Effective School Interventions To Combat Childhood Obesity: Summary of Literature Review

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PHP Capstone Experience

Introduction

- Childhood obesity is a major public health concern, with nearly one-third of children in the U.S. considered overweight or obese. [a]
- The CDC considers a child overweight if he has a BMI-for-age in the 85th–95th percentile, and obese if he has a BMI-for-age ≥95th percentile.[b]
- Factors that contribute to childhood obesity include lack of exercise, sedentary activities such as playing video games and watching television, and consumption of high-calorie foods and beverages.
- Schools can be ideal settings for implementing obesity-prevention programs focused on physical activity and nutrition offerings, activities, and education.

a. American Heart Association 2014. Available from: http://www.heart.org/HEARTORG/GettingHealthy/HealthierKids/ChildhoodObesity/What-is-childhood-obesity_UCM_304347_Article.jsp. Accessed February 13, 2014.
b. Centers for Disease Control and Prevention 2014. Available from: http://www.cdc.gov/healthyyouth/obesity/facts.htm. Accessed February 13, 2014.

Thesis Statement

More and more researchers are reporting empirical evidence that obesity prevention interventions implemented in school settings are effective means for preventing overweight and obesity among children.

Research Question:

Which types of childhood obesity prevention interventions implemented in schools have shown the most effectiveness?

Literature Search

* **Searched *Academic Search Premiere*, *EbscoHost*, and *Google Scholar***
* **Search period was March 1999–March 2014**
  * Review spanned 15 years to show a possible progression of interventions
* **Study inclusion criteria**
  * Study or evaluation conducted in a school setting
  * Primary study (not systematic review or meta analysis)
  * Included both pre and post measurements and/or reported quantative evaluation outcomes
  * Included a control group for comparison
  * Published in English

Relevant Theories among Included Studies

- **Physical activity interventions are more effective**
  - **Fitness programs**
  - **Afterschool games and sports**
  - **PA education, delivered during class or in special sessions**

- **Nutrition interventions are more effective**
  - **Healthy snack offerings**
  - **Nutrition education**
  - **Nutrition policy**

- **Combination of PA and Nutrition interventions are most effective**

- **Social Marketing is an important component.**

- **Community and parental outreach can be useful tools.**

- **Promotion of reducing screen time is a factor in increasing physical activity.**

- **Promoting fruit and vegetable consumption is a factor in improving nutrition.**

Overview of Included Studies

Study types: 5 Randomized control trials, 4 evaluations, 1 experimental field trial

Intervention components were similar among studies; most were multi-component

Outcome measures varied among studies:

- BMI, fat percentage, or cardio fitness—5 studies
- Increases in physical activity—3 studies
- Improvements in school nutrition—1 study
- Dietary intake—3 studies
- Student behavior modification—2 studies
- Attitudes, knowledge, or beliefs—2 studies
- Body image—1 study
- Satisfaction with implementation process—1 study

Note: Most studies included more than 1 component and had multiple outcome measures. Some studies were a combination of a trial and an evaluation.

The following 7 slides are included to describe the differences among the study interventions reviewed.

STUDY #1, Author: Sahota 2001[1]

Intervention: APPLES (Active Programme Promoting Lifestyle Education in School—a health promotion program to reduce obesity risk factors and to evaluate implementation and effectiveness.
Type of Study: Evaluation of randomized controlled crossover trial
Study Population: 634 children aged 7–11 years.
Setting and Duration: 10 primary schools in Leeds United Kingdom, over 1 academic year.
Outcome Measures: Questionnaire response rates; teachers' evaluation of training; success of school action plans; content of school meals; student knowledge & self-reported behavior.
Results: 64% of parents responded to questionnairs; all teachers attending training reported satisfaction; 76% of school action plans achieved; positive changes in school meals; students demonstrated increased knowledge, healthier eating behaviors, and increased physical activity.
Conclusion: Program was successful.

