

Lessons Learned: Promoting Children's Health through School-based Active Video Game Intervention

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Introduction of Active Video Games

The physical well-being 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 underserved minority children ages 2 to 19. For example, Hispanic children and adolescents 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]. It is well known that regular physical activity helps prevent and reduce obesity in children. Thus, finding new ways to increase physical activity opportunities among underserved urban children is a promising strategy for improving their physical health.

Active video games (AVG) refer to some types of video games that are also a form of exercise. Although traditional sedentary video games have been blamed for children's increased sedentary lifestyle, AVG has been considered fun and entertaining ways for children to develop a physically active lifestyle [3,4]. Recent efforts have examined the benefits of AVG as a means for population-based PA intervention. However, investigations have been primarily conducted in laboratory settings with small samples of non-Hispanic white individuals [5-9]. Although underserved urban children have both a disproportionately higher rate of obesity and health problems [1], few studies have been conducted to investigate the effects of AVG that promote physical activity on physical activity participation and health-related physical fitness in this population. In response, the project GAME (Gaming Approaches for More Exercise) was designed to examine the impact of an AVG-based exercise program on urban children's daily physical activity levels, cardio respiratory endurance and body composition.

Project GAME

This project was funded by Robert Wood Johnson Foundation from 2009-2011. The goal of the project was to examine the impact of an AVG (Dance Dance Revolution [DDR]) based exercise during school recess periods on underserved urban children's physical activity levels and health-related physical fitness. The following measurable goals were set for the project: (1) children's 1-week physical activity levels; and (2) children's health-related physical fitness measured by FITNESSGRAM [10]. Specifically, the researchers measured the following components of health-related physical fitness: a cardio respiratory endurance assessment (1 mile run) and two body composition assessments (Body Mass Index [BMI] calculated by height and weight, percent of body fat measured by skin fold; important obesity index). Children's 1-week physical activity levels were also measured via the self-reported SPARK physical activity checklist.

In this project, the researchers measured four indices (physical activity levels, 1 mile run, BMI, and percent of body fat) four times over time (August 2009, May 2010, August 2010, and May 2011). The target population was 268, 3rd through 5th grade students recruited

from Rose Park Elementary School, Salt Lake City in August 2009. This school had no physical education class. Specifically, the 4th grade children were assigned to the intervention group playing 30-minute DDR-based exercise three times per week; while 3rd and 5th grade children were in the comparison group in the first year. The comparison children did not participate in any structured exercise at school. Rather, they only had the conventional unstructured recess in the classroom (i.e., sitting or walking) or the outside field (i.e., playing in the playground). This cohort was then tracked to the second year. The 4th grade children were again assigned to the intervention group in the second year, while 5th and 6th grade in the second year were in the comparison group. The participants had multiple assessments of their daily physical activity levels and physical fitness across time. By the end of the second year, the final sample comprised of 165 urban students with valid data.

Findings and Challenges

The major findings of this project [11] include:

- Intervention children (4th grade children) are more likely to improve their daily physical activity levels over time.
- Intervention children (4th grade children) are more likely to improve their 1-mile run performance over time.
- There were no significant differences on children's gain scores of body composition between the intervention children and comparison children over time.

The researchers encountered an internal challenge during the implementation of the project. At the very beginning, DDR was proposed as the only intervention strategy in the proposal. However, it was noticed that some children were off task (e.g., playing marbles on the floor, chasing around on the stage) when playing DDR in the gym for 30 minutes during our pilot study in year 2008-2009. This was due to children's short attention on DDR and caused discipline problems and safety issues. Thus, a center activity station (e.g., aerobic dance, jump rope, etc.) was added in the Fall of 2009. Specifically, the children were split into two groups: one group played DDR for 15 minutes at eight DDR stations in the gym, while the other group played center activities for 15 minutes, then the groups switched. In this way, all the children were active and on tasks. This change was effective and positive to the project.

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Several external challenges were also encountered during the course of the project. First, it was challenging to integrate the intervention program into the school's curriculum. As known, there was no structured physical education or physical activity programs at this school. There were only two-15 minute daily school recess periods. Following discussions with the school principal and the classroom teachers, the researchers combined the two-15 minute daily recess periods into one 30-minute physical activity program, and offered the fourth grade children three 30-minute DDR-based exercise programs per week. Second, the researchers encountered resistance from one 3rd grades and one 5th grade classroom teacher based on their concern that the intervention program and measurements were taking away from the children's instructional time. It was disappointing, but the research team had to deal with it. Eventually both sides reached an agreement to only conduct the assessments of the 3rd and 5th grade children twice a year. Fortunately, the Foundation granted the research team the flexibility to make adjustments to the original proposed scope of work, which made it possible for us to successfully implement the project while taking into account the "real world" challenges that emerge when working in urban school settings.

Lessons Learned

In the process of implementing and executing this project, we took the following steps in the planning stages to involve key stakeholders. In 2008-2009, the researchers received extensive support from Salt Lake City school district and Rose Park Elementary school administrators. During the conceptualization process of the project, the researchers held three meetings with the principal of Rose Park Elementary School, the Community School Manager, and several classroom teachers regarding the initiation and implementation of the project at the school site. They provided insightful suggestions and comments that helped us avoid the effects of extra confounding factors on the study variables. The classroom teachers also cooperated fully with the research team. In December 2008 and May 2009, the research team successfully set up a DDR booth during the parental fairs at the school site, which greatly stimulated the interests of the students and their parents. Hence, it is very important to introduce the intervention program to the key stakeholders, and let them buy in the program idea before the initiation of the project.

