THE H.Y.P.P.E. INITIATIVE:
A SCHOOL-BASED PHYSICAL ACTIVITY PROMOTION PROGRAM

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ABSTRACT

The H.Y.P.P.E. initiative: A school-based physical activity promotion program

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Physical activity promotion in schools is a critical component of adolescent health. The main purpose of this study was to test the efficacy of a school-based program to increase the physical activity of 6th grade students.

A total of 113 students in a large suburban public middle school participated in the 11 week study. A quasi-experimental design was used. Physical education (PE) classes served as the unit of randomization. Six PE classes were assigned to the control condition and six PE classes to the experimental condition. Control group students were asked to wear unsealed pedometers throughout the day in school and at home and to record their daily step-counts in school. Experimental group students also wore unsealed pedometers throughout the day and logged their daily step-counts in school, but additionally received a 10,000 step per day goal, were asked to attain an increased step-count goal during PE class, and received an enhanced PE curriculum.
Pre- and post-test data were gathered for all dependent measures including average daily step-counts by week, GPA, attendance, tardiness, attitude and self-efficacy toward physical activity, and Presidential Physical Fitness Tests. The data analysis was completed using analyses of variance (ANOVAs), analysis of covariance (ANCOVA), paired sample t-tests, and independent sample t-tests. Results revealed significant gains in physical activity for both treatment conditions. Both groups demonstrated significantly increased step-counts relative to their baseline step-counts. The intervention did not produce significant changes in attitude or self-efficacy. There were some significant improvements in physical fitness and the scholastic measures, but these changes were not attributed to the intervention. Very low attrition, a high compliance rate, and favorable participant feedback were also noted.

Overall, this study revealed that, in the short-term, it is possible to significantly improve physical activity without changing an adolescent’s self-efficacy or attitude. An important finding of this study was that multi-faceted self-monitoring was the most critical factor that contributed to increased physical activity.
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CHAPTER 1
INTRODUCTION
The Problem

Physical activity rates of youth have reached the forefront of attention in the United States because of the potential role physical activity plays in reversing the trend of energy imbalance associated with the current obesity epidemic (Leibel, Rosenbaum, & Hirsch, 1995; O’Hill, 2009; Swinburn et al., 2009; Wang, Gortmaker, Sobol, & Kunz, 2006). Current estimates of overweight children aged 6-11 is 19% and for overweight adolescents aged 12-19 years the percentage is 17% based on 2003-04 National Health and Nutrition Examination Surveys (NHANES) (U.S Department of Health and Human Services, 2004).

According to the 2007 Youth Risk Behavior Surveillance System, two-thirds of students in the United States in grades 9-12 are not meeting the daily recommendation for physical activity (Eaton et al., 2008). The Centers for Disease Control and Prevention (CDC) collected survey data that indicated 61.5% of students aged 9-13 do not engage in any organized physical activity during their non-school hours and 22.6% of the same age group do not participate in
any free time physical activity (Centers for Disease Control and Prevention, 2003).

Adolescent ethnic minorities are less physically active than non-minority adolescents (Gordon-Larsen et al., 1999). In particular, African-American female adolescents are less physically active than white female adolescents (Kimm et al., 2002). Non-Hispanic white children and children of families with higher education or income levels are more likely than Non-Hispanic black or Hispanic children to engage in organized physical activities (Centers for Disease Control and Prevention, 2003).

A recent longitudinal study suggested that the rate of moderate-to-vigorous physical activity (MVPA) dramatically decreases from age 9 to 15 years for both boys and girls (Nader, Bradley, Houts, McRitchie, & O’Brien, 2009). At age 9 years, children engaged in MVPA about 3 hours per day on both weekdays and weekend days. However, by age 15 years, adolescents only engaged in 50 minutes per weekday and 36 minutes per weekend day (Nader et al., 2009). Troiano et al. (2008) found that 42% of 6-11 year olds in their sample obtained 60 minutes of daily physical activity compared to only 8% of adolescents in their sample. Other studies have noted an inverse relationship between time engaged in physical activity and age (Heath, Pratt, Warren,
& Kann, 1994; Pratt, Macera, & Blanton, 1999; Trost, Pate, et al., 2002).

It is estimated that boys drop below the suggested 60 minutes of MVPA per day at age 14.9 years compared to 13.2 years for girls (Nader et al., 2009). Other studies have indicated that adolescent girls are less physically active than adolescent boys (Caspersen, Pereira, & Curran, 2000; Trost et al., 2002; Van Der Horst, Paw, Twisk, & Van Mechelen, 2007).

Schools play a major role in helping school-aged children meet their recommended amount of physical activity. The National Association for Sport and Physical Education (NASPE) (2004) suggests that middle school students should receive 225 minutes of physical education per week. To accomplish this goal over a five day school week, students would have to get 45 minutes each day. It should be noted that in Pennsylvania, the state in which both the current study and Shore et al. (2008) were conducted, the PA Department of Education does mandate physical education for middle school students, but does not specify the frequency or duration (PA code 4.2). The middle school setting of the current study and Shore et al. (2008) only provides students with two 45 minute periods of physical education every six school days. Pennsylvania,
like many other states, is falling well short of providing the recommended amount of physical education. According to the 2004 School Health Profiles, the state median of schools that require two or more physical education courses in any grades 6-12 was only 81.7% (Centers for Disease Control and Prevention, 2004).

In addition to the current NASPE recommendation, objectives in Healthy People 2010 contain some benchmarks for measuring physical education in schools. Specifically, Objective 22-8 calls for states to “Increase the proportion of public and private schools that require physical education for all students.” Objective 22-9 calls for states to “Increase the proportion of adolescents who participate in daily school physical education.” (U.S. Department of Health and Human Services, 2000).

In 2000, 6.4% of all public and private middle and junior high schools and 5.8% of all public and private senior high schools required daily physical education (Centers for Disease Control and Prevention, 2000). Similar rates of physical education were found in the School Health Policies and Programs Study in 2006. It was noted that 3.8% of elementary schools, 7.9% of all middle schools, and 2.1% of all high schools provide daily physical education (Kann, Brenner, & Wechsler, 2007). Since
2000, the prevalence of physical education in schools has not increased in any level of education in the United States (Lee, Burgeson, Fulton, & Spain, 2007). The percent of high school students that report attending daily physical education classes has declined from 41.6% in 1991 to 33.0% in 2005 (Centers for Disease Control and Prevention, 2005).

There have been some positive school-related physical activity trends noted at the state and school district level from 2000 to 2006. The percent of states that require elementary schools to provide regularly scheduled recess increased from 4.1% in 2000 to 11.8% in 2006 (Kann et al., 2007). School districts that instituted a similar requirement increased from 46.3% in 2000 to 57.1% in 2006 (Kann et al.). States that adopted policies that prohibited schools from using physical activity as punishment increased from 2.1% in 2000 to 16.0% in 2006 (Kann et al.).

Specific to middle school physical education, 16.1% of all middle schools have a physical education requirement and only 7.9% provide daily physical education in all grades throughout the year (Lee et al., 2007). Seventy-eight percent of states and 78.6% of districts that teach physical education adopted goals and expected outcomes for
physical education (Lee et al.). However, only 37.3% of states and 76.0% of districts require a specific number of minutes per week or hours per year for middle school physical education. Only 2.0% of states require and 39.2% of states recommend that schools assess students’ knowledge of physical education through written tests (Lee et al.). Physical skill assessments are required by 2.0% of states and are recommended by 43.1% of states (Lee et al.).

According to the Youth Risk Behavior Surveillance System (YRBSS) in 2005, 35.8% of high school students received 60 minutes or more of physical activity on five or more of the last seven days (Centers for Disease Control and Prevention, 2005). From 1999 to 2005, the percentage of students who participated in at least 20 minutes of vigorous physical activity on three or more of the past seven days and/or at least 30 minutes of moderate physical activity on five or more of the past seven days has remained close to 68% (Centers for Disease Control and Prevention). The percent of students who did not engage in moderate or vigorous physical activity in the last 7 days in 2005 was 9.6% compared to 9.4% in 1999 (Centers for Disease Control and Prevention).

The connection between physical activity and obesity will be explored in more detail in the Review of
Literature. However, some findings from Shore et al. (2008) detailing the decreased academic success of overweight middle school students provide an interesting backdrop for the current study. Shore et al. determined that at the school where the current study took place, the percentage of students at-risk for overweight was 15.8% and the percentage of overweight was 10.5% for 6th and 7th graders. Overall, the percent of students either at-risk for overweight or overweight was 26% for 6th and 7th graders. In addition to the rates of overweight being determined, the purpose of the Shore et al. study was to report on whether overweight students achieved a lower relative degree of scholastic achievement compared to nonoverweight students (Shore et al.).

In the Shore et al. (2008) study, subjects consisted of 6th and 7th grade students enrolled in a large public middle school in a suburb of Philadelphia, PA. Grade point averages, nationally standardized reading scores, school detentions, school suspensions, school attendance, tardiness to school, physical fitness test scores, and participation on school athletic teams were compared among nonoverweight, at-risk for overweight, and overweight students. Overweight students achieved lower grades ($p < 0.001$) and lower physical fitness scores than their
nonoverweight peers \((p < 0.0001)\). Overweight students demonstrated a 0.4 letter grade lower GPA (on a 4.00 scale) and 11% lower national percentile reading scores than their nonoverweight peers (Shore et al.).