STUDY #2, Author: Caballero 2003[2]

Intervention: Pathways—a school-based multicomponent intervention for reducing body fat among American Indian students.
Type of Study: Evaluation of randomized controlled trial.
Study Population: 1704 students grades 3–5.
Setting and Duration: 41 schools in Arizona, New Mexico, and South Dakota, over 3 years.
Outcome Measures: Body fat percentage; dietary intake; increased physical activity; and knowledge, attitudes, and behaviors.
Results: No significant reduction in body fat percentage; significant reduction in fat energy percentage; no increase in activity level among study group compared with controls; positive changes in knowledge, attitudes, and behaviors.
Conclusion: Mixed results; more intense interventions needed.

STUDY #3, Author: Salmon 2005[3]

Intervention: Switch-Play—a program designed to prevent weight gain in children by reducing sedentary behaviors, increasing physical activities, or both.
Type of Study: Process evaluation.
Study Population: 397 children aged 10 years in grade 5.
Setting and Duration: 3 government primary schools in Melbourne, Australia, over 12 months.
Outcome Measures: Behavior modification, as related to reducing sedentary activities; fundamental motor skills.
Results: >50% of students reported reducing TV screen time, but <50% reported increasing physical activity
Conclusion: Program was successfully delivered.

STUDY #4, Author: Gortmaker 1994[4]

Intervention: Planet Health—a behavior intervention comprising educational sessions incorporated into existing curricula to decrease TV viewing, decrease consumption of fatty foods, increase fruit and vegetable consumption, and increase physical activity.
Type of Study: Randomized controlled trial.
Study Population: 1295 students in grades 6–7.
Setting and Duration: 4 public schools in Massachusetts, over 2 academic years.
Outcome Measures: Obesity, as measured by BMI and triceps skinfols.
Results: Prevalence of obesity reduced among intervention girls compared with controls, but no differences found among boys; TV viewing was reduced and fruit and vegetable consumption was increased among boys and girls in intervention group.
Conclusion: Program was successful among girls.

STUDY #5, Author: Foster 2008[5]

Intervention: School Nutrition Policy Initiative—a multicomponent intervention to decrease overweight and obesity among children.
Type of Study: Randomized controlled trial.
Study Population: 1349 students grades 4–6.
Setting and Duration: 10 Mid-Atlantac U.S. schools, over 2 years.
Outcome Measures: Primary–incidence of overweight and obesity after 2 years; Secondary–prevalence of overweight and obesity, BMI *z* score, energy and fat intake, fruit and vegetable consumption, body satisfaction, physical activity.
Results: 50% reduction in incidence and of overweight among intervention schools; decreased prevalence of overweight among intervention children; no differences observed in incidence or prevalence of obesity after 2 years.
Conclusion: Intervention proven to be effective.

STUDY #6, Author: Gortmaker 1999[6]

Intervention: Eat Well and Keep Moving—a health behavior program targeting diet and physical activity, and delivered through classroom instruction materials focused on decreasing consumption of high-fat foods and increasing fruits and vegetables, reducing TV viewing, andi ncreasing physical activity.
Type of Study: Evaluation of impact of a quasi-experimental field trial.
Study Population: 479 students in 4th grade.
Setting and Duration: 14 schools in Baltimore, Maryland, over 2 years.
Outcome Measures: Dietary intake, physical activity.
Results: Reductions in total energy intake from fat; increases in fruit and vegetable consumption; and slight reduction in TV viewing among intervention students compared with controls.
Conclusion: Evaluation showed effectiveness for improving dietary intake and decreasing television viewing time.

STUDY #7, Author: Yin 2005[7]

Intervention: FitKid—a physical activity program conducted after school to reduce adiposity in children. The program was 2 hours/day and included academic enrichment, a healthy snack, and fitness activities.
Type of Study: Randomized control trial.
Study Population: 601 students in 3rd grade.
Setting and Duration: 18 Georgia public schools, over 3 years.
Outcome Measures: Body fat percentage; bone mineral density; cardiovascular fitness.
Results: Youth in intervention group showed reduction in body fat, gain in bone mineral density, and reduction in heart rate compared with children in control group.
Conclusion: Program was successful, generalizable to most public schools.

