). Most of this difference came from intervention students eating more whole fruit compared with control students (.18 cups more,  $p < .001$ ); a smaller amount was observed for vegetable intake (.10 cups more in intervention vs. control,  $p = .009$ ), with no significant difference between groups in fruit juice intake ( $-.02$  cups,  $p = .75$ ).

Total daily minutes of PA reported by both groups at baseline was nearly 2 hours (117.0 minutes for intervention; 118.9 minutes for control), double the amount recommended.<sup>3</sup> From baseline to follow-up, there was no significant difference between groups in change in total daily PA minutes ( $-5.1$  minutes,  $p = .43$ ). However, examination of PA at different times of day showed a significant increase during recess/lunch (5.1 minutes more,  $p = .003$ ) between baseline and follow-up among students in the intervention compared with the control group.

## DISCUSSION

### Summary

This study evaluated the impact of *Power Play!* on daily FV intake and PA time among fourth/fifth-grade children attending low-resource schools. Students participating in this 10-week

campaign showed significant gains from baseline to follow-up in FV consumption and PA time at school during recess/lunch compared with control children.

### Limitations

All student data were captured by self-report. Although the PA tool used was previously validated, comparing total daily PA minutes reported by children in this study with a similar statewide population (using a 2-day diary) suggests that PA was overreported by a half hour.<sup>5</sup> Given the large sample size, other time-consuming (e.g., 2-day diary) or objective (e.g., accelerometry) methods were cost prohibitive. Although minimized by use of a randomized, control study design, social desirability or recall bias may have impacted the data. This study was conducted in one California county with primarily urban schools and provided financial compensation to teachers and schools, limiting the generalizability of the findings. Lastly, the 10-week intervention period was too brief to determine long-term impacts.

### Significance

The nutrition education materials, recently updated to reflect the 2010 *Dietary Guidelines for Americans*, were effective in increasing FV intake, confirming previous campaign evaluations.<sup>6,7</sup> The increase in FV intake (.26 cups or ~.52 servings) is in line with previous school-based FV interventions (.32 servings) and represents a meaningful improvement (13% more FV daily) among low-income children.<sup>9</sup>

Students participating in *Power Play!* showed a small gain in PA during recess/lunch (5 minutes more per

### SO WHAT? Implications for Health Promotion Practitioners and Researchers

#### What is already known on this topic?

Children in the United States do not meet the FV/PA recommendations. Schools play a critical role and need pragmatic and effective strategies to promote nutrition and PA.

#### What does this article add?

*Power Play!* provides free resources and training and has the potential to improve diet among large populations of ethnically diverse children from low-income households in the United States.

#### What are the implications for health promotion practice or research?

Future efforts should explore policy, system, and environmental change strategies during and after school to increase PA among children; include longer-term follow-up to assess sustainability and optimal intervention length; and develop valid measures for large-scale PA interventions.

day), with no change in total daily PA minutes. A recent review similarly found that school-based PA interventions tend to show a small effect (4 minutes more per day) on children's overall PA levels.<sup>10</sup> Previous research also indicated the difficulty children face overcoming barriers to PA.<sup>7</sup> Collectively, this evidence suggests that efforts to improve children's PA may be more effective if schools and school districts institutionalize policies to increase the time designated for PA.

#### References

1. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of obesity and trends in body

mass index among US children and adolescents, 1999–2010. *JAMA*. 2012;307:483–490.

2. Ogden CL, Lamb MM, Carroll MD, Flegal KM. Obesity and socioeconomic status in children and adolescents: United States, 2005–2008. *NCHS Data Brief*. 2010;51:1–8.
3. US Dept of Agriculture, US Dept of Health and Human Services. *Dietary Guidelines for Americans, 2010*. Washington, DC: US Government Printing Office; 2010.
4. Fakhouri TH, Hughes JP, Brody DJ, et al. Physical activity and screen-time viewing among elementary school-aged children in the US from 2009–2010. *JAMA Pediatr*. 2013;167:223–229.
5. Keihnner A, Mitchell P, Linares A, Sugerman S. *Low-Income Children Face Healthy Lifestyle Barriers: Top Facts from California, 2009*. Sacramento, Calif: California Department of Public Health; 2011.
6. Foerster SB, Gregson J, Bealle DL, et al. The California Children's 5 a Day - Power Play! Campaign: evaluation of a large scale-social marketing initiative. *Fam Community Health*. 1998;21:46–64.
7. Keihnner AJ, Meigs R, Sugerman S, et al. The Power Play! Campaign's School Idea & Resource Kits improve determinants of fruit and vegetable intake and physical activity among fourth- and fifth-grade children. *J Nutr Educ Behav*. 2011;43(4 suppl 2):S122–S129.
8. Sallis JF, Strikmiller PK, Harsha DW, et al. Validation of interviewer- and self-administered physical activity checklists for fifth grade students. *Med Sci Sports Exerc*. 1996;28:840–851.
9. Evans CE, Christian MS, Cleghorn CL, et al. Systematic review and meta-analysis of school-based interventions to improve daily fruit and vegetable intake in children aged 5–12y. *Am J Clin Nutr*. 2012;96:889–901.
10. Metcalf B, Henley W, Wilkin T. Effectiveness of intervention on physical activity of children: systematic review and meta-analysis of controlled trials with objectively measured outcomes. *BMJ*. 2012;345:e5888.