The overweight students also demonstrated significantly more detentions, worsened school attendance, more tardiness to school, and less participation on school athletic teams than their nonoverweight peers. This study suggests that body mass is an important indicator of scholastic achievement, attendance, behavior, and physical fitness among middle school students, reiterating the need for healthy lifestyle intervention and prevention measures (Shore et al., 2008). Moreover, these findings support the aims of the current dissertation. The current study was needed to determine whether a school-based intervention can increase physical activity among sixth grade students at this school. Secondly, the study was needed to investigate the relationship between increased physical activity and other variables such as grade point average, physical fitness, and self-efficacy and attitude toward physical activity.

Purpose

There were three main purposes of this study. The primary purpose of the study was to determine the efficacy
of an intervention to increase physical activity consisting of a 10 lesson school-based curriculum combined with self-monitoring among sixth grade students in the experimental condition relative to sixth grade students in the control condition. A secondary aim of the study was to determine whether the experimental group increased their grades, physical fitness, self-efficacy, and attitude about physical activity relative to the control group. The third aim was to determine whether increased physical activity was associated with academic and fitness dependent measures.

Hypotheses

The following hypotheses were presented in this study:

1. The experimental group will significantly increase their physical activity relative to the control group.

2. The experimental group will significantly increase their physical activity during the intervention compared to their baseline physical activity.

3. The control group will significantly increase their physical activity during the intervention compared to their baseline physical activity.

4. The experimental group will significantly improve their grades relative to the control group.

5. The experimental group will significantly improve on
measures of physical fitness relative to the control group.

6. The experimental group will significantly improve their measures of self-efficacy to be physically active relative to the control group.

7. The experimental group will significantly improve their attitude toward physical activity relative to the control group.

Delimitations

The study was delimited as follows:

1. Participants self-reported their amount of physical activity.

2. Confounding factors may have contributed to changes in grades, measures of physical fitness, and self-efficacy to be physically active.

3. The results of this study are reflective of one suburban middle school near Philadelphia, PA.

Limitations

The study was limited as follows:

1. The research design of the study did not allow for a true experimental group.

2. The researcher was responsible for the design of the curriculum-based component of the study.

3. The accuracy of self-reported physical activity was
based on the truthfulness of the participants.

Definitions of Terms

For the purposes of this study, relevant terms are defined below:

**Attitude toward physical activity**: A construct that refers to one’s like or dislike of engaging in planned movement such as walking, running, or swimming. For this study it was defined by a student’s self-rating on the Attitude Questionnaire by Motl et al. (2000).

**Grades**: A teacher’s evaluation of a student’s performance in a given class. Teachers in this school could assign a letter grade from A through F.

**Obesity**: A condition that results from an excess storage of fat in humans. It is generally defined in adults by a BMI > 30 and in children by a BMI > 95th percentile.

**Overweight**: A condition that results from a person having more body fat than is optimally healthy. Adult overweight is defined by a BMI value between 25.0-29.9 and in children by a BMI percentile between 85 – 94.9.

**Physical Fitness**: Refers to the functioning of one’s heart, lungs, blood vessels, and muscles. Physical Fitness was assessed using the Presidential Physical Fitness Test consisting of curl-ups, shuttle run, endurance 1 mile run/walk, pull-ups, and sit and reach. Students received
an age-related national percentile score for each component. **Self-efficacy of physical activity**: A construct that refers to one’s belief that one can successfully engage in planned movement such as walking, running, or swimming. This was assessed using the Self-Efficacy Questionnaire developed by Motl et al. (2000).

**Self-monitoring**: A behavioral strategy employed to help individuals regulate their behavior based on self-attained feedback. Students self-monitored their daily physical activity using a pedometer and recorded their daily step-counts.

**School-based curriculum**: A set of courses, coursework, or studies offered by a school to educate students in a particular subject.
CHAPTER 2
REVIEW OF THE LITERATURE

There were three main purposes of this study. The primary purpose of the study was to determine the efficacy of an intervention to increase physical activity consisting of a 10 lesson school-based curriculum combined with self-monitoring among sixth grade students in the experimental condition relative to sixth grade students in the control condition. A secondary aim of the study was to determine whether the experimental group increased their grades, physical fitness, self-efficacy, and attitude about physical activity relative to the control group. The third aim was to determine whether increased physical activity was associated with academic and fitness dependent measures.

Current Rates of Adult Physical Activity

The rates of adult physical activity are relevant to the current study because previous research suggests that parental physical activity (Van Der Horst et al., 2007) and parental support (Heitzler, Martin, Duke, & Huhman, 2006; Sallis, Prochaska, & Taylor, 2000) are associated with adolescent physical activity. The correlation between
pediatric overweight and obesity and adult overweight is well documented (DiPietro, Mossberg, & Stunkard, 1994; Guo, Roche, Chumlea, Gardner, & Siervogel, 1994; Serdula et al., 1993; Whitaker, Wright, Pepe, Seidel, & Dietz, 1997). Two older studies reported that 80% of overweight children are overweight as adults (Abraham & Nordsieck, 1960; Abraham, Collins, & Nordsieck, 1971). A more recent meta-analysis on the years from 1970-1992 revealed that about 33% of obese preschool children are obese as adults, and about 50% of obese school-age children are obese as adults (Serdula et al., 1993).

Physical activity among adults has been on the steady decline in the United States (National Institutes of Health, 1996). Less than 50% of all American adults met the prior suggested guideline for physical activity of 30 minutes or more of moderate physical activity on most days of the week (Centers for Disease Control and Prevention, 2003). More recently, the CDC classified 31.9% of 18-24 year olds, 36.9% of 25-34 year olds, 39.8% of 35-44 year olds, 39.6% of 45-64 year olds, and 36.9% of 65 years and older as getting insufficient daily physical activity (Centers for Disease Control and Prevention, 2007).

Healthy People 2010, a campaign launched by the Department of Health and Human Services in 2000, contains
15 objectives related to physical activity. Limited progress has been made on some of the objectives moving toward their target goals. However, data collected from the Midcourse Review of Healthy People 2010 in 2005 suggest that none of the physical activity objectives met their targets (Centers for Disease Control & President’s Council on Physical Fitness and Sports, 2005). From 1997 to 2003, the percentage of the population that reported no leisure time physical activity declined 3%, but still remains close to 40% (Centers for Disease Control & President’s Council on Physical Fitness and Sports).

Only 13% of White women, 8% of African-American women, and 11% of Mexican-American women get 30 minutes or more of MVPA on most days of the week (Ransdell & Wells, 1998). Physical inactivity is highest among the less educated (Harper & Lynch, 2007). Twenty-six percent of adults, 65 years or older, get the recommended amount of physical activity (McGuire, Strine, Okoro, Ahluwalia, & Ford, 2007).

Non-Hispanic black and Hispanic men and women are less likely to engage in leisure time physical activity (LTPA) than White men and women (He & Baker, 2005; Marshall et al., 2007). Among American workers, 36% of men and 31% of women report meeting the Healthy People 2010 target for leisure time physical activity (LTPA) of a) light-moderate
activity ≥ 30 min five or more times per week; and/or b) vigorous activity ≥ 20 min three or more times per week (Caban-Martinez et al., 2007). Women of color, women that are not college educated, and women over 40 participate in the least amount of LTPA (Ransdell & Wells, 1998). Men are more likely to engage in leisure time physical activity if they are young, have higher levels of income and education, are single, own a home, live in the West, and have contact with a health professional in the last year (Ahmed et al., 2005). White men are more likely to engage in LTPA than other ethnicities (Ahmed et al.; He & Baker). For men and women, the time spent for physical activity during leisure time is less for individuals in a lower socioeconomic status (Marshall et al.) and lower levels of education (He, 2005; Centers for Disease Control and Prevention & President’s Council on Physical Fitness and Sports). In contrast to LTPA, work related physical activity is lowest among Whites and those with more education (He & Baker).

The Relationship between Physical Activity and Obesity

The causes of obesity are complex and multi-faceted. The cause of obesity most relevant for discussion to this dissertation is decreased energy expenditure in the form of declining physical activity. It is believed that inactivity contributes to the current obesity epidemic

Increased sedentary behavior primarily in the form of television viewing has been linked to higher levels of obesity (Andersen et al., 1998; Dietz & Gortmaker, 1985; Gortmaker, Dietz, & Chueng, 1990; Wake, Hesketh, & Waters, 2003). In 12-17 year olds, for every additional hour of television watched, obesity increases by 2% (Dietz & Gortmaker). Twenty-one percent of high school students use a computer for purposes unrelated to school or play video games for three hours or more a day (Centers for Disease Control and Prevention, 2005). Children are also walking to school less. Since 1969, the percent of students that walk to school has decreased 28% (McDonald, 2007). This trend continues through adulthood as the majority of young adults use cars to commute to work (90.4%) and school (74.7%) (Gordon-Larsen, McMurray, & Popkin, 2005). Nonoverweight young adults are more likely to use active transportation to commute to work or school than overweight young adults (Gordon-Larsen et al.).
Another relevant factor to the discussion of weight gain is increased energy intake (Dewey, Heinig, Nommsen, Peerson, & Lonnerdal, 1993; Putnam & Allshouse, 1999; Stunkard, Berkowitz, Stallings, & Schoeller, 1999). One source of increased caloric intake is the growth of portion sizes in the United States. Portion sizes, with the exception of sliced white bread, have increased in fast-food restaurants, take-out establishments, and family-type restaurants and far exceed recommended portion sizes (Young & Nestle, 2002). Compared to USDA standards, the portion size of cookies, pasta, muffins, steaks, and bagels readily available for consumption exceed the recommended portion size by 700%, 480%, 333%, 224%, and 195% respectively (Young & Nestle). Children report preferences for larger portions of French fries, meat, and potatoes, and smaller portions of vegetables (Colapinto, Fitzgerald, Taper, & Veugelers, 2007).

