

Salud America!

The Robert Wood Johnson Foundation Research Network to Prevent Obesity Among Latino Children

RESEARCH BRIEF

December 2011

Impact of Physical Activity on Physical Health and Academic Performance

Introduction

The physical well-being and academic progress of urban children and adolescents from families of lower socioeconomic status continues to be a challenge in the U.S.¹ This is especially true among Hispanic children ages 2 to 19, who are disproportionately affected by the obesity epidemic—38.2 percent of this population is overweight or obese, compared with 31.7 percent of all children those ages.² Finding new ways to increase physical activity among Latino youth is a promising strategy for improving their physical health and academic outcomes. Regular physical activity helps prevent and reduce obesity in children.³ The benefits of physical activity on academic performance also are promising.⁴

PRELIMINARY RESEARCH RESULTS

Our *Salud America!* pilot research study, “Integrating *DDR* to Promote Urban Latino School Children’s Physical Health and Academic Achievement: Project GAME,” examines the impact of a structured exercise program (e.g., the interactive video game *Dance Dance Revolution [DDR]*,⁵ during which players stomp on a dance mat to mimic the steps of an on-screen dancer; aerobic dance; jump rope; etc.) on physical fitness and academic performance among urban Latino children. We compared physical fitness levels and reading and math test scores of students who participated in the exercise intervention (with *DDR*) to those in a comparison group. Fitness was measured using the FITNESSGRAM test,⁵ including a 1-mile run and body mass index (BMI) assessment. The FITNESSGRAM accounts for age, gender

AUTHOR

Zan Gao, Ph.D.

Texas Tech University

PEER REVIEW

Peer review for this research brief was conducted by *Salud America!* National Advisory Committee Member Elva Arredondo, Ph.D., assistant professor, Division of Health Promotion and Behavioral Sciences, San Diego State University.

For more information about *Salud America!*, visit

www.salud-america.org

¹ Molnar, BE, Gortmaker, SL, Bull, FC, Buka, SL. “Unsafe to play? Neighborhood disorder and lack of safety predict reduced physical activity among urban children and adolescents.” *American Journal of Health Promotion*, 18(5): 78-386, 2004.

² Ogden CL, Carroll MD, Curtin LR, Lamb MM and Flegal KM. “Prevalence of High Body Mass Index in US Children and Adolescents, 2007–2008.” *Journal of the American Medical Association*, 303(3): 242–249, 2010.

³ Ogden, CL, Carroll, MD, Curtin, LR, McDowell, MA, Tabak, CJ, and Flegal, KM. “Prevalence of overweight and obesity in the United States (1999-2004).” *Journal of the American Medical Association*, 295: 1549-1555, 2006.

⁴ Nelson, MC, and Gordon-Larson, P. “Physical activity and sedentary behavior patterns are associated with selected adolescent health risk behaviors.” *Pediatrics*, 117: 1281-1290, 2006.

⁵ Cooper Institute for Aerobics Research. The FITNESSGRAM test administration manual (2nd ed.). Champaign, IL: Human Kinetics. 1999.



and growth curve when generating reports.⁵ Academic performance was measured using the students' reading and math scores from the Utah Performance Assessment System's Criterion-Referenced Tests. We also conducted in-depth interviews assessing students' experience in the exercise program with 13 randomly selected students each semester.

Our final sample included 208 students in grades 3–5 (ages 9 to 11) in an urban school in Utah. After obtaining baseline physical fitness and academic performance measures (Time 1), 4th grade students were assigned to the intervention and instructed to do 30 minutes of aerobic exercises three times a week (n=85) over 9 months. The 3rd and 5th graders served as a comparison group who did not participate in the exercise program at school (n=123). Physical fitness and academic performance measures were repeated nine months later (Time 2). The 3rd and 5th grade students were appropriate for a comparison cohort because 5th grade students at Time 1 were similar to 4th grade students at Time 2, and 3rd grade students at Time 2 were similar to 4th grade students at Time 1. We found no significant differences in the study variables (e.g., BMI, math scores) between the intervention group and comparison group at Time 1. Therefore, it is assumed that the age effect at the baseline can be neglected. Preliminary results include:

■ **Children who participate in a structured exercise program at school are more likely to improve their 1-mile run performance and math scores over time.**

Based on FITNESSGRAM testing results at Time 1 and Time 2, students were classified into four groups based on changes in status for “health fitness zone” and/or “needs improvement.” As shown in Table 1, significantly more intervention students maintained or improved their 1-mile run performance over time than did comparison students, whose running performance decreased far more often (Chi square=8.60, $p<.05$). BMI did not significantly change between groups. As shown in Table 2, both invention and comparison students showed improved math performance over time, and intervention students had significantly better math grades ($F(1, 206)=18.59$, $p<.01$), and slightly better reading grades than those in the comparison group over nine months.

