I, Demaree K. Bruck, hereby submit this original work as part of the requirements for the degree of Master of Arts in Psychology.

It is entitled:
Effectiveness of a Participatory, School-Based Program to Promote Nutrition and Physical-Activity Among Urban Elementary School Students

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Effectiveness of a Participatory, School-Based Program to Promote Nutrition and Physical-Activity Among Urban Elementary School Students

A thesis submitted to the
Graduate School
of the University of Cincinnati
in partial fulfillment of the
requirements for the degree of

Master of Arts

in the Department of Psychology
of the College of Arts and Sciences
by

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B.A., Michigan State University

July 2009

Committee Chair: Farrah Jacquez, Ph.D.
Abstract

The prevalence of obesity among children and adults has more than doubled since the 1970s, with prevalence even higher among low-income and minority youth (Wang & Beydoun, 2007; Ogden et al., 2010). Despite the increased rates among minority youth and the negative consequences associated with obesity, very few intervention programs have been conducted to improve their healthy lifestyles. The purpose of this study was to evaluate the effectiveness of a school-based obesity prevention program that utilized student-driven media production to improve knowledge, behaviors, self-efficacy, and perceived barriers related to healthy eating and physical activity in a group of ethnically diverse students. A comparison group and pre/posttest measurements were used to assess the effectiveness of the 10-week program. The sample (N=66) included participants whose ages ranged from 9 to 13 and were predominantly Hispanic (45.5%) and African American (43.9%). The intervention group showed a greater increase in self-reported healthy lifestyle choices, $F(1,62) = 5.59, p = .021$, and greater decrease in perceived difficulty, $F(1,62) = 6.41, p = .014$, compared to those in the control group. In addition, the intervention group increased significantly from pretest to posttest on measures of healthy lifestyle choices, beliefs, and knowledge, and decreased significantly from pretest to posttest on measures of perceived difficulty. There were no significant changes from pretest to posttest on any of the outcome measures for the control group. This school-based obesity prevention program appears to be a promising participatory strategy for improving the knowledge, behaviors, self-efficacy, and perceived barriers related to healthy eating and physical activity among a diverse sample of students.
Acknowledgements

I would like to thank several important people who helped me to complete this very important milestone in my academic career. First, I would like to thank my committee chair, Dr. Farrah Jacquez, for her unwavering support, encouragement, and guidance throughout this project. I would also like to thank Dr. Monica Mitchell and Dr. Lisa Vaughn for sharing their invaluable pieces of advice and expertise. A special thank you to Dr. Sarah Whitton for setting aside time to offer her statistical expertise and to guide me through the data analysis process. In addition, I would like to thank Maria Lang for making it possible for me to do this project in the school setting and for coordinating with all of the teachers involved. I would like to give a special thanks to the University of Cincinnati Research Council, the University of Cincinnati Department of Psychology’s Frakes Research Fund, and the LULAC Ford Foundation for providing financial support for this project. Finally, I would like to thank Revere and my family for their support throughout this project and my academic career. I couldn’t have done any of this without them.
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Introduction

According to the National Health and Nutrition Examination Survey (NHANES), approximately 32% of children and adolescents (ages 2 to 19) in the United States have a BMI at or above the 85th percentile for age. Additionally, the rate of child and adolescent obesity (17% or 12.5 million; ages 2 to 19) has tripled since 1980 (Ogden et al., 2012). Data suggests that the prevalence of childhood obesity has increased in all age groups. Between 1976–1980 and 2009–2010, obesity increased from 5% to 12% among preschool children ages 2 to 5 years and obesity increased from 7% to 18% among 6 to 11-year-olds. Obesity also increased from 5% to 18% among 12 to 19-year-olds during the same period (Ogden et al., 2012).

Childhood obesity is a well-documented health disparity, with higher rates of overweight and obesity observed in low income and minority youth compared to their middle class White peers. The prevalence of overweight and obese youth, ages 2 to 19, continues to be higher among African American (39%) and Latino (39%) children and adolescents compared to Caucasian youth (28%) (Ogden et al., 2012). Additionally, during the past 12 years (1999-2010), the odds of being obese were significantly higher for African American males and females and Latino males and females compared with both Caucasian males and females after controlling for age and survey period (Ogden et al., 2012). Given what is known about the likelihood for childhood obesity to track into adulthood and the associated long-term negative health consequences later in life, it is easy to understand why these disparities in child and adolescent obesity are a major public health concern.

Consequences of Child and Adolescent Obesity

Overweight and obese children are at increased risk to be overweight of obese in adulthood (Deckelbaum & Williams, 2001). In fact, overweight children and adolescents have a
70% chance of becoming overweight or obese as adults, which increases to 80% if at least one parent is overweight or obese (U.S. Department of Health and Human Services [DHHS], 2007). Additionally, a myriad of consequences have been shown to accompany childhood overweight and obesity. Children who are overweight or obese are likely to experience issues related to their psychological functioning and physical health (Hayden et al., 2005; Latner & Strunkard, 2003; Richardson & Royce, 1968; Puhl & Latner, 2007). Associated health issues that were once found only in adults, such as type 2 diabetes, cardiovascular disease, nonalcoholic fatty liver disease, hypertension, asthma, sleep apnea, and some forms of cancer, are now appearing in overweight and obese children and adolescents (Dietz & Robinson, 2005; Schwimmer, Burwinkle, & Varni, 2003; Yanovski & Yanovski, 2011). Research has shown that as many as 45% of newly diagnosed diabetes cases in children are type 2, which was once referred to as “adult onset” diabetes and is generally preventable with proper diet and physical activity. At least 65% of people with diabetes die of heart disease or stroke when the disease is left untreated (American Heart Association [AHA], 2011). In addition to the increasing rates of type 2 diabetes, a study of overweight children (ages 5 to 10) found that approximately 60% had at least one risk factor for heart disease such as high cholesterol, high triglycerides, high insulin or high blood pressure and 25% had two or more risk factors (Friedemann et al., 2012).

Additionally, excess weight at a young age has been linked to higher and earlier death rates in adulthood (Krebbs et al., 2007). Former Surgeon General Richard Carmona offered a somber description of the childhood obesity problem saying, “Because of the increasing rates of obesity, unhealthy eating habits and physical inactivity, we may see the first generation that will be less healthy and have a shorter life expectancy than their parents” (as cited in AHA, 2011, p. 1; Carmona, 2004). As adolescents and teens transition into young adulthood, studies have found
that their dietary habits, physical inactivity, and rates and degree of obesity worsen; making early preventative measures and intervention programs even more critical (Biro & Wien, 2010).