Rates of sugar consumption in the United States parallel the weight gains of the population in the United States. The consumption of high fructose corn syrup (HFCS) in the United States increased more than 1000% since 1967, more than any increase in food intake over the same time period (Bray, Nielson, & Popkin, 2004). In adults, the consumption of HFCS has been linked to weight gain.
(Anderson, Story, Zettwoch, & Gustafson, 1989; Tordoff & Alleva, 1990). Individuals 2 years or older consume an average of 113 kcal of HFCS, while the top 20% of HFCS consumers intake over 300 kcal per day (Bray, 2004). Two-thirds of HFCS consumed in the United States is in beverages (Bray et al.). The consumption of sweet drinks by children as young as 2 years has been shown to be associated with overweight (Welsh et al., 2005). While sugar consumption is on the rise among youth in the United States, the consumption of 5 or more servings of fruits and vegetables by students in grades 9-12 has decreased from 23.9% in 1999 to 20.1% in 2005 (Centers for Disease Control and Prevention, 2005).

Nutritional options that contribute to weight gain are accessible throughout schools in the United States. In 2006, food and beverages high in fat or added sugars were available in 11.9% of all elementary schools, 25.4% of all middle schools, and 48.0% of all high schools from a vending machine, school store, or snack bar during lunch (Kann et al., 2007). The most popular items purchased from school vending machines are soda, sports drinks, salty snacks that are high in fat, and fruit drinks (Kann et al.). Only 50% of districts and schools follow 9 out of 22 nutritionist recommended food preparation practices for
reducing fat and added sugar in school meals (Kann et al.). A minority of school districts require more than a high school diploma or GED as a requirement to become a food service manager in a school (Kann et al.). There have been some positive trends in school nutritional services in recent years. From 2000 to 2006 the percentage of schools that offer low-fat à la carte items including lettuce, pita bread, low-fat or non-fat yogurt, and vegetables other than potatoes has increased (Kann et al.).

Biological factors that contribute to weight gain are genetics (Maes, Neale, & Eves, 1997; Roberts, Savage, Coward, Chew, & Lucas, 1988; Whitaker et al., 1997) and hormones (Gale, 2004; Rahmouni, 2005; Scharf, 2004). Approximately 50 to 90% of the variance in BMI is attributed to genetic factors (Maes et al., 1997). Decreased energy expenditure and weight gain is associated with infants of obese mothers (Roberts et al., 1988). Children are more likely to be overweight if one or more of their parents are overweight (Dowda, Ainsworth, Addy, Saunders, & Riner, 2001; Maffeis, Talamini, & Tato, 1998). Overweight children with an overweight parent consume more calories from fat than children from families with no overweight parent (Eck, Klesges, Hanson, & Slawson, 1992).
Current Rates of Pediatric and Adult Overweight and Obesity

Body Mass Index (BMI) values are a measure of body weight adjusted for height. BMI values highly correlate to sophisticated measures of body fat such as underwater weighing and dual energy x-ray absorptiometry (Garrow & Webster, 1985; Mei et al., 2002; Pietrobelli et al., 1998). Adult overweight is defined by a BMI value between 25.0–29.9 and adult obesity is defined by a BMI value ≥ 30 (U.S. Department of Health and Human Services, 1998). BMI values for adults 20 years and older are calculated as weight in kilograms divided by height in meters squared (U.S. Department of Health and Human Services, 1998).

BMI values for children and adolescents are calculated using the same formula used to calculate BMI values for adults. Excess weight in children and adolescents in the United States is identified by BMI percentiles, which additionally factor age and gender. BMI percentile values are determined by plotting the BMI value on the 2000 CDC Growth Charts for the United States (Kuczmarski et al., 2002). Children and adolescents aged 2–19 are considered overweight that have a BMI percentile between 85.0 – 94.9 and are considered obese with a BMI percentile ≥ 95.
It has been well documented that the percentage of overweight children and adults in the United States has been on the rise for several decades and has reached epidemic proportions. (Ogden, Carroll, McDowell, & Flegal, 2007; Strauss & Pollack, 2001). Since the late 1970’s, the percentage of overweight children aged 2-5 has grown from 5% to 14%. For children aged 6-11, the percentage has grown from 7% to 19%, while for adolescents aged 12-19 years the percentage of overweight has jumped from 5% to 17% based on the 1976-1970 and the 2003-04 National Health and Nutrition Examination Surveys (NHANES) (U.S Department of Health and Human Services, 1980, 2004). Between 1999-2004, the rates of overweight for female children and adolescents modestly increased from 14% to 16% and from 14% to 18% among male children and adolescents (Ogden et al., 2006).

The rate of overweight among boys is significantly greater for Mexican-American than white or African-American boys. For girls, the prevalence of overweight is higher for Mexican-American and African-American girls than white girls (National Center for Health Stats, 2004). Mexican-American adolescents aged 12-19 have a rate of overweight of 41% and an obesity rate of 23% (Forrest & Leeds, 2007). Among adolescents, Filipino-Americans (18.5%) and Chinese-
Americans (15.3%) have the lowest rates of obesity (Popkin & Udry, 1998).

A study that compared the obesity rate at the beginning and end of the twentieth century found that the obesity rate among White males aged 40-69 increased from 3.4% in 1890 to 35% in 2000 (Helmchen & Henderson, 2004). More recent data from the 2005-06 NHANES indicate adult obesity rates for men and women leveled off since the 2003-04 NHANES, yet 33% of adults in America, or 72 million people, remain obese (Ogden et al., 2007). The rate of obesity among men and women aged 40-59 is approximately 10% higher than men and women aged 20-39 (Ogden et al., 2007). Despite the percentage of adult obesity leveling off, the entire adult U.S. population is heavier now than it was in 1980 (Ogden et al., 2007). This trend is caused by the significant increase of extremely overweight adults in the last 25 years (Ogden et al., 2007). The rate of extreme obesity (body mass index \( \geq 40 \)) was 3% in men and 7% in women in 2003-04 (Ogden et al., 2006).

According to the 2005-06 NHANES, there are no significant differences in obesity rates between ethnic groups for men (Ogden et al., 2007). There are considerable disparities for the rate of obesity between women of different ethnic groups in the United States. The rate of
obesity of African-American and Mexican-American women aged 40-59 is over 50% compared to the 39% obesity rate of the same aged non-Hispanic white women (Ogden et al., 2007). This difference is even greater for African-American women aged 60 years or older. Their rate of obesity is 61% compared to 32% for non-Hispanic white women and 37% for Mexican-American women the same age.

Based on data from four administrations of the NHANES, it is predicted that 35% of white men, 36% of white women, 33% of black men, and 55% of black women will be obese in the United States by 2010 (Wang, Colditz, & Kuntz, 2007).

Health and Psychosocial Risks Associated with Obesity

Overweight children and adolescents are at-risk for significant health problems including insulin resistance (Bergstrom, Hernell, Persson, & Vessby, 1996; Lee, Okumura, Davis, Herman, & Gurney, 2006; Reinehr, Kiess, & Andler, 2005; Steinberger, Moorehead, Katch, & Rocchini 1995), cardiovascular risk factors (Freedman, Mei, Srinivasan, Berenson, & Dietz, 2007; Hanevold et al., 2005; Ribeiro et al., 2003), asthma (Forrest & Leeds, 2007), and high cholesterol or hyperlipidemia (Newfield, Dewan, & Jain, 2008), and obstructive sleep apnea syndrome (Karla et al., 2005; Mallory, Fiser, & Jackson, 1989). Children that are
overweight are two times more likely to report health-related concerns than nonoverweight children (Neumark-Sztainer, Story, Resnick, & Blum, 1997). Left Ventricular Hypertrophy, an indicator of heart disease, is more common among overweight Hispanic-American youth than other ethnic groups (Hanevold et al.). Children with a BMI percentile of > 75% show a 1.5 times greater occurrence of one or more risk factors for heart disease (Ribeiro et al.).