Conclusion

School-based programs can be successfully implemented and can reduce childhood obesity through a number of physical activity and nutrition interventions.

The most successful programs combine physical activity and nutrition components.

Programs work best when implemented among younger children.

A systematic approach to combating childhood obesity is ideal.

All stakeholders should be involved in the process—parents, students, school administrators, teachers, community leaders, elected officials, etc.

Major Limitations Encountered among Studies

* Small Sample Sizes
* Publication Bias
* Non-generalizability of some programs
* Confounding factors
* Threats to internal validity—attrition, instrumentation, contamination, selection bias, history, and statistical regression

Evidence Gaps

* Limited studies among high school students
* Cost-benefit and cost-effectiveness analyses of specific interventions
* Longitudinal studies that track results over years through periodic measurements
* Studies that account for effect differences between girls and boys

Recommendations

* Interventions implemented in schools should be multicomponent, combining education, physical activity, and nutrition efforts.
* Interventions should start in elementary schools and be supported throughout all grades.
* Policies at the school district levels should be implemented (e.g., mandatory daily PE time, more time for recess).
* Environmental changes should be made to facilitate physical activity (e.g., walking trails, playground fitness equipment, sidewalk improvements.)

Considerations for Implementation

Intervention costs might limit the scope of a program.

Support from parents, teachers, administrators, and other stakeholders is necessary, but can often be limited.

The limited time in a school day might be prohibitive to certain programs that are extracurricular and require additional time.

Social justice and socio-economic status of program participants should be considered when implementing interventions and evaluating outcomes.

Interventions might create risk for increasing body-image concerns among youth, especially among girls.

Causal factors might be different between girls and boys.

The summer months when children are out of school can slow the momentum of long-term interventions.

Included Studies

1. Sahota P, Rudolf MCJ, Dixey R, Hill AJ, Barth J, Cade J. Evaluation of implementation and effect of primary school based intervention to reduce risk factors for obesity. *BMJ* 2001;323:1–4.

2. Callabero B, Clay T, Davis SM, Ethelbah B, Rock BH, Lohman T, et al. Pathways: a school-based, randomized controlled trial for the prevention of obesity in American Indian schoolchildren. *Am J Clin Nutr* 2003; 78(5):1030–8.

3. Salmon J, Ball K, Crawford D, Booth M, Telford A, Hume C, et al. Reducing sedentary behavior and increasing physical activity among 10-year-old children: overview and process evaluation of the 'Switch-Play' intervention. Health Promotion Int 2005;20(1):7–16.

4. Gortmaker SL, Peterson K, Wiecha J, Sobol AM, Dixit S, Fox MK, et al. Reducing obesity via a school-based interdisciplinary intervention among youth: Planet Health. *Arch Pediatr Adolesc Med.* 1999;153(4):409-18.

5. Foster GD, Sherman S, Borradaile KE, Grundy KM, Vander Veur SS, Nachmani J, et al. A policy-based school intervention to prevent overweight and obesity. *Pediatrics* 2008;121(4); pp. e794 -e802. Available from http://pediatrics.aappublications.org/content/121/4/e794.short%20(2008. Accessed March 3, 2014.

6. Gortmaker SL, Cheung LWY, Peterson K, Chomitz G, Cradle JH, Dart H, et al. Impact of school-based interdisciplinary intervention on diet and physical activity among urban primary school children: Eat Well and Keep Moving. *Arch Pediatr Adolesc Med* 1999;153(9):975-83.

7. Yin Z, Gutin B, Johnson MH, Hanes Jr. J, Moore JB, Cuvnar M, et al. An environmental approach to obesity prevention in children: Medical College of Georgia FitKid Project Year 1 results. Obesity Research 2005;13(12):2153–61.