**Determinants of Child and Adolescent Obesity**

In order to design and implement effective obesity prevention programs it is imperative that we increase our understanding of the causes of obesity among children and adolescents. Individuals become overweight or obese due to a calorie imbalance; that is, when calorie consumption exceeds calorie expenditure (Rosin, 2007). Specifically, childhood obesity can be attributed to genetic susceptibility, in combination with lifestyle and environmental risk factors that impact diet or physical activity level; however, this relationship isn’t so easily understood. Some risk factors are common (prevalence >10%) but not modifiable, such as the combined effect of multiple genetic variants. Other risk factors are both common and modifiable, such as high levels of television viewing; low levels of physical activity; parents’ inactivity; and high consumption of dietary fat, carbohydrate, and sweetened drink (Kipping, Jago, & Lawlor, 2008). A better understanding of the etiology of obesity can inform the design and implementation of prevention programs and interventions, by targeting these modifiable risk factors.

**Physical activity and sedentary behaviors.** There is a strong association between a lifestyle characterized by a lack of physical activity and excessive inactivity and subsequent weight gain. Data from the School Health Policies and Practices Study (SHPPS), a national survey conducted to assess school health policies and practices at the state, district, school, and classroom levels, indicate that almost one in four children do not participate in any free-time physical activity (Center for Disease Control and Prevention [CDC], 2007). Data from the 2009 National Youth Risk Behavior Survey (YRBS) indicated that more than 30% of students reported spending three or more hours a day watching TV. Additionally, 31% of youth reported
using the computer for three or more hours a day for something that was not related to school (CDC, 2009). The sedentary lifestyle behaviors of children and adolescents have increased over the years, which in conjunction with decreased physical activity, is likely associated with the increasing rise in childhood obesity. In fact, a prospective study conducted to examine the effects of television viewing on obesity risk among children found that physical activity was inversely associated with BMI change in girls, and media time (watching television or videos, playing video or computer games) was directly associated with BMI change in both sexes (Berkey et al., 2000).

Nutrition. Several dietary factors are related to childhood and adolescent obesity, including increased intake of energy-dense foods and beverages. Increased consumption of sugar-sweetened beverages has been linked to increased risk of developing obesity in adolescence. Findings from randomized controlled studies found that reducing children’s consumption of such beverages could reduce their weight gain and fat accumulation (de Ruyter, Olthof, Seidell, & Katan, 2012; Ebbeling et al., 2012). In one of these studies the intervention group had almost completely eliminated the consumption of sugar-sweetened beverages after one year of intervention and consumption of these beverages was still reduced in this group after an additional year without intervention. Increases in BMI were significantly smaller in the intervention group compared to the control group after one year (Ebbeling et al, 2012).

There is also evidence that the consumption of nutrient-dense foods (i.e., vegetables, fruits, whole grains, etc.) is decreasing while the consumption of energy-dense foods is increasing, which is associated with increased weight (Ebbeling, Pawlak, & Ludwig, 2002). The US Department of Agriculture's (USDA's) food guide has increased the recommended amounts from previous guidelines (USDA, 2010). Depending on caloric requirements, daily
recommendations for adolescents range from 1.5 cups to 2.5 cups of fruits and from 2.0 cups to 3.0 cups of vegetables (USDA, 2009). Data from the 2003–2004 NHANES suggests that fewer than 1 in 10 Americans meet their recommended daily allowance of fruits or vegetables (Kimmons, Gillespie, Seymour, Serdula, & Blanck, 2009). In fact, among adolescents (aged 12 to 18) the median intake of fruit was 0.51 cup. The primary contributors to total fruit intake among adolescents were fruit juices, such as orange juice, as opposed to whole fresh fruit. This is important to note because for children older than 6 months, fruit juice offers no nutritional benefits over whole fruits. In fact, according to daily nutritional guidelines fruit juice should be limited to 4 to 6 ounces children (ages 1 to 6) and 8 to 12 ounces for adolescents (ages 7 to 18) (American Academy of Pediatrics, 2013). Additionally, potatoes dominated vegetable consumption among adolescents, as fried potatoes increased the median vegetable intake from 0.72 cup to 1.21 cups per day. Dark green and orange vegetables and legumes accounted for a small portion of vegetable intake, and few adolescents met the recommendations (Kimmons et al., 2009).

**Other environmental factors.** Food commercialism, media and technology, and urban and socioeconomic developments contribute to the creation of what is termed ‘obesogenic environments’ that nurture over-eating and inactive lifestyles (Maziak, Ward, & Stockton, 2008). The average child in the United States views 15 television food advertisements every day and unfortunately, a vast majority of these marketing schemes promote calorie-dense, low-nutrient foods, further contributing to the obesity epidemic (Harris, Pomeranz, Lobstein, & Brownell, 2009). Research has shown that food marketing has direct influences on children’s food preferences, knowledge and behavior. Studies of food preferences using experimental designs have consistently shown that children exposed to advertising will choose advertised food
products at significantly higher rates than children who were not exposed (Story & Simone, 2004). Similar results were seen in observational studies of mother-child pairs shopping, where children's exposure to food television advertising increased the number of attempts children made to influence food purchases their parents buy (Story & Simone, 2004).

**Other barriers to healthy lifestyle choices.** While the relation between childhood obesity and environmental and lifestyle risk factors are quite apparent, additional factors should be taken into consideration, such as the individual level barriers that interfere with youth making positive choices related to nutrition and physical activity. Goh et al. (2009) conducted focus groups with youth who identified several barriers to making healthy food choices and to being physical active. Interestingly, the youth identified their own lack of knowledge, awareness, and motivation as barriers to making healthy food and physical activity choices. Additionally, the youth offered ideas about possible nutrition interventions such as media literacy education, greater focus on nutrition in the school health curriculum, and weekend cooking classes for families. Youth also suggested that students would be more receptive to health messages from other students than from adults (Goh et al., 2009).