Psychosocial risks have also been identified among overweight children and adolescents (Must & Strauss, 1999). Recent studies have found that overweight and at-risk for overweight pre-adolescents and young adolescents demonstrate decreased health-related quality of life in social and school domains (Pinhas-Hamiel et al., 2006; Williams, Wake, Hasketh, Maher, & Waters, 2005; Zeller & Modi, 2006). Overweight adolescents report being teased more than nonoverweight adolescents (Neumark-Sztainer et al., 2002). Overweight adolescents are less likely to be identified by their peers as belonging to social networks (Strauss & Pollack, 2003). A study that was conducted in 1961 was replicated in 2001 and demonstrated that 5th and 6th grade students rated liking the picture of a nonoverweight child more than a picture of an overweight child (Latner & Stunkard, 2003).
A large meta-analysis identified 13 studies that found lower self-esteem in overweight and obese adolescents compared to their nonoverweight peers (French, Story, & Perry, 1995). Conversely, low-income Hispanic 4th grade students who participated in a structured physical fitness program, increased their self-esteem at the conclusion of the program (Crews, Lochbaum, & Landers, 2004). Adolescent females have also been shown to increase their self-esteem by participating in an intervention to increase their physical activity (Schmalz, Deane, Birch, & Davison, 2007). Obese children whose self-esteem decreased over several years are more likely to smoke cigarettes and drink alcohol compared to obese children whose self-esteem stayed stable over several years (Strauss, 2000). One study reported that 6% of overweight students in grades 7-12 reported being teased about their weight at least once a week (Eisenberg, Neumark-Sztainer, & Perry, 2003). A recent study of students in grades 4-6 in a large urban school district found that overweight students were absent significantly more than nonoverweight students (Geier et al., 2007).

Psychosocial problems associated with elevated weight status extend into adulthood. A longitudinal study suggested that females that were overweight as adolescents were more likely to complete fewer years of formal
education, generate lower incomes, and have a greater likelihood of living in poverty as adults than their non-overweight peers (Gortmaker et al., 1993). Women are at a greater risk of major depression and suicidal ideation with an elevated weight status (Carpenter, Hasin, Allison, & Faith, 2000). The chances of a diagnosis of major depression, bi-polar disorder, and anxiety disorder are greater for obese adults (Simon et al., 2006).

Numerous health-related conditions are associated with overweight and obesity among adults, including hypertension (Brennan, Simpson, Blacket, & McGilchrist, 1980; Dyer & Elliott, 1989; Stamler, Stamler, Riedlinger, Algera, & Roberts, 1978; Van Itallie, 1985; Wang et al., 2006) type-2 diabetes (Colditz et al., 1990; Medalie, Papier, Goldbourt, & Herman, 1975; Pettitt, Lisse, Knowler, & Bennett, 1982; Schienkiewitz, Schulze, Hoffmann, Kroke, & Boeing, 2006), coronary heart disease (Hubert, Feinleib, McNamara, & Castelli, 1983; Kannel et al., 1991; Kim, Meade, & Haines, 2006; Willet et al., 1995;), stroke (Kannel et al.; Rexrode et al., 1997; Kurth et al., 2002), breast cancer (Ahn et al., 2007; Eliassen, Colditz, Rosner, Willett, & Hankinson, 2006; Huang et al., 1997; Trentham-Dietz et al., 2000;), and prostate cancer (Andersson et al., 1997; Rodriguez et al., 2007). These health-related conditions are estimated
to contribute to over 300,000 deaths annually in the United States (Allison, Fontaine, Mason, Stevens, & VanItallie, 1999). Eighty percent of obesity-related deaths in the United States for adults over 18 years occur in individuals with a BMI value > 30 (Allison, Fontaine, et al.).

Rates of hypertension for overweight adults are 50-300% greater than the rate of hypertension for nonoverweight adults (Stamler et al., 1978). The onset of type 2 diabetes is associated more with weight gain in early adulthood than weight gain in middle adulthood (Schienkiewitz et al., 2006). Weight gain for women after the age of 18 years is a strong predictor of coronary heart disease. Even for women with a BMI in the normal range, weight gain after age 18 increases the risk of coronary heart disease (Willet et al., 1995). Each unit of increased BMI is associated with a 6% increase in the risk of stroke among men (Kurth et al., 2002).

The occurrence of breast cancer in women after menopause that never used postmenopausal hormones is associated with weight gain after age 18 (Ahn et al., 2007; Huang et al., 1997). Weight gain after 18 years for women accounts for approximately 16% of breast cancer in postmenopausal women who do not use postmenopausal hormones (Eliassen et al., 2006; Huang et al., 1997). Weight gain
between 18 years and menopause accounts for 24% of postmenopausal breast cancer and nearly 8% of postmenopausal breast cancer is associated with weight gain after menopause (Eliassen et al.). Conversely, weight gain prevention between 18 years and menopause or weight reduction or maintenance during the same age range reduces the risk of breast cancer among women (Eliassen et al.; Harvey et al., 2005). In men there is a stronger association with elevated weight with mortality from prostate cancer than the incidence of prostate cancer (Andersson et al., 1997).

More significant health risks among the overweight population have resulted in mortality rates that are higher for overweight individuals than nonoverweight individuals (Adams et al., 2006; Allison, Fontaine et al., 1999; Bellanger & Bray, 2005; Lee, Manson, Hennekens, & Paffenbarger, 1993; Lindsted, Tonstad, & Kuzma, 1991; Manson et al., 1995). Three-hundred thousand adult deaths are attributable to obesity (Allison, Zannolli, & Narayan, 1999). Mortality rates among overweight middle aged women are two times greater than middle aged lean women (Manson et al., 1995). Life expectancy for moderately obese middle aged men is one year less than non-obese middle age men (Thompson, Edelsberg, Colditz, Bird, & Oster, 1999).
The overall cost of healthcare associated with obesity-related disease is estimated at almost $100 billion dollars annually (Finkelstein, Fiebelkorn, & Wang, 2003; Wolf & Colditz, 1998). The total cost of obesity in the United States in 2000 was $117 billion dollars (U.S. Department of Health and Human Services, 2001). The overall health expenditure on obesity is between 5.0%-9.0% of the total National Health Expenditure in the United States (Finkelstein et al.; Wolf & Colditz). The cost of individual healthcare is greater for overweight individuals (Heithoff, Cuffel, Kennedy, & Peters, 1997; Thompson, Brown, Nichols, Elmer, & Oster, 2001; Quesenberry, Caan, & Jacobson, 1998). Health care costs are 25% greater for individuals with a BMI between 30-34.9 and 44% greater compared to individuals with a BMI between 20-24.9 (Quesenberry et al.). Healthcare costs based on Medicaid expenditures are significantly greater for at-risk for overweight and overweight adolescents than normal weight adolescents (Buescher, Whitmire, & Plescia, 2008).

Obese workers are more likely than average weight workers to report lost productivity time (Ricci & Chee, 2005). The loss of productivity per moderately to extremely obese worker is around $500.00 annually (Gates, Succop, Brehem, Gillespie, & Sommers, 2008). It is
estimated that obese workers account for $42 billion in lost productivity time per year (Ricci & Chee, 2005).

History of Physical Activity Recommendations for Children and Adolescents

The current view of physical activity for children and adolescents has dramatically changed from the nineteenth century (Corbin, Pangrazi, & Welk, 1994). Work by a German physician named Behnke was instrumental in limiting the physical activity of children (Corbin et al.). Behnke warned that children should not participate in physical activity because their blood vessels develop at a considerably lower rate than their heart (Karpovich, 1937). Thus, the fallacy that the stress of physical activity would cause children to experience high blood pressure and other circulatory problems was established (Karpovich).

This incorrect physiological assumption continued into the mid twentieth century (Corbin et al., 1994). Other health educators and child development experts concurred that the decreased vein and artery size in relation to the heart among children was a sound reason to discourage strenuous exercise (Hurlock, 1967; Van Hagen, Dexter, & Williams, 1951). These experts relied on sources that originally traced back to Behnke (Corbin et al.). Physical activity was cautioned also by Boas and Lowenburg (1931),
who asserted that children’s muscles would fail during excessive exercise.

Kraus and Hirschland (1953) brought national attention to the physical fitness movement for children. They reported that 56% of American schoolchildren did not meet even the minimum requirement for physical fitness compared to 8% of their European peers (Kraus & Hirschland). When President Eisenhower learned of this information, he invited several athletes and experts in exercise to a conference in 1956 to further investigate these findings. This conference lead to the formation of the President’s Council on Youth Fitness and the President’s Citizens Advisory Committee on the Fitness of American Youth (Hackensmith, 1966). Also of note during the 1960’s, the American Association of Health, Physical Education, and Recreation (AAHPER) developed new norms for its fitness testing program. The tests were normed with 11,000 girls and boys between the ages of 12-17 years (U.S. Department of Health and Human Services, 1996). In 1966, AAHPER also incorporated the newly created Presidential Physical Fitness Awards into their fitness testing program (U.S. Department of Health and Human Services).

The health and fitness movement for adults gained support from research conducted in the 1950’s and 1960’s
(Corbin et al., 1994). The health benefits of physical activity were highlighted in three studies (Morris, Hady, Raffle, Roberts, & Parks, 1953; Pomeroy & White, 1958; Taylor et al., 1962). The next major development in the field of exercise and health was the development of the Exercise Prescription Model (EPM) (Corbin et al.). The EPM was largely based on the work by Karvonen (1957), which identified thresholds of training based on \( VO_{2\text{max}} \). The EPM served as the recommended guideline for cardiovascular exercise for adults through the 1970’s and 1980’s (Corbin et al.).