Table 1

FITNESSGRAM individual reports for 1-mile run performance and BMI score

| Change from Time 1 to Time 2 | 1-mile run (Number of students) | | BMI (Number of students) | |
|------------------------------|---------------------------------|------------------|--------------------------|------------------|
| | Intervention group | Comparison group | Intervention group | Comparison group |
| HFZ→NI | 4 | 19 | 16 | 23 |
| NI → NI | 14 | 36 | 12 | 32 |
| HFZ → HFZ | 38 | 33 | 37 | 40 |
| NI → HFZ | 7 | 4 | 2 | 4 |

(Notes: Health fitness zone=HFZ; Need improvement =NI; HFZ→NI: children's scores fell in health fitness zone at the baseline, but fell in need improvement category at follow-up; NI → NI: children's scores fell in need improvement category at both baseline and follow-up; HFZ → HFZ: children's scores fell in health fitness zone at both baseline and follow-up; NI → HFZ: children's scores fell in need improvement category at the baseline, but fell in health fitness zone at follow-up)

Table 2

Student math and reading mean change scores

| | Math at Time 1 | Math at Time 2 | Math change score | Reading at Time 1 | Reading at Time 2 | Reading change score |
|---------------------------|----------------|----------------|-------------------|-------------------|-------------------|----------------------|
| Intervention group (n=85) | 2.55 | 3.23 | 0.68 | 2.77 | 2.92 | 0.15 |
| Comparison group (n=123) | 2.65 | 2.86 | 0.21 | 2.56 | 2.58 | 0.02 |

- **Interviews revealed that students believed the intervention program (featuring the *DDR* video game) benefited their physical fitness and academic performance.** Preliminary results from our student interviews show that students reported the intervention program helped them run faster, lose weight, and improve their general happiness, concentration and energy.

Conclusion and Policy Implications

Our preliminary findings suggest that implementing a structured school-based exercise program could significantly improve 1-mile run performance and math grades over time among urban Latino children. As expected, students who participated in a program that included *DDR*, aerobic dance and jump rope, had greater improvements in their 1-mile run tests over time than did students who did not participate in such a program. Similarly, other research suggests that interactive video games, such as *DDR*, can capture and maintain children's interest and promote a health-enhancing level of fitness in lab settings.^{6,7} Such findings provide preliminary empirical support for using interactive dance-based exercise to improve children's cardiovascular fitness and academic performance.

Some exercises, such as those generated by the *DDR* video game, have the potential to stimulate brain activity through timing and pattern-reading, which ultimately increases normal children's and ADHD children's success in math.⁸ Meanwhile, intervention students also had slightly increased reading grades over time (although there was no significant difference on the mean change score of reading grades), so it seems that children's reading capability also benefits from the exercise program over the school year. These findings can aid academics and schools as they aim to alleviate achievement gaps that are common in underserved Latino communities.

As we continue to collect and analyze data in the second year of our study, we expect that we will have more insightful findings. Specifically, in the second year, we tracked the three cohorts (4th, 5th and 6th graders) and assigned the exercise intervention to 4th graders. In this way, we will be able to further compare the effect of the intervention on children's physical fitness and academic outcomes with the comparison group. Our findings can help inform local policy decisions regarding school-based physical activity interventions, especially policies that can promote in-school physical activity participation among Latino children. Such findings also help demonstrate an association between regular physical activity and academic performance, as well as an association between regular physical activity and fitness level among school children. This research could help inform efforts to reduce obesity and academic achievement gaps among Latino children. Our preliminary results will be shared with the Rose Park Elementary School in Salt Lake City, a school already involved in this project, as well as with Hawthorne Elementary School in Salt Lake City and Cooper-North Elementary School in Lubbock, Texas, two schools that may potentially be involved in the *DDR* exercise program going forward.

⁶ Epstein, LH, Beecher, MD, Graf, JL, and Roemmich, JL. Choice of interactive dance and bicycle games in overweight and non-overweight youth. *Ann Behav Med*, 33(2): 124-131, 2007.

⁷ Lanningham-Foster, L, Jensen, TB, Foster, RC, et al. "Energy expenditure of sedentary screen time compared with active screen time for children." *Pediatrics*, 118: e1831-1835, 2006.

⁸ McGraw, T, Burdette, K, and Chadwick, K. "The effects of a consumer-oriented multimedia game on the reading disorders of children with ADHD." Retrieved March, 5, 2008, from http://www.edvantia.org/products/pdf/04Multimedia_ADHD.pdf, 2005.