In order to bring about positive changes, future obesity prevention programs and interventions must address factors that put youth at increased risk for becoming overweight or obese. Prevention programs should focus on teaching youth how to navigate the food service industry in order to make quick, informed, and healthy food decisions. In addition, strategies should be employed to prevent excessive caloric intake, to decrease time with TV/videos/games, and to increase participation in a wide variety of physical activities. Given the fact that most children and adolescents are not consuming enough fruits and vegetables, prevention programs should also incorporate educational components about daily nutrition recommendations. It isn’t
enough to just tell individuals what to eat and why; prevention strategies should also expose them to new and unique types of fruits and vegetables through activities such as taste testing. Additionally, it would likely be beneficial to teach individuals how to easily and creatively incorporate fruits and vegetables into daily meals. Based on studies that have utilized community-based participatory research approaches to assess the needs of the community, it is clear that youth view their own lack of knowledge and motivation as barriers to making healthy food and physical activity choices and suggest that prevention programs address these issues.

**Review of School-Based Obesity Prevention Programs**

Given the negative health consequences and the high prevalence rates of obesity among children and adolescents in the United States, especially Latino and African American children, it is important that effective, culturally sensitive and community-based health promotion programs are developed and implemented. Many strategies have been tested in an attempt to curb the rise in adolescent obesity and the school environment has been identified as a key setting for health promotion (Katz, 2009; Gonzalez-Suarez, Worley, Grimmer-Somers, & Dones, 2009; Cook-Cottone, Casey, Feeley, & Baran, 2009; Khamhalia, Dickinson, Hardy, Gill, & Baur, 2012). Students spend approximately 7 hours a day, 5 days a week in a school environment, thus making it an excellent place to instruct students on the importance of following a healthy lifestyle (Watson, Kwon, Nichols, & Rew, 2009). There is a growing body of empirical research exploring the effectiveness of school-based obesity prevention programs, however several reviews on the topic have resulted in mixed findings (Khamhalia, et al., 2012). What follows is a summary of the findings from three pertinent meta-analyses that review existing school-based obesity interventions.
The first meta-analysis was conducted by Katz (2009) who provided a systematic review and synthesis of the available evidence concerning school-based obesity prevention programs, as well as associated health promotion programs. Studies included in the review aimed to prevent unnecessary weight gain or manage weight and employed interventions related to nutrition, physical activity, reduction in television viewing, or combinations thereof. Of the 19 studies meeting criteria for inclusion, 14 were randomized controlled studies and 5 were nonrandomized controlled studies. Six of the studies were treatment, and 13 were strictly primary prevention. Of the 19 studies included in the analysis, one study was a TV reduction intervention, one was a nutrition intervention, one was a physical activity intervention, and nine were combination interventions (nutrition plus physical activity). Statistical analysis indicated that the combination interventions, the single nutrition intervention, and TV reduction were comparably effective at reduced body weight in children. In general, these results are consistent with the American Dietetic Association (ADA) reports, which state that the most effective school-based strategies for changing children’s eating behaviors involve a clear message, multiple interventions that reinforce the message, family involvement, an increase in the amount of time and intensity of contact and a theoretical framework (ADA, 2006). Based on the results of this meta-analysis, Katz (2009) suggests that future programs should incorporate multiple strategies, such as classroom instruction on improving dietary intake or increasing physical activity, focus on game, dance, and other non-traditional forms of physical activity, participatory/hands-on, skill-building student activities, the provision of print materials, and program tailoring for cultural relevance.

The second meta-analysis conducted by Gonzalez-Suarez, Worley, Grimmer-Somers, and Dones (2009) evaluated the effectiveness of school-based programs in the prevention and management of childhood obesity. Children of normal BMI were included in the study because
the study investigated both the prevention and treatment of overweight and obesity. The interventions that were considered for inclusion in the review were any deliberate approach to increase physical activity, improve dietary behaviors, modify poor exercise or dietary behaviors, or a combination of the above approaches. A total of 19 studies were included in the meta-analysis. The interventions reported were generally designed to decrease overweight by increasing physical activity, decreasing participation in sedentary activities, and decreasing intake of food high in fat and sugar content through classroom lessons and physical education classes. Most of the studies used multipronged intervention strategies, such as parental involvement or modifications to the school environment. Other studies utilized single intervention strategies such as improving involvement in noncompetitive physical activities without any strategies to improve food habits. The duration of the programs ranged from less than 6 months to greater than 2 years. Gonzalez-Suarez et al. (2009) found evidence that school-based interventions were effective, at least short term, in reducing the prevalence of childhood obesity. Interventions that were applied for more than 1-2 years showed a lower likelihood of participants being overweight and obese compared with shorter-period programs of less than 6 months. In addition, the results suggest that interventions that used both physical activities and classroom teachings about proper nutrition and physical activity were more effective in reducing childhood obesity compared with those that involved either physical activity or classroom teachings.

The final meta-analysis, conducted by Cook-Cottone, Casey, Feeley, and Baran (2009), evaluated the effectiveness of school-based obesity prevention programs. As noted by Khambalia, Dickinson, Hardy, Gill, & Baur (2012), a major strength of this review is the fact that they evaluated moderating variables that may impact the outcomes of school-based obesity
prevention programs, such as participant features (i.e., age, sex, ethnicity, and risk-status) as well as program qualities (i.e., program duration, family/community involvement, health education, physical activity, delivery features, etc.). Obesity-prevention programs were defined as those which aimed to decrease cardiovascular risk factors for obesity, increase physical activity in children, or decrease sedentary behaviors such as watching television. Interventions were considered to be prevention programs if they targeted children of normal weight along with children who may have been at risk for overweight or who were overweight at the time of the program’s implementation. A total of 66 comparisons were considered from 40 published studies. Cook-Cottone et al., (2009) found that interventions targeting elementary children were more effective than those targeting middle and high school children. Cook-Cottone et al. (2009) point out that young children may be uniquely suited for prevention because they are developmentally amenable to behavior and attitude change. Results also suggest that girls and boys do not necessarily respond comparably to a given intervention. Gender differences need to be examined in more detail; however, it has been suggested that girls may respond better to educational components based upon social learning while boys may be more influenced by structural and environmental changes facilitating increased physical activity and improved diet intake (Kropski, Keckley, & Jensen, 2008). The intensity of the intervention did not moderate effects on BMI, as both low intensity (meeting 1-2 times per week) and higher intensity (meeting 3-5 times per week) were both positive and significantly effective. Finally, interventions that encouraged healthy eating were more effective than implementing environmental or system-wide changes and those that targeted physical activity and sedentary activities were found to be more effective than those that did not. Cook-Cottone et al. (2009) suggest that future obesity prevention programs need to be carefully planned and suited to each school’s population, risk,
and needs. Additionally, the specific goals of the prevention program must include more than BMI reduction or weight loss. Intervention goals should include improved nutrition and health knowledge through psychoeducation, encouragement of nutritional change, reduction of sedentary behaviors, and more parental involvement.