The American College of Sports Medicine (ASCM) (1978) released the first position statement of its kind highlighting the frequency, duration, and intensity of adult exercise. The recommendations called for exercise training of 3–5 days per week with an intensity of 60%–90% of maximal heart rate. In addition, the training was supposed to last 15–60 minutes per session and consist of rhythmical and aerobic use of large muscle groups through such activities as running or hiking (The American College of Sports Medicine, 1978). The goal of these recommendations was largely to improve cardiorespiratory endurance (U.S. Department of Health and Human Services, 1996). The guidelines served as the basis for most
exercise recommendations for adults until 1990, when the ASCM revised its position statement (U.S. Department of Health and Human Services).

In 1978 the American Academy of Pediatrics issued a position paper that proposed that many children who were previously screened out for physical education were capable of full participation (American Academy of Pediatrics, 1991). The American Alliance for Health, Physical Education, Recreation, and Dance (AAHPERD) (1980) further supported the ability of children to be physically active by including the mile run in the national physical fitness test batteries. The EPM served as the guideline for physical activity for children until the late 1980’s (Corbin et al., 1994). It was recommended that, in order for children to gain cardiovascular benefits, they should follow the same prescribed exercise duration and intensity as adults (Rowland, 1985; Sady, 1986). Sady suggested that for children to develop cardiorespiratory fitness, they should exercise 3-5 times a week at 50-85% of their VO$_2$ Max for 15-60 minutes per session.

The efficacy of the EPM to quantify physical activity for children was questioned by the results of two studies (Armstrong, Balding, Gentle, & Kirby, 1990; Armstrong & Bray, 1991). Armstrong et al. found that over 75% of girls
and boys would be classified as inactive using the criteria of a continuous heart rate above 140 for 20 minutes. Sleap and Waburton (1992) used observational methods to conclude that the majority of children aged 5-11 were inactive based on the recommended criteria of 20 to 30 minutes of continuous MVPA at least three times per week. Only 21% of the children engaged in a 20 minute bout of MVPA (Sleap & Warbuton). Another similar study noted that there were no observed continuous 20-30 minute bouts of MVPA for students in grades 3-6 over the course of the 48 day observation period (Baranowski, Hooks, Tsong, Cieslik, & Nader, 1987). Thus, the EPM began to fall out of favor in regard to children, giving way to a new strategy for quantifying physical activity (Corbin et al.).

During the 1990’s several important organizations issued statements that reflected what Blair, Kohl, and Gordon (1992) termed “life-style exercise.” In 1992 the CDC and ACSM released a statement that indicated the low rate of physical activity participation of Americans was based on the faulty notion that physical activity had to be continuous and vigorous in order for them to reap health benefits (Pate et al., 1995). The statement further recommended that adults engage in 30 minutes or more of accumulated moderate-intensity physical activity on most
days of the week (Pate et al.). Adults that meet this weekly goal will expend around 200 calories per day (Pate et al.). The new physical activity recommendation for adults promoted the accumulation of lifestyle activity (like raking leaves or walking up steps) over the course of the week as a way of gaining health benefits (Pate et al.).

The change in emphasis on accumulated lifestyle activity is supported by a study that indicated that accumulated intermittent activity has the same capacity to increase fitness as continuous activity (DeBusk, Stenestrand, Sheehan, & Haskell, 1990). Other studies found that health benefits can be obtained through weekly caloric expenditure between 1500-2000 calories through physical activity (Leon, Connett, Jacobs, & Rauramaa, 1987; Paffenbarger, Hyde, Wing, & Hsueh, 1986). The same studies that identified most children as inactive based on the EPM, provide data in support of the LPAM (Armstrong & Bray, 1990, 1991; Baranowski et al., 1987; Slep & Warburton, 1992). These studies found that children engaged in daily accumulated physical activity between 31-88 minutes per day.

Healthy People 2000, a monumental health agenda for the United States, was issued in 1990 by the Secretary of the Department of Health and Human Services. The agenda
contained 22 priority areas including one specific area for physical activity (National Center for Health Statistics, 2001). There were 13 specific targets within the physical activity priority area. The targets regarding physical activity and children included, 1.3: “Increase to at least 30 percent the proportion of people aged 6 and older who engage regularly, preferably daily, in light to moderate physical activity for at least 30 minutes per day.”, 1.5: “Reduce to no more than 15 percent the proportion of people aged 6 and older who engage in no leisure-time physical activity.”, 1.6: “Increase to at least 40 percent the proportion of people aged 6 and older who regularly perform physical activities that enhance and maintain muscular strength, muscular endurance, and flexibility.”, 1.8: Increase to at least 50 percent the proportion of children and adolescents in 1st-12th grade who participate in daily school physical education.”, and 1.9: “Increase to at least 50 percent the proportion of school physical education class time that students spend being physically active, preferably engaged in lifetime physical activities.” (National Center for Health Statistics, 2001).

In 1993, the International Consensus Conference on Physical Activity Guidelines for adolescents issued a statement that adolescents should be physically active
every day and engage in three or more 20-minute sessions of moderate to vigorous physical activity per week (Sallis & Patrick, 1994). The American Academy of Pediatrics issued position statements in 1992 and 1994 that encouraged active play in pre-school children, the assessment of children's fitness, and parental involvement. The statements by the International Conference and American Academy of Pediatrics both emphasized lifestyle physical activity rather than a prescribed physical training for children (U.S. Department of Health and Human Services, 1996).

In 1994, the Surgeon General authorized the Centers for Disease Control and Prevention (CDC) to compile the first ever Surgeon General's Report on physical activity and health (U.S. Department of Health and Human Services, 1996). The President's Council on Physical Fitness and Sports (PCPFS) partnered with the CDC to provide the leadership for this report. In addition, contributions were made to the report by representatives from the Office of the Surgeon General, the Office of Public Health and Science, the Office of Disease Prevention, and the following institutes from the NIH: the National Heart, Lung, and Blood Institute; the National Institute of Child Health and Human Development; the National Institute of Diabetes and Digestive and Kidney Diseases; and the
National Institute of Arthritis and Musculoskeletal and Skin Diseases. Non-federal organizations including the American Alliance for Health, Physical Education, Recreation, and Dance; the American College of Sports Medicine; and the American Heart Association also contributed to the report (U.S. Department of Health and Human Services, 1996).

The Surgeon General's report recognizes that both the life-style exercise approach and the structured exercise regimen have potential to help people attain the necessary weekly physical activity (U.S. Department of Health and Human Services, 1996). The report suggests that people over two years of age should accumulate 30 minutes or more of endurance-type physical activity of at least moderate intensity on most days of the week (U.S. Department of Health and Human Services). Additional benefits of physical activity can be achieved by adding more moderate-intensity activity (U.S. Department of Health and Human Services, 1996).

Healthy People 2010, launched in 2000 again under the leadership of the Department of Health and Human Services, contains 467 objectives for improving the health of all people. It also contains 28 focus areas, one of which is Physical Activity and Fitness. There are 13 physical
activity and fitness objectives. Of particular note, objective 22-6 suggests that the percentage of adolescents who engage in moderate physical activity for at least 30 minutes on 5 of the previous 7 days needs to be increased. Objective 22-8 calls for an increase in public and private schools that offer daily physical education. Objective 22-11 suggests that the percentage of children and adolescents who watch 2 hours or more of television on school days needs to be decreased (U.S. Department of Health and Human Services, 2000).

The current recommended amount of physical activity for children and adolescents by the CDC is based on Dietary Guidelines for Americans (2005) which is published every five years by the Department of Health and Human Services and the US Department of Agriculture. It is currently recommended that children and adolescents engage in at least 60 minutes of physical activity, preferably on most days of the week (U.S. Department of Health and Human Services and the US Department of Agriculture, 2005).

Schools and Physical Activity

Despite increased attention to the importance of physical activity, the data on physical education do not suggest that students will not meet their recommended amount of physical activity during their school day.
Despite some of the discouraging rates of physical education in schools, schools still have considerable potential to help students adopt healthy behaviors (Story, 1999). Public schools have the capability of influencing almost 50 million students in the United States who are enrolled in public schools (U.S. Department of Education, 2005).

There are well-documented attempts to help students adopt healthy behavior in schools through specially designed programs that supplement the existing physical education and health education curriculum. Many of these early programs focused on helping overweight students reduce their weight by providing physical activity instruction/programming, nutrition education, and behavior modification targeted at slowing the pace of eating, controlling eating stimuli, and increasing independent physical activity (Botvin, Cantlon, Carter, & Williams, 1979; Brownell & Kaye, 1982; Christakis, Sajecki, Hillman, Blumenthal, & Archer, 1965; Lansky & Brownell, 1982; Lansky & Vance, 1983; Zakus, Chin, Cooper, Makovsky, & Merrill, 1981). In one of these studies, 13 and 14 year old boys demonstrated an 11% decrease in percent overweight and significantly better achievement on the Chinning Test, a
measure of physical fitness, after 18 months (Christakis et al.).

Another study indicated that the middle school girls who participated in a school-based weight reduction program showed a 9.3% decrease in percent overweight 8 months after the intervention (Zakus et al., 1981). A comprehensive 10 week weight reduction program including behavior modification, nutrition education, physical activity, and parent education yielded significant weight reduction. As part of the intervention, parents received instruction in behavior modification techniques. The overweight students participated in noncompetitive activities during physical education, received a reduced calorie school lunch, and received peer-group support in regularly scheduled small groups. Sixty-three overweight children from 5-12 years of age participated in the program. A comparison group was composed of overweight students at the same school who did not receive the intervention. Ninety-five percent of the treatment group lost weight compared to 21.4% of the control group. Ninety-seven percent of the treatment group reduced their percent overweight at the conclusion of the study while 73% of the control group showed increases in their percent overweight after 10 weeks. Thus, the majority of the overweight children that did not receive
the intervention had a strong chance of remaining overweight (Brownell & Kaye, 1982).