During the implementation of the project, the researchers held regular meetings with the school principal, the Community School Manager and the classroom teachers to deal with multiple issues as they occurred within the program over time. For example, it was not easy to integrate the intervention program into the school's curriculum. Before the program was started, the researchers discussed this issue with the principal and some classroom teachers, and decided to provide the 4th grade children three 30-minute DDR-based exercises per week. Another example was the change of the intervention activity. As mentioned earlier, DDR was proposed as the only intervention strategy in the proposal. However, after identifying the fact that some children were off task during the pilot study, the researchers had several meetings with the principal and classroom teachers and added a center activity station (e.g., aerobic dance, jump rope, etc.) at the beginning of the program. With this change, all the children were active and on task. Thus it is critical to communicate with the key stakeholders (e.g., school administrators, teachers) for any kind of school-based physical activity intervention.

Overall, the implementation strategies worked well among urban elementary school children over time. As a result of the project, the Salt Lake School District supported this program, and built the

connections between the research team and another elementary school – Howthorne Elementary School. The researchers implemented another DDR program at Howthorne Elementary School in the spring of 2010. This school had a 30-minute physical education class every week, and another 30-minute DDR was offered for all the 4th, 5th, and 6th grade children every Thursday. The DDR has been well received by both the students and teachers at that school site, and the researchers received all kinds of thank-you notes from them by the end of the program. Recently the primary researcher has established AVG labs at three elementary schools in Texas and one elementary school in Minnesota to implement the school-based AVG program. The primary researcher conducted a pilot study in 2011-2012, and received very positive responses from the school administrators, teachers, and students. In June of 2012 the primary researcher was awarded a 3-year research grant by National Institute of Health to support the AVG programs at schools. Hopefully with the federal support, the researchers will be able to expand the AVG program to a larger scale.

In sum, based upon our experiences and lessons learned from the project GAME, below are the major issues that should be aware of when implementing the AVG program at school-based settings:

(1) Integrate the AVG program into the schools' overall curricular as a supplement for school physical education program or infuses the AVG program into the physical education curriculum. Specifically, the AVG program has been integrated into the overall curricular as AVG/brain gym class beyond physical education class in two Texas schools and one Minnesota school. On the other hand, the AVG program has been included as one learning component in physical education class in one Texas school and the Minnesota school.

(2) Provide at least eight different AVGs (e.g., DDR, Wii Just Dance, Wii Cardio Workout, Wii Just Dance, Wii Fit, Xbox Kinect Sports) to motivate children to be active. This offers a friendly environment that provides choices and autonomy to all intervention children, intrinsically motivating them to be physically active and be fully engaged during the AVG program.

(3) Stay current with the video games. A number of AVG programs have been incorporated into school settings with multiple gaming systems. For example, for the AVG/brain gym class at each intervention school, 12 AVG stations have been set up in the specific rooms at the school sites, with each station being equipped with various games in three gaming systems (PS3, Wii, Xbox), such as DDR, Just Dance, Just Dance for Kids, Wii Dance Workout, Xbox Dance Central, and Xbox Kinect Ultimate Sports.

(4) Set up multiple AVG stations to allow structured play among children. With structured play children rotate from one AVG to another AVG for specific time limits. At each station, one specific AVG is provided. Each station accommodates up to two children to play, and children will rotate from one station to another station every 8-10 minutes allowing for short duration transition. As such, all children in one class have the opportunity to play AVG simultaneously, and are able to play different AVG activities during the program.

(5) Appoint a full-time teacher at each school to supervise the AVG program. In general, when the AVG program is integrate into the schools' overall curricular as a supplement program, full-time school personnel is required to run the program to make the program sustainable. If the AVG program is infused into the physical education curriculum, the physical education teachers usually take the responsibility to run the AVG program.

(6) Deal with cost and funds, space and logistical issues. No

doubt, cost is always a primary concern with any school-based AVG program. Researchers can think of securing research funds from instrumentation grants of internal resources, private foundation and federal government to establish AVG programs. Other resources include soliciting donations from the manufacturers and franchise such as Walmart and local banks, as well as organizing fundraising at local communities. Space also can be an issue for establishing any AVG lab. It is plausible to develop the facility in phases that will progressively introduce, implement and evaluate AVG as a component of physical activity. The research team is fortunate to have the fully support from the schools. For instance, the two schools in Texas offered nearly 1,000 square feet rooms for the AVG labs respectively. In addition to limited space, noise of AVG is a must consideration. Housing the AVG lab near academic classrooms sometimes is problematic. It is desirable to build the AVG lab adjacent to the school gym. Other lessons learned in the Project GAME include the ideal location of electrical outlets, the placement of electrical cords, the indoor lighting system, and the type of flooring.

Public Health Implications

The project yielded meaningful findings that implementing an AVG-based exercise program can have a significantly positive effect on urban children's physical activity participations and cardio respiratory fitness over time. This project reached many children and their families during the process of its implementation. It not only provided an exercise opportunity to urban school children, but also served as a good strategy to shape children's behavior and attitudes at school. It also offered a great opportunity for the research team to investigate the effect of such intervention on children's health outcomes. As of today, we have implemented the AVG programs at seven schools, including six elementary schools and one junior high school, as well as a home school community. Based on our research findings and field observations, the vast majority of children loved playing AVG, and they were physically active during the program. We are confident that the AVG program would work in other communities such as fitness centers or rehabilitation centers.

In closing, we think that the project will make a significant contribution to the effort of the U.S. to achieve the goal of promoting a physically active lifestyle and reducing the prevalence of childhood obesity. The project is important and practical for school leaders and the local community in identifying and implementing appropriate intervention programs to reverse childhood obesity epidemic among underserved urban children.

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