Overall, these meta-analyses concluded that school-based obesity interventions had a significant, although modest, effect in achieving weight reduction in school settings (Khambalia et al., 2012). Katz (2009) reported significant reductions in body weight in intervention compared with control groups with interventions combining nutrition and physical activity. Gonzalez-Suarez et al. (2009) found that school-based interventions were effective in the short term, in reducing the prevalence of childhood obesity. Cooke-Cottone et al. (2009) found that aggregate findings indicated small effects on BMI for obesity prevention programs in schools.

One issue with the existing literature is that most studies use BMI or BMI z scores as outcome measures and do not take into account the factors that may be impacting BMI measures, such as sexual/pubertal maturity or weight status at the start of the program (Cook-Cottone et al., 2009). Although some studies have found improved health-related outcomes (e.g., increased physical activity, improved nutrition, increased knowledge and self-efficacy, etc.), they fail to find positive changes in BMI, which may be due in part to the short-duration of the program (Cook-Cottone et al., 2009). Rather than relying only on BMI, which is not easily modified by short-term interventions, it may be more beneficial to evaluate program effectiveness by measuring improvements on health-related outcomes such as increased knowledge, attitudes, self-efficacy, and changes in behaviors.

Another issue with the existing literature appears to be the lack of studies that utilize active student involvement in the design of prevention and intervention programs. Katz (2009)
suggests that the future school-based obesity interventions should utilize participatory, hands on approaches to encourage healthy behavior change among students. Giving students an opportunity to decide what they want to learn may prove to be empowering and enhance their overall experience in the intervention. Additionally, the existing literature lacks studies that utilize multiple strategies to improve nutrition and physical activity knowledge, self-efficacy and behaviors. For example, nutrition and physical activity education may be enhanced when done in conjunction with activities such as student-driven media production and dissemination.

**Innovative Child and Adolescent Obesity Prevention Strategies**

Social cognitive theory has been used as a framework for the development of school-based obesity prevention programs. These particular programs have been designed to improve students’ health behaviors related to proper nutrition and participation in regular physical activities by addressing key constructs of social cognitive theory, such as self-efficacy, self-control, and expectations (Bandura, 2004; Sharma, Wagner, & Wilkerson, 2005; Warren, Henry, Lightowler, Bradshaw, & Perwaiz, 2003). Social cognitive research has shown that students benefit the most when they are actively engaged, participate in groups, receive frequent instructor interaction and feedback, and actively make connections to real-world contexts (Katz, 2009; Moore, McGowan, Donato, Kollipara, & Roubideaux, 2009).

Implementing participatory interventions that are hands on and experiential in nature can lead to positive changes in adolescents’ nutrition and physical activity related knowledge and behaviors (Neumark-Sztainer, Story, Hannan, & Rex, 2003; Jackson, Mullis, & Hughes, 2010). For example, Jackson, Mullis, and Hughes (2009) utilized a community-based participatory approach to develop and implement a theater-based nutrition and physical activity intervention that conveyed health messages to low-income, urban, African Americans. The youth were
included in focus groups, providing their thoughts and priorities for the intervention. Based on input from all community partners, participants received six theater-based health lessons. At the end of the 6-week program, students performed their final healthy nutrition and physical activity play in front of family and friends. Each week students learned pertinent nutrition and physical activity information that was later incorporated into writing and performing their own “healthy” skits. The post-intervention results suggested that there were increases in the number of students who knew the daily-recommended number of servings of fruits and vegetables as well as the recommended time that children should be active. Jackson et al. (2009) recognized that a major issue with their intervention program was that it was at competition with other after-school activities, which may have impacted recruitment.

In addition to participatory approaches, research has also pointed to technology as an important tool that can enhance students’ learning and understanding of a particular topic and positively impact their attitudes and engagement (Hernandez-Ramos & De La Paz, 2009). Media production engages multiple literacies such as technology, information, and media literacy all at once alongside health literacy (Shuldman & Tajik, 2010). This approach to learning is dynamic and interactive, with the student making sense of the materials presented rather than simply memorizing facts. Learners also see the usefulness of what they are learning and how it impacts others. Although many obesity prevention and intervention programs have been developed and implemented, relatively few have engaged students in the use of technology to create and disseminate their own educational tools. There are no known published data, however, on the use of a participatory, student driven nutrition and physical activity curriculum and student created media production to promote both nutrition and physical activity messages to fellow adolescents.
Project Overview

Study Purpose

Given the overwhelming prevalence of overweight and obese children and adolescents, programs that provide youth with necessary nutrition and physical activity education are crucial. Such programs are particularly necessary among minority youth, due to the disproportionate rate at which they are affected by being overweight and obesity. The goal of this study was to determine the effectiveness of a participatory obesity prevention program, utilizing student driven media creation to promote health-related changes among an ethnically, diverse sample of students. Using key constructs of social cognitive theory this prevention program addressed socioenvironmental, personal, and behavioral factors to improve students’ habits related to proper nutrition and participation in regular physical activities (Bandura, 2004; Warren et al, 2003; Sharma et al, 2005). Specifically, in order to modify precursors of obesity identified by social cognitive theory, the study assessed changes in students’ knowledge, self-efficacy, behaviors, and reported difficulties related to healthy eating and participation in regular physical activities.

The study aims included:

1. Create and implement a curriculum guided by student-identified topics related to nutrition and physical activity.

2. Facilitate student driven media creation in the form of infomercials or short media clips.

3. Examine the impact of a student-centered participatory program on students’ knowledge, self-efficacy, behaviors, and difficulties related to nutrition and physical activity by:
   a. comparing pre- and posttest measures and,
   b. comparing the intervention group to a control group.
**Design and Hypotheses**

Using a comparison group and pre/post-intervention measurements, the study sought to measure changes in students’ knowledge, behaviors, self-efficacy, and perceived challenges related to healthy eating and participation in regular physical activities. Our hypotheses included:

**Hypothesis 1:** After participating in the program, students will demonstrate a significantly greater increase in healthy eating and physical activity *knowledge* compared to control group participants.

**Hypothesis 2:** After participating in the program, students will report a significantly greater increase in healthy eating and physical activity *behaviors* compared to control group participants.