A review of the literature shows a noted shift from school programs that help only overweight students adopt healthy behavior to school-wide or grade-wide efforts to promote physical activity and weight gain prevention through a school-based curriculum and some type of monitoring of physical activity. (Frenn et al., 2005; Gortmaker, Cheung et al., 1999; Gortmaker, Peterson et al., 1999; Schofield, Mummery, & Schofield, 2005; Spiegel & Foulk, 2006; Ward et al., 2006).

Gortmaker, Peterson et al. (1999) reported on the efficacy of Planet Health to decrease obesity in an ethnically diverse population of 6th and 7th grade students. The intervention was based on the behavioral-choice and social cognitive theories of individual change. Students in the intervention group received a total of 16 lessons during the two-year intervention period. The lessons were taught by classroom teachers in major subjects. The emphasis of the program was to promote lifestyle change by reducing television viewing, reducing the consumption of high fat foods, increasing fruit and vegetable consumption, and increasing physical activity. Monitoring of physical activity was conducted using an adaptation of the Youth
Activity Questionnaire. Results of this study indicated that the prevalence of obesity among female students in the intervention group was reduced, but not among male students.

Dishman et al. (2005) assessed whether the Lifestyle Education for Activity Program (LEAP), a school-based program, would increase enjoyment of physical activity and physical education, and self-efficacy to be physically active. The intervention was implemented with 4044 adolescent females in 12 control and 12 experimental high school settings. LEAP is based on the Coordinated School Health Program (Illuzzi & Cinelli, 2000) which aims to change eight facets of the school environment. The intervention increased physical activity and enjoyment of physical activity in both black and white girls. Dishman et al. speculate that the mechanism of increased enjoyment of physical activity mediated increased physical activity. The success of LEAP to increase physical activity among black and white girls was also reported by Dishman et al.

Coordinated Approach to Student Health (CATCH), is a program aimed at improving healthy eating and increasing physical activity among elementary aged students (Franks et al., 2007). This randomized and controlled study included students from 96 elementary schools with diverse ethnic and
racial participants over the course of three years. Students in the intervention schools increased the amount of time they spent in MVPA during physical education class from 40% to 50% and reduced their consumption of meals high in fat in the school cafeteria from 39% to 32%. The intervention in CATCH involved classroom teachers using an age appropriate curriculum to teach students about healthy eating and physical activity. In addition, physical education teachers encouraged students to actively participate in physical education class. The intervention schools also served low-fat foods in their cafeterias (Franks et al.).

A recent study involving 1349 students in grades 4-6 by Foster et al. (2008), consisting of school self-assessment, nutrition education, nutrition policy, social marketing, and parent outreach, yielded positive results in reducing the incidence of obesity and overweight, increasing physical activity and healthy food consumption. A 50% reduction in the incidence of overweight was noted in the participants, of whom more than 50% were eligible for the federal free and reduced meal program (Foster et al.).

Katz (2009) conducted a review of 64 relevant papers that supplied evidence for school-based interventions for health promotion and obesity prevention. Nineteen studies
met quality criteria including taking place in a school setting, reported on a commonly used weight-related measure (BMI), included a control measure, and followed the participants for at least 6 months from the beginning of the intervention (Katz). Multiple strategies were incorporated in the studies. The most relevant strategies related to the current study were parent participation, modification of intensity of PE, student training in self-monitoring, and introduction of PA in addition to PE (Katz).

Decreased Scholastic Achievement in Overweight Middle School Students

Introduction

Shore et al. (2008) reported that overweight students achieved a lower relative degree of scholastic achievement compared to nonoverweight students in one particular middle school. While there is some evidence of decreased academic achievement among overweight students based on self-reported measures in larger samples (Crosnoe & Muller, 2004; Swallen, Reither, Haas, & Meier, 2005), there is a void in establishing this trend using objective school data. The purpose of Shore et al. was to determine whether there were notable differences in school achievement between overweight and nonoverweight middle school students.
as measured by objective school data. It was hypothesized that a quantifiable achievement gap would be discovered between the overweight and nonoverweight students in this study (Shore et al.).

Methods and Procedures

Subjects

All data were obtained through a secondary data analysis from existing school records of 6th and 7th grade students from a large public middle school in a suburb of Philadelphia, PA. There were 271 6th graders and 301 7th graders enrolled in the school at the time of the study. Parents and guardians were notified in writing about the study. Parents were required to provide written notification if they did not consent to their child’s records being included in the study. A total of six parents requested that their child’s records be excluded from the study, leaving the records of 566 students to be analyzed in the study (Shore et al., 2008)

Dependent Measures

Data that were collected and analyzed for Shore et al. (2008) were originally gathered by school personnel for purposes other than the study. All of the data for the study were collected at the conclusion of the 2004-05 academic school year. The dependent measures were placed
into three categories including Academic Achievement, Attendance and Discipline, and Physical Fitness and Athletic Team Participation (Shore et al.).

**Academic Achievement Measures**

Grade point averages (GPAs) were collected from year-end student report cards. The GPAs reflect the cumulative average from the grades earned for each child over the course of 4 10-week marking periods. Weighted grades are not used in this school. Reading comprehension scores were obtained from the Degree of Reading Power (DRP) Test. This test was administered to all students during the first month of school by certified teachers for purposes other than the study. The DRP is a nationally standardized test that assesses reading comprehension of nonfiction texts. All of the national percentile scores for students were recorded (Shore et al.).

**Attendance and Discipline Measures**

Year-end totals for the number of days absent, number of days tardy, number of administrative detentions assigned, and number of days suspended from school were recorded for all students (Shore et al., 2008).
Physical Fitness and Athletic Team Participation

Measures

Physical fitness data were collected from assessments that were conducted by certified physical education teachers during the school day in physical education classes in October. The assessments consisted of curl-ups, shuttle run, endurance 1 mile run/walk, pull-ups, and sit and reach. The purpose of the fitness tests was to determine students' eligibility for two nationally standardized physical fitness awards. The Presidential Physical Fitness Award is awarded to students who score at or above the 85th percentile (based on the 1985 School Population Fitness Survey) on all five tests. Students are awarded the National Physical Fitness Award for scoring above the 50th percentile (based on the 1985 School Population Fitness Survey) on all five tests (President's Council, 1986); (Shore, et al., 2008).

Physical Education teachers recorded the height and weight of all students using standardized measuring procedures concurrently with the physical fitness tests. All heights and weights were converted into Body Mass Index (BMI) percentile scores using the 2000 Centers for Disease Control (CDC) Weight by Age by Gender Tables. Each student was placed into the nonoverweight (BMI%-tile<85), at-risk
for overweight (BMI%-tile 85-94), or overweight (BMI%-tile ≥95) category based on the Centers for Disease Control’s parameters (2000; Shore et al., 2008).

The participation of 7th grade students on school-based inter-scholastic athletic teams was recorded. Sixth grade students were not permitted to participate on school-based athletic teams (Shore et al., 2008).

Data Analysis

Comparisons of means between the nonoverweight, at-risk for overweight, and overweight groups were computed using a one-way ANOVA controlled for demographics with Scheffe post-hoc analysis. All the tests were controlled for demographics including gender, socioeconomic status (SES), and ethnicity. SES status was determined by students’ enrollment in the Federal Free and Reduced Lunch Program. All statistics were reported as mean ± standard deviation. For binary response variables, logistic regression was used (also adjusted for the demographic variables) (Shore et al., 2008).

Results

There were 406 nonoverweight, 85 at-risk for overweight, and 58 overweight students. Sample characteristics are detailed in Table 1. The comparison of the Academic Achievement and Attendance and Discipline
variables for nonoverweight, at-risk for overweight, and overweight students is listed in Table 2. For all indices of Academic Achievement and Attendance and Discipline, with the exception of suspensions and DRP national percentile scores, there were significant differences between overweight students and nonoverweight students when controlled for demographic variables. Specifically, the grade point averages of nonoverweight students were approximately 11% higher than the overweight students ($p < 0.001$). There was a general tendency for lower, yet not significant, DRP national percentile scores for overweight students compared to nonoverweight students when controlled for demographics. When detentions were categorized into groups of students who had 0-5 detentions and those who had 6 or more detentions, there was again a statistical difference between the nonoverweight and overweight students when controlled for demographics ($p < 0.05$). Overweight students were five times more likely to have 6 or more detentions than nonoverweight students. The rate of detentions of the nonoverweight students was one-half of that observed in overweight students when controlled for demographics (Shore et al., 2008).
Table 1. Characteristics of Study Sample from Shore et al.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean ± SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>19.6 ± 3.6</td>
<td>12.3 - 34.4</td>
</tr>
<tr>
<td>(percentile)</td>
<td>56.2 ± 31.2</td>
<td>0.4 - 99.5</td>
</tr>
<tr>
<td>Gender Distribution</td>
<td>53.5% male</td>
<td>46.5% female</td>
</tr>
<tr>
<td>Socio-Economic Status</td>
<td>3.2% free lunch</td>
<td>2.3% reduced lunch</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>N</td>
<td>% of Total Sample</td>
</tr>
<tr>
<td>African-American</td>
<td>48</td>
<td>8.5%</td>
</tr>
<tr>
<td>Asian</td>
<td>29</td>
<td>5.1%</td>
</tr>
<tr>
<td>Caucasian</td>
<td>480</td>
<td>84.8%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>7</td>
<td>1.2%</td>
</tr>
<tr>
<td>Native-American</td>
<td>2</td>
<td>.04%</td>
</tr>
</tbody>
</table>

Nonoverweight students also had fewer absences (25%) and fewer days tardy to school (39%) relative to overweight students (p < 0.05). There were no significant differences between the at-risk for overweight students and the nonoverweight students on the Academic Achievement and Attendance and Discipline measures. There was a trend for the at-risk for overweight students demonstrating better
Table 2. Academic Achievement, Discipline, and Attendance Data from Shore et al.

<table>
<thead>
<tr>
<th></th>
<th>Nonoverweight Students (n=406)</th>
<th>At-Risk Students (n=85)</th>
<th>Overweight Students (n=58)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade Point Average (4.0 scale)</td>
<td>3.45 ± 0.59</td>
<td>3.35 ± 0.74</td>
<td>3.06 ± 0.75 †</td>
</tr>
<tr>
<td>Degree of Reading Power (National Percentile Rank)</td>
<td>74.9 ± 23.7</td>
<td>74.4 ± 24.62</td>
<td>66.0 ± 27.20</td>
</tr>
<tr>
<td>Total Detentions for the school year (days)</td>
<td>0.52 ± 1.46</td>
<td>0.82 ± 1.64</td>
<td>1.27 ± 3.18 †</td>
</tr>
<tr>
<td>Total Absences for the school year (days)</td>
<td>6.43 ± 5.33</td>
<td>7.07 ± 5.77</td>
<td>8.60 ± 8.14 †</td>
</tr>
<tr>
<td>Total Suspensions for the school year (days)</td>
<td>0.08 ± 0.53</td>
<td>0.24 ± 1.09</td>
<td>0.27 ± 0.89</td>
</tr>
<tr>
<td>Total Tardiness for the school year (days)</td>
<td>3.83 ± 5.88</td>
<td>4.02 ± 5.24</td>
<td>6.31 ± 10.86 †</td>
</tr>
</tbody>
</table>

Note. Data are reported as mean ± SD. † indicates p<0.05 overweight vs. nonoverweight. ‡ indicates p<0.001 overweight vs. nonoverweight.

performance than overweight students on GPA (p = .08), but not on DRP scores or Attendance and Discipline measures (Shore et al., 2008).

The overall performance of the students on the measures of physical fitness is outlined in Table 3. As the table indicates, nonoverweight students performed
better than their at-risk for overweight and overweight peers when controlled for demographic variables ($p < .0001$). As expected, at-risk for overweight students also performed at higher levels than overweight students for all fitness standards with the exception of the sit and reach test. The most notable differences in performance among all three groups were on weight-dependent tasks such as the pull up, shuttle run, and one mile run (Shore et al., 2008).

Table 3. Physical Fitness Test Percentile Scores from Shore et al.

<table>
<thead>
<tr>
<th>Test</th>
<th>Nonoverweight Students</th>
<th>At-Risk Students</th>
<th>Overweight Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Curl Up</td>
<td>69.92 ± 25.95</td>
<td>53.03 ± 30.96 *</td>
<td>38.39 ± 28.75 † ‡</td>
</tr>
<tr>
<td>Fall Sit &amp; Reach</td>
<td>68.86 ± 26.89</td>
<td>68.00 ± 28.95</td>
<td>63.25 ± 30.39</td>
</tr>
<tr>
<td>Fall Pull Up</td>
<td>65.81 ± 21.76</td>
<td>51.23 ± 19.78 *</td>
<td>47.50 ± 18.90 †</td>
</tr>
<tr>
<td>Fall Shuttle Run</td>
<td>66.09 ± 23.52</td>
<td>51.25 ± 26.53 *</td>
<td>37.65 ± 26.80 † ‡</td>
</tr>
<tr>
<td>Fall Mile</td>
<td>62.06 ± 24.82</td>
<td>41.79 ± 24.46 *</td>
<td>25.92 ± 19.99 † ‡</td>
</tr>
<tr>
<td>Fitness Average</td>
<td>67.67 ± 16.77</td>
<td>54.23 ± 17.64 *</td>
<td>42.92 ± 15.75 † ‡</td>
</tr>
</tbody>
</table>

Note. Data are reported as mean ± SD. * indicates $p < 0.0001$ at-risk vs. nonoverweight

Figure 1 on page 56 illustrates student participation on school athletic teams. As the figure highlights, 75% of all nonoverweight 7th grade students participated in at least one school-based athletic team compared to only 61% of at-risk and 33% of the overweight students ($p < 0.001$ adjusted demographics). This establishes an inverse
relationship between school-based athletic team participation and BMI percentile (Shore et al., 2008).

Discussion

The major finding of the Shore et al. (2008) study was that nonoverweight students demonstrated better grades, a tendency toward higher reading scores, better attendance, and less school discipline problems relative to overweight youth. Overweight children demonstrate a weaker self-concept and engage in more high-risk behavior than nonoverweight children, which could interfere with scholastic functioning (Kimm et al., 1997; Strauss, 2000). A stronger self-concept and less high-risk behavior helps students to achieve greater school success, attend school more regularly, engage in less negative behavior, and participate in school athletics. It is also possible that decreased school attendance not only has a direct impact on the other dependent measures, but also on some factors that were not measured such as peer relations, relations with teachers, and student satisfaction with school (Shore et al., 2008).

It was not surprising to find that nonoverweight students were more physically fit than overweight students, yet we were surprised to find that school-based athletic team participation was greater for nonoverweight students.
Figure 1. Percentage of School Athletic Team Participation (Shore et al.)

Figure 1 Percentage of school athletic team participation. This figure illustrates the differences in school athletic team participation rates among all three groups of students. Seventy-five percent of all nonoverweight 7th grade students participated in at least one school-based athletic team compared to only 61% of at risk and 33% of the overweight students ($P < 0.001$).

This was an unexpected finding because this particular middle school has a “no-cut” policy (except for basketball) for sport participation and strongly encourages sport participation regardless of students’ athletic ability. This trend is supported by a recent study by Franklin, Denyer, Steinbeck, Caterson, and Hill (2006) that suggested overweight children entering adolescence have a low self-perception of their ability to participate in sport (Shore et al., 2008).

Interestingly, weight status significantly impacted the performance of all three groups of students on the
Physical Fitness measures, but only impacted the differences on the Academic and Attendance and Discipline measures for the overweight and nonoverweight students. This suggests that the protective psychosocial factors such as self-efficacy and resiliency appear to be less compromised for academic tasks than physical tasks for students that are at-risk for overweight. The at-risk students' elevated weight status might be a relatively recent development and, thus, not have impacted their psychosocial protective factors to the point of limiting their academic functioning. It would be interesting for future work to assess whether physical fitness declines at a faster pace than academic performance once a student reaches the overweight threshold (Shore et al., 2008).

The findings are particularly relevant to key stakeholders in public education, including parents, administrators, and health and physical education teachers. These key stakeholders can now reference a pervasive achievement gap as supporting evidence to make the case for public policy that promotes healthy student behavior in school. Existing literature has already found an inverse relationship between school achievement and body mass index using self-reported measures of achievement and attendance (Crosnoe & Muller, 2004; Swallen et al., 2005). Shore et
al. (2008) broaden the current literature by reporting on a robust set of variables that are objective, comprehensive, and highly meaningful to key stakeholders and educators alike. In the era of No Child Left Behind, objective data that indicate a gap in achievement must be the driving force behind changes made in public education at the state or federal levels (Shore et al.).

Future research that builds on the previous study has the potential to bring more attention to the achievement gap between overweight and nonoverweight students. It is clear that at this particular school, overweight students achieved less academically, had more school-related problems such as worse attendance and more discipline problems, participated in school athletics less, and were less physically fit than their nonoverweight peers. The results of Shore et al. (2008) provide the justification for the aims of the current dissertation.

Cognitive-behavioral Techniques to Increase Physical Activity

Cognitive-behavioral techniques are designed to modify lifestyle behavior and patterns. Several of these techniques are useful in changing physical activity behavior and habits (U.S. Department of Health and Human Services, 1998). One such strategy is self-monitoring
(Bandura, 1991). Self-monitoring refers to the objectifying of one’s behavior through observation and record keeping (U.S. Department of Health and Human Services). Examples of self-monitoring of physical activity are using a pedometer, an accelerometer, or keeping a log. Problem-solving is another Cognitive-behavioral technique that can modify physical activity behavior (U.S. Department of Health and Human Services). Problem solving to change physical activity behavior requires an individual to use brainstorming, self-selection of a solution, and planning to overcome a situation not conducive to physical activity participation (U.S. Department of Health and Human Services). For example, individuals need to employ problem solving to be physically active if their primary form of physical activity is trail running and severe weather will not permit this activity. Social support can help change physical activity behavior by serving as motivation or positive reinforcement to become physically active or maintain physical activity (U.S. Department of Health and Human Services). In particular, there is a positive association between parental encouragement of young children to be more physically active and the amount of physical activity the
child accumulates (Taylor, Baranowski, Sallis, & Patrick 1994).