**Hypothesis 3:** After participating in the program, students will report a significantly greater increase in *self-efficacy* about healthy eating and physical activity compared to control group participants.

**Hypothesis 4:** After participating in the program, students will report a significantly greater decrease in *perceived challenges* to healthy eating and physical activity compared to control group participants.

**Hypothesis 5:** Students participating in the program will demonstrate significant improvements from pretest to posttest on measures of nutrition and physical activity related knowledge, behaviors, self-efficacy, and perceived challenges, whereas the control group will not.
Methods

Setting

During the 2012-2013 school year, participants were recruited from the Academy of Multilingual Immersion Studies (AMIS), a Cincinnati public school that focuses on Spanish or French language immersion for K-8th grade students. Close to 50% of the student body self-identifies as Hispanic/Latino, while the remaining 50% identifies as either African-American or West African immigrants. Almost 87% of the student body is economically disadvantaged. Because the research team lacked French language fluency, only Spanish-immersion classrooms were eligible for participation. Spanish-immersion classrooms were selected based on the teachers’ willingness to allow the researchers to carry out the program. Entire classrooms were assigned to either control or intervention group to prevent diffusion of the prevention program.

Participants

Following review and approval by the university’s institutional review board, the prevention program took place in two waves. The first wave of participants was recruited from 4th and 5th grade classrooms in Fall 2012. The second wave of participants was recruited from 6th and 7th grade classrooms in Spring 2013. Members of the research team recruited students by presenting an informational session about the study in the classroom. After the informational session, students took home an informational letter and permission form to be completed by their parents. Oral and written assent was then obtained from each student who returned a parent permission form. Students were excluded from the study if they did not return a parental consent and youth assent form or if they missed more than 2 educational sessions.

Table 1 describes the participants. Of the 100 eligible participants, 66 male and female participants, with ages ranging from 9 to 13 ($M = 10.64$, $SD = 1.45$), were included in the study.
The sample was predominantly African American (n = 29) and Hispanic (n = 30) students and included Native American/Alaskan Native (n = 1), Asian/Pacific Islander (n = 1), White (n = 1), and Other (n = 3) students. Students were excluded from the study if they did not return a parental consent and student assent form (n = 33), if they missed more than 2 educational sessions, or if they missed any testing sessions (n = 1). Students not enrolled in the study participated in alternate activities (e.g., music, gym, art, etc.) in a location separate from the program location.

**TABLE 1. Demographic data (N = 66).**

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<td>Asian or Pacific Islander</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>American Indian or Alaskan Native</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td><strong>Grade</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4th</td>
<td>20</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>5th</td>
<td>0</td>
<td>11</td>
<td>-</td>
</tr>
<tr>
<td>6th</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>7th</td>
<td>-</td>
<td>-</td>
<td>15</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>20</td>
<td>3</td>
<td>-</td>
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<tr>
<td>10</td>
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<td>-</td>
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<tr>
<td>12</td>
<td>-</td>
<td>-</td>
<td>8</td>
</tr>
<tr>
<td>13</td>
<td>-</td>
<td>-</td>
<td>7</td>
</tr>
</tbody>
</table>

**Procedure**

**Intervention group.** After obtaining parent permission and student assent, participants in the intervention group completed a baseline self-report measures assessing healthy eating and physical activity related behaviors, self-efficacy, perceived challenges, and knowledge.
Following the baseline assessment, the 10-week prevention program took place once per week during the students’ “specials” time, which is essentially a 50-minute period for rotating activities such as music or gym. All program sessions were organized and conducted by a clinical psychology graduate student. Each week, a research staff consisting of three psychology undergraduate research assistants helped to facilitate the program. A faculty member from the university E-Media department helped to facilitate sessions devoted to media education and production. After the program was completed, participants completed a packet of self-report measures identical to those administered at baseline. After study completion participants received a water bottle and t-shirt.

**Control group.** After obtaining parent permission and youth assent, participants in the control group completed a baseline packet of self-report measures assessing healthy eating and physical activity related behaviors, self-efficacy, perceived challenges, and knowledge. Ten weeks later, participants completed an identical packet of measures. After the study was completed all participants received a water bottle and t-shirt.

**Measures**

Program attendance was assessed by summing the total number of sessions each student attended. We collected students’ self-reported age, gender, race, and ethnicity.

**Knowledge.** The exercise and nutrition knowledge instrument (AKNS) is a 21-item questionnaire that measures knowledge regarding benefits of exercise, types of exercise, food nutritional information, portion sizes, and eating habits (Melnyk et al., 2009). (eg, “Exercise helps to reduce stress,” “Being out of breath and dizzy when you exercise is a sign of a good workout,” and “Pretzels are higher in fat than potato chips). Subjects respond by answering yes,
no, or don’t know. Scores range from 0 to 21, with 21 indicating all correct answers. Reliability and validity have been previously established with Cronbach's $\alpha$ of .80 (Melnyk et al., 2009).

**Behaviors.** The Healthy Lifestyle Choices Scale (HLCS) is a 16-item instrument that assesses behaviors about nutrition and exercise to maintain a healthy lifestyle. Participants respond to each item on a three point Likert-type scale (eg, “I exercise on a regular basis,” and “I do what I should do to lead a healthy life”)

Possible scores range from 0 to 32 for the summed items. A higher score on the scale indicates an increase in the participation of healthy lifestyle behaviors. The reliability and validity of this instrument was previously established with a sample of Hispanic adolescents (Cronbach’s $\alpha$ .85) (Melnyk et al., 2006; Melnyk et al., 2009).

**Self-Efficacy.** The Healthy Living Beliefs Scale (HLBS) is a 15-item instrument adapted from other belief scales used by Melnyk et al. (2006) in prior studies to assess beliefs about various facets (i.e., nutrition and exercise) of maintaining a healthy lifestyle. (eg, “I believe that I can be more active” and “I am sure that I will do what is best to lead a healthy life”)

(Dowdy et al., 2012). Participants respond to each item on a 3-point Likert-type scale of No, Sometimes, or Yes. A higher score on the scale indicates a stronger belief in maintaining a healthy lifestyle. Possible scores range from 0 to 30 for the summed items. The reliability and validity of this instrument was previously established with a sample of Hispanic adolescents and found that Cronbach’s $\alpha$ was .90 (Melnyk et al., 2006; Melnyk et al., 2009).

**Challenges.** The Healthy Lifestyles Perceived Difficulty Scale (PDHLS) instrument is a 12-item questionnaire that measures one’s perceived difficulty in living a healthy lifestyle. It was adapted from a similar scale used with teens in an HIV-prevention study (Melnyk & Small, 2003; Morrison-Beedy, Nelson, & Volpe, 2005). Subjects respond to each item on a 3-point Likert scale that ranges from 1, “very hard to do,” to 3, “very easy to do” (e.g., “How hard is it
to...eat healthy; exercise regularly”), with a range of scores from 0 to 24. Items are reverse scored for analysis, with higher scores indicating greater perceived difficulty in leading a healthy lifestyle. Cronbach’s $\alpha$ from a study by Kelly, Melnyk, Jacobson, and O’Haver (2011) was .88.

**Prevention Program Protocol**

**Week 1.** Table 2 summarizes the content of the 10-week program. At the first program session, students completed the baseline survey packet and participated in interactive “ice-breaker” games. Time was spent reviewing project details and answering questions that the students had regarding the project.

<table>
<thead>
<tr>
<th>Session</th>
<th>Session Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introductions; Pre-Tests</td>
</tr>
<tr>
<td>2</td>
<td>What does it mean to be healthy? Group-Level Assessment</td>
</tr>
<tr>
<td>3</td>
<td>Physical Activity Education</td>
</tr>
<tr>
<td>4</td>
<td>Nutrition Education I</td>
</tr>
<tr>
<td>5</td>
<td>Nutrition Education II</td>
</tr>
<tr>
<td>6</td>
<td>How does the media impact our health?</td>
</tr>
<tr>
<td>7</td>
<td>Form production teams; brainstorm concept and script</td>
</tr>
<tr>
<td>8</td>
<td>Film Day I</td>
</tr>
<tr>
<td>9</td>
<td>Film Day II</td>
</tr>
<tr>
<td>10</td>
<td>Premier final media products; Debrief; Post-Tests</td>
</tr>
</tbody>
</table>

**Week 2.** During the second program session, students participated in an interactive, group-level assessment in order to identify the nutrition and physical activity related topics that were most important to them (Vaughn & Lohmueller, 1998). The participatory assessment strategy is a crucial component of the program design because it allowed students to prioritize the health related topics they wanted to focus on rather than having program content dictated to them by the research team. The group level assessment was facilitated by splitting the group into three smaller discussion teams and using poster boards to record and display each groups responses to questions such as, “What does it mean to be healthy” and “What do you think is
important to teach other students about (eating healthy/exercising).” After answering the question on each poster board the teams went around to each one again, this time putting a sticker next to the three responses that they felt were the best or most important. The qualitative data elicited through the group level assessment was organized into major themes, which guided the development of the educational portion of the program and the students’ videos.

Week 3-6. After students identified important health behaviors, the research team delivered three weeks of education targeting physical activity (Week 3), nutrition (Week 4 & 5), and media & health (Week 6). The physical activity session focused on different kinds of exercise, daily recommendations, exercise safety (e.g., proper hydration/nutrition, signs of dehydration, location/supervision), and strategies to drink more water. The students learned a variety of different stretches and strategies to get their heart rates up that aren’t always considered “exercise”, such as playing tag, capture the flag, or dancing with friends.

The nutrition session focused on the nutritional value and daily recommendations of fruits, vegetables, whole grains, and proteins, healthy snack and meal alternatives, and strategies for making healthier choices at restaurants. Educational material was incorporated using content from MyPlate and Media-Smart Youth. Using an interactive brochure, the students moved through different stations in small groups (Appendix B). At three of the stations students had the opportunity to “taste-test” healthy alternatives to common, unhealthy snacks and meals. For example, the students had the opportunity to make and taste low-fat yogurt parfaits with fruit and granola and then compare it’s nutritional content to common desserts and cereals that are higher in fat and sugar. They also had the opportunity to make and taste a whole-wheat pita with turkey, low-fat mozzarella, spinach, and humus with pretzels. They compared this meal alternative to a less healthy option like a cheeseburger and fried potato chips. Students also tasted various fruits
and vegetables with healthy dip alternatives such as hummus and guacamole. During one of the station sessions, the students talked about their favorite places to eat out and then discussed the nutritional content of some of their favorite meals. Using various educational booklets (i.e., Eat This Not That) the students learned how to “decode” restaurant menus by asking their server or looking for words that indicate healthier options (e.g., grilled/broiled/baked vs. fried/breaded). They also came up with healthy alternatives to their favorite fast-food meals.

The media education session focused on the role that media plays on our health. The students started out in a large group discussion about the purpose of media and the different examples of media. The students then discussed the various ways in which media impacts their health by influencing their attitudes and behaviors about nutrition and physical activity. The last part of the session was spent in small groups, where the students discussed how they could use media to positively influence the health of their peers. They ended with a brainstorming session of possible ideas for their own media product.

**Week 7-9.** The final three weeks were spent planning and filming the students’ media products, reinforcing what the student’s learned during the educational portion. During the seventh session the students worked in their small groups to finalize the concept and format of their media product (e.g., infomercial, news bulletin, movie trailer, etc.). They also worked on the scripts and agreed on the roles of each group member (e.g., actor, production assistant, extra, etc.). During sessions eight and nine the students shot each scene of their media product.

**Week 10.** The final week was used to debrief the student’s on what had been accomplished over the prior weeks. During this session the students had the opportunity to “premiere” their final media products with the rest of their classmates. Students also completed posttest measures.
Data Analysis Plan

We hypothesized that participants in the intervention group would evidence significant improvements in nutrition and physical activity related behaviors, perceived challenges, self-efficacy, and knowledge relative to participants in the control group. Independent sample t tests and chi-square analyses will be conducted to assess for potential pre-assessment differences between the intervention and control groups on demographic variables such as age, gender, and race/ethnicity, as well as the outcome variables. The effect of treatment will be examined for each of the outcome variables using analysis of covariance (ANCOVA) predicting scores after the pretreatment assessment. In order to determine if there is a significant change in pre- to posttest scores within each treatment group paired samples t-tests will be conducted.

Results

Qualitative Themes of the Group-Level Assessment & Student-Created Video Clips

The first major aim of this study was to create and implement a curriculum that was guided by student-identified nutrition and physical activity related topics. During the second week of the program students participated in a group-level assessment that gave them the opportunity to voice their opinions and particular interests with regard to nutrition and physical activity. Table 3 outlines the major themes that came out of the group-level assessment, which guided the creation of the educational curriculum and the students’ media creations.

<table>
<thead>
<tr>
<th>Healthy Eating</th>
<th>Physical Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effects of Unhealthy Eating on Your Body</td>
<td>Exercise Preparation: Proper Nutrition</td>
</tr>
<tr>
<td>Examples of Healthy Foods/Meals</td>
<td>Exercise Safety</td>
</tr>
<tr>
<td>Importance of Water</td>
<td>Types of Exercise</td>
</tr>
<tr>
<td>Limiting Intake of Unhealthy Foods</td>
<td>Sportsmanship</td>
</tr>
</tbody>
</table>
The second major aim of this study was to facilitate student driven media creation in the form of infomercials or short media clips. This was done during weeks 7-9 of the program as the students formed “media production” teams, developed the concept and scripts for their media product, and then filmed each scene of their media products. Using the educational materials that they received during weeks 3-6, each media production team selected a topic that they found to be the most interesting and that they would want to teach to other students. The themes of the final media products covered nutrition and exercise. There appeared to be more interest in creating videos that discussed healthy food alternatives, as well as the importance of getting exercise. Table 4 describes the final videos created by the students.

<table>
<thead>
<tr>
<th>Title</th>
<th>Film Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Woman vs. Sugar Diva</td>
<td>A breaking news bulletin describes the “evils” of sugary beverages and the importance of water.</td>
</tr>
<tr>
<td>Smoothie Makers</td>
<td>A how-to guide to real fruit smoothies and why they are a healthy alternative to ice cream.</td>
</tr>
<tr>
<td>Healthy Friends</td>
<td>A group of friends try to convince another student to choose healthier snacks and to increase exercise.</td>
</tr>
<tr>
<td>Smoothie Squad</td>
<td>Super heroes teach a student the importance of choosing healthy snacks like real fruit smoothies.</td>
</tr>
<tr>
<td>Video Game Obsessions</td>
<td>Students convince their friends to put the video games down and show them that exercise is fun.</td>
</tr>
<tr>
<td>Channel 13 News</td>
<td>News reporters explain the importance of exercise and demonstrate easy ways to get 60 minutes a day.</td>
</tr>
</tbody>
</table>

Preliminary Analyses

The last aim of this study was to examine the impact of a school-based, participatory obesity prevention program on students’ knowledge, behaviors, self-efficacy, and perceived difficulties related to nutrition and physical activity using pre/posttests and control group comparison. Independent samples t tests and chi-square analyses were conducted to assess for potential pre-treatment differences between the intervention and control groups on demographic variables such as age, gender, and race/ethnicity, as well as the outcome variables. The
intervention and control groups did not differ significantly on any of the demographic variables. There were no statistically significant differences between the intervention and control group at pretest on the main outcome variables measuring self-reported nutrition and physical activity related knowledge, behaviors, self-efficacy, and perceived difficulties, \( t(23) < 1.82, p > .05 \).

Assessment of Treatment Effects

We first hypothesized that compared to the control group, the intervention group would demonstrate a significantly greater increase in healthy eating and physical activity related knowledge, behaviors, and self-efficacy, and would demonstrate a significantly greater decrease in perceived difficulty to eating healthy and being physically active. Table 4 shows the mean and standard deviations on the outcome variables for the intervention and control group.

**TABLE 5.**
**Means and Standard Deviations of Outcome Measure at Pre- and Posttest by Condition**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Pre</th>
<th>Post</th>
<th>Effect of Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intervention(^a)</td>
<td>Control(^b)</td>
<td>Intervention(^a)</td>
</tr>
<tr>
<td>Knowledge</td>
<td>10.40 (3.00)</td>
<td>9.97 (3.10)</td>
<td>11.71 (3.82)</td>
</tr>
<tr>
<td>Behaviors</td>
<td>18.69 (3.93)</td>
<td>18.26 (4.42)</td>
<td>21.40 (4.34)</td>
</tr>
<tr>
<td>Self-Efficacy</td>
<td>23.49 (4.04)</td>
<td>22.90 (3.96)</td>
<td>25.46 (3.48)</td>
</tr>
<tr>
<td>Perceived Difficulty</td>
<td>7.23 (4.22)</td>
<td>9.16 (4.71)</td>
<td>5.74 (3.28)</td>
</tr>
</tbody>
</table>

*Note. Effect of treatment was estimated using analysis of covariance predicting posttest scores with pretest score and grade included as a covariate. Knowledge = Activity & Nutrition Knowledge Scale; Behaviors = Healthy Lifestyle Choices Scale; Self-Efficacy = Healthy Lifestyle Belief Scale; Perceived Difficulty = Perceived Difficulty to Living a Healthy Life Scale.

\(^a\) \( n = 35 \); \(^b\) \( n = 31 \); *\( p < .05 \).

Analyses of covariance were used to assess for the effect of the treatment condition. For each outcome variable separately, scores at posttest were predicted by treatment condition, with pretest scores included as a covariate. Given that the participating school had only one classroom per grade level, restricting our ability to match on grade, and that entire classrooms were selected as either intervention or control group, grade automatically differed between each condition.

Thus, grade was also included as a covariate. As shown in Table 4, there was a significant main
effect of treatment condition for two of the outcome variables. Individuals in the intervention group showed a greater increase in self-reported healthy lifestyle choices and greater decrease in perceived difficulty compared to those in the control group. Treatment effect sizes, calculated using Cohen’s $d$, were in the medium to large range for the variables measuring healthy lifestyle choices and perceived difficulty.

Finally, we hypothesized that students participating in the prevention program will evidence significant improvements from pretest to posttest on measures of nutrition related knowledge, behaviors, self-efficacy, and perceived challenges, whereas the control group will not. Planned comparisons, using paired samples $t$ tests, revealed that the intervention group increased significantly from pretest to posttest on three of the outcome measures, including healthy lifestyle choices, $t(34) = 5.01, p < .001$; healthy lifestyle beliefs, $t(34) = 3.74, p = .001$; and activity and nutrition knowledge, $t(34) = 2.05, p < .05$. The increased scores from pretest to posttest indicate that the intervention group demonstrated an increase in nutrition and physical activity related knowledge and also reports making healthier nutrition and physical activity related choices. In addition, the intervention group reports having improved self-efficacy regarding their ability to eat healthy and be physically active. The intervention group decreased significantly from pretest to posttest on the perceived difficulty scale, $t(34) = -2.38, p < .05$, indicating that participants report fewer challenges or barriers to eating healthy foods and being physically active. In the control group, paired samples $t$ tests revealed that there were no significant changes from pretest to posttest on any of the four outcome measures of nutrition related knowledge, behaviors, self-efficacy, and perceived challenges.
Discussion

A school-based, participatory obesity prevention program that utilized student-driven media creation with minority youth was successfully developed and implemented. Findings demonstrate preliminary support that this school-based obesity prevention program had a positive effect on participants’ knowledge, behaviors, perceived challenges, and self-efficacy related to healthy eating and participation in regular physical activities. The program was effective at increasing participants self-reported healthy eating and physical activity related choices and reducing perceived difficulty to maintaining a healthy lifestyle, in comparison to the control group. Additionally, only the intervention group improved significantly from pretest to posttest on all outcome measures of nutrition related knowledge, behaviors, self-efficacy, and perceived challenges. These results are promising and show that it is feasible to deliver the program within the context of a typical school curriculum, given that the program was only 10-weeks long and sessions occurred once per week.

Social cognitive research has shown that students benefit the most when they are actively engaged, participate in groups, receive frequent instructor interaction and feedback, and actively make connections to real-world contexts (Katz, 2009; Moore, McGowan, Donato, Kollipara, & Roubideaux, 2009). Research has also found that effective interventions utilized interactive and engaging activities that are hands on and experiential, leading to positive changes in adolescents’ nutrition and physical activity related knowledge and behaviors (Neumark-Sztainer, Story, Hannan, & Rex, 2003; Jackson, Mullis, & Hughes, 2010). A unique and innovative aspect of this prevention program was the use of participatory methods to engage youth. The group-level assessment is a crucial component of this program because it gives students the opportunity to identify the nutrition and physical activity related topics that are most important to them. This
participatory approach gave the students in the program an important role in guiding the content and outcome of the program and ultimately increased their engagement in the overall program.

Not only did this study successfully implement participatory strategies, but it did so while balancing the priorities identified by the students with the nutrition and physical activity content areas identified by experts as most important. For example, the *Dietary Guidelines for Americans* encourages Americans to be physically active and to focus on a healthful diet by avoiding foods high in solid fats and added sugars, consuming a variety of fruits and vegetables, choosing whole grains over refined grains, and consuming fat-free or low-fat dairy products (USDA & HHS, 2010). The students participating in this program had the opportunity to choose whatever physical activity and nutrition related topics they wanted, yet in both intervention groups the students’ choices overlapped with the nutrition and physical activity guidelines set forth by the U.S. Department of Agriculture and the U.S. Department of Health and Human Services. The students’ priorities identified through the participatory group level assessment revealed that students know something about healthy nutrition and physical activity and are interested in learning more about how to integrate recommended strategies into their lives. The participatory strategy employed in this program was the catalyst to full student engagement and it was necessary in order to engage the students into integrating the nutrition and physical activity content areas into their lives.

Although many obesity prevention programs have been developed and implemented, relatively few have combined participatory approaches with media creation in order to engage students to create their own educational tools related to healthy eating and physical activity. This particular study is the first of its kind and demonstrates the effectiveness of using a participatory approach in combination with student-driven media creation in order to promote healthy eating
and physical activity among a diverse group of students. Again, using a participatory strategy such as this was a crucial component of the program design because it allowed students the opportunity to prioritize the health related topics they wanted to focus on rather than having program content dictated to them by the research team. Giving students the opportunity to create their own educational videos allowed them to use what they had learned in a creative way, resulting in a product that they were proud of and excited to share with others.

This study is unique in terms of generalizability to future research in that the focus is on the process of engaging students using participatory strategies and media creation rather than the content of the prevention program. Unlike traditional obesity-related research that focuses on teaching students a pre-determined curricula, students in the current study identified their own nutrition and physical activity-related content areas on which to focus, each of which overlapped with standard best practices in obesity prevention. Future research utilizing the participatory strategies described here will vary in content depending on the interests of the participating youth. The current study provides evidence that the process of engaging youth using participatory strategies and media creation can result in positive changes in knowledge, behavior, self-efficacy, and perceived difficulties. In addition, our results suggest that students who participate in a participatory program improve on nutrition and physical activity related behaviors and perceived challenges in comparison to a control group. Future researchers interested in modifying nutrition and physical activity-related knowledge, attitudes, and behaviors should consider utilizing participatory processes that engage youth as co-investigators.

As mentioned previously, the school environment has been identified as a key setting for health promotion, especially for topics related to healthy eating and physical activity (Katz, 2009; Gonzalez-Suarez, Worley, Grimmer-Somers, & Dones, 2009; Cook-Cottone, Casey,
Another strength of this obesity prevention program was the ability to conduct the program during the school day. This allowed a larger number of students to participate by eliminating barriers such as transportation and conflicting after-school activities, which often occur when projects take place after school. The difficulties that come with having a large number of participants were offset by having multiple program assistants and a graduate student with experience in media production and film editing. While conducting the program within a school setting allowed more students to participate, it is important to note that there were some challenges as well. Because the program was conducted during the school day we had only a small window of time that was convenient for the teachers and did not interfere with the students’ regularly scheduled classes. In addition, the program had to coordinate around days when the students were not available to meet due to field trips, holidays, and state testing.

While there were several strengths of this program, there were also some limitations that need to be addressed. One limitation of the study is the fact that only short-term outcomes were assessed. Future studies would benefit from examining longer-term outcomes, including weight-related outcomes, in order to determine the programs impact on the maintenance of nutrition and physical activity related knowledge, behaviors, self-efficacy and perceived difficulty as well as a healthy weight. Another limitation of the study was the use of a convenience sample and the need to randomize by entire classes in order to avoid cross contamination. Due to this sampling technique and the fact that the participating school only had one classroom per grade level, grade automatically differed between each condition.

In conclusion, this study is significant as it adds to knowledge base about the use of participatory approaches and media creation in a school setting to promote healthy eating and
physical activity among urban elementary school children from diverse backgrounds. Overall the findings gathered from this school-based obesity prevention program are promising in that there were reported changes related to healthy eating and physical activity that could be the basis for obesity prevention and intervention.
References


Evaluation of a pilot school programme aimed at the prevention of obesity in children.  