Pedometers and Self-Monitoring

It has been well documented that pedometers provide a cost-effective objective measure of physical activity among youth (Jago et al., 2006; Rowlands, Eston, & Ingledow, 1997; Scruggs, 2007; Sirard & Pate, 2001; Strycker, Duncan, Chaumeton, Duncan, & Toobert, 2007). Some studies with children have suggested that 3 days per week of data collection using a pedometer provides the minimum number of days needed to produce reliable measurements. (Rowe, Mahar, Raedeke, & Lore, 2004; Trost, Pate, Freedson, Sallis, & Taylor, 2000). In a review of 25 articles specifically concerned with the convergent validity of pedometers to accurately assess physical activity compared to other measures, Tudor-Locke, Williams, Reis, and Pluto (2002) concluded that pedometers offer an effective option for measuring physical activity in research and practice. A meta-analysis of 26 studies including 2767 adult subjects found that pedometer users significantly increased their steps per day by 2491 (Bravata et al., 2007).

It has been suggested that to reduce excess body fat in children, boys should take 16,000 steps per day and girls should take 13,000 steps per day (Duncan, Schofield,
& Duncan, 2007). These recommendations are based on a study of 969 New Zealand European, Polynesian, and Asian children (515 male, 454 female) aged 5-12 (Duncan, Schofield et al.). American children aged 6-12 years old are less physically active than their Australian and Swedish peers based on a study of 1954 children who wore pedometers for four consecutive days (Vincent, Pangrazi, Raustorp, Tomson, & Cuddihy, 2003). A study of primary school children in England determined that boys took 12,263 steps per day and girls took 11,748 steps per day (Duncan, Schofield et al.). It was also determined that boys and girls were more physically active on weekdays than weekends (Duncan, Al-Nakeeb, Woodfield, & Lyons, 2007).

Several studies have noted that youth participants using pedometers in the United States take 10,000 or more steps per day (Le Masurier & Corbin, 2006; Strycker et al., 2007). Specifically, sixth grade female students were reported to take 12,332 steps per day and sixth grade male students 16,421 steps per day (Tudor-Locke et al., 2004). However, one recent study found more ominous results for high school students in the United States, noting that only 14% of the 236 high school students in the study achieved 10,000 steps or more per day (Hohepa, Schofield, Kolt, Scragg, & Garrett, 2008).
It has been suggested that boys are more active than girls based on pedometer step-counts (Beighle, Morgan, Le Masurier, & Pagrazi, 2006; Duncan, Al-Nakeeb et al., 2007; Oliver, Schofield, & McEvoy, 2006). In addition, boys in grades three through five were found to be more physically active outside of school than their female peers (Beighle et al.). Tudor-Locke and Basset (2004) proposed that the following indices be used to classify steps per day as measured by a pedometer. Individuals attaining (a) <5000 steps per day can be classified as having a “sedentary lifestyle index”, (b) 5000-7499 steps per day can be considered “low active”, (c) 7500-9999 steps per day can be considered “somewhat active”, (d) >or=10000 steps per day indicates an “active lifestyle”, and (e) >12500 steps per day are likely to be classified as “highly active” (Tudor-Locke & Basset). Cut points for identifying normal versus overweight adults based on pedometer step-counts have been established (Tudor-Locke et al., 2008). The cut point for normal versus overweight men is 11,000-12,000 steps per day and 8,000-12,000 steps per day for women (Tudor-Locke et al., 2008).

Butcher, Fairclough, Stratton, and Richardson (2007) assessed the efficacy of feedback (use of a pedometer) versus feedback plus information to increase physical
activity among 147 elementary aged school children. The experimental group wore a pedometer for 1 school week and received information about how they could increase their daily step-count. The other treatment condition wore a pedometer for 1 school week, but did not receive information on how they could increase their daily step-count. Students in the experimental group achieved significantly more steps per minute than the control group (Butcher et al.). The authors suggested that a longer intervention period is necessary to determine the impact of combining the feedback from daily pedometer counts combined with information about how to become more physically active (Butcher et al.). Another study found that a four-week pedometer walking program combined with a curricular component designed to increase physical activity did not increase physical activity during the intervention relative to baseline measures of physical activity among elementary schoolchildren in New Zealand (Oliver et al., 2006). However, there were notable step-count increases for low active children, especially females during the intervention (Oliver et al.). Horne, Hardman, Lowe, and Rowlands (2007) found a substantial increase in physical activity among children aged 9-11 in Wales after an intervention consisting of using a pedometer and small incentives for
increased step-counts. The increases in physical activity were noted for girls at 12-week follow-up, but not for boys (Horne et al.).

Children who used pedometers over a six-month period achieved healthier Body Mass Indexes (BMI) (Rodearmel et al., 2007). Overweight children take significantly fewer steps per day than non-overweight children (Duncan, Al-Nakeeb et al., 2007). In addition, children with higher step-counts demonstrate better psychological well-being (Parfitt & Eston, 2005). Parfitt and Eston were the first authors to report on the connection between increased physical activity as measured by a pedometer and psychological well-being as measured by global self-esteem and absence of anxiety and depression. It should be noted that interventions designed to increase physical activity among adolescents have not been found to produce body image dissatisfaction or decreased self-esteem even for overweight or at risk for overweight participants (Huang, Norman, Zabinski, Calfas, & Patrick, 2007).

While the President’s Council on Physical Fitness and Sports recommends 13,000 steps per day for boys and 11,000 steps per day for girls (President’s Council on Physical Fitness and Sports, 2002), having a suggested step-count goal might not be completely necessary (Tudor-Locke et al.,
2004). There is some evidence that step-count goals should be determined by baseline values and sustainability factors (Tudor-Locke et al., 2004) such as parental physical activity levels and access to sport and recreation activities.
CHAPTER 3

METHODOLOGY

There were three main purposes of this study. The primary purpose of the study was to determine the efficacy of an intervention to increase physical activity consisting of a 10 lesson school-based curriculum combined with self-monitoring (via a pedometer) among sixth grade students in the experimental condition relative to sixth grade students in the control condition. A secondary aim of the study was to determine whether the experimental group improved their grades, physical fitness, self-efficacy and attitude about physical activity relative to the control group. The third aim is to determine whether increased physical activity was associated with academic and fitness dependent measures. The details of this intervention are presented in the following sections: Research Design, Participants, Instrumentation, Procedures, Curriculum, Data Collection, and Data Analysis.

Research Design

A quasi-experimental design was used in this study. The physical education (PE) classes served as the unit of randomization with the students nested within the classes.
Students were assigned to PE classes at this school based on scheduling constraints that included class size and staffing issues that were not related to this study. The composition of the PE classes had some degree of random assignment via Power School, the school district’s student accounting program with consideration of students’ music classes and academic team assignments.

There were four PE teachers at this school who each taught three sections of sixth grade PE. To keep the instruction and the intervention consistent, 2 PE teachers (teachers A & B) taught all six intact sixth grade physical education classes assigned to the experimental condition and 2 other PE teachers (teachers C & D) taught six intact sixth grade physical education classes assigned to the control condition. Further, teachers A and B and teachers C and D teach as pairs and often co-teach their sections, so it was necessary for them to teach the same treatment conditions. It was determined by a coin toss which treatment condition the teaching pairs were assigned to teach.

TEACHERS A & B: taught 6 experimental classes

TEACHERS C & D: taught 6 control classes
Participants

There were 252 6th grade students enrolled at this school at the time of the study. Almost 45% (44.8%) of the grade (113 sixth grade students) consented to participate in the study. Three students dropped out of the study during the intervention, leaving 49 students in the control group and 61 students in the experimental group to be included in the data analysis. The rationale for using the sixth grade students in this study was two-fold. First, based on the author’s experience, sixth grade students are generally more receptive than seventh or eighth grade students to meet expectations given by teachers and try new things. Based on anecdotal reports from PE staff at this school, sixth grade students express more enthusiasm than older students about using pedometers in PE class. It was anticipated that this enthusiasm would translate into better adherence to pedometer use outside of PE class. Second, the impact of encouraging, especially, female adolescents to be physically active is critical at this age (Schmalz et al., 2007).

Instrumentation

Grades

Changes in grades were determined by comparing second marking period (pre-intervention) GPAs to both the third
marking period (during the intervention) and fourth marking period (post-intervention) GPAs. GPAs were calculated on a quarterly basis and are based on a 4.0 scale. There are approximately 45 school days in each marking period. The GPA scale ranges from 0.0 to 4.0 with grade points assigned to the following letter grades: F = 0, D = 1.0, C = 2.0, B = 3.0, and A = 4.0. GPAs are the numerical average of the total number of grade points earned divided by the number of subjects taken per quarter. There are no weighted or honors level courses or grades at this school. Some students have advanced math classes, but there are no added grade points attached to grades earned in these classes.

Physical Fitness

Changes in physical fitness were assessed by comparing the Presidential Physical Fitness Test results (President’s Council, 1986) from October 2008 (pre-intervention) and April 2009 (post-intervention). These tests are administered at this school bi-annually by certified PE teachers for purposes other than this study. The purpose of the fitness tests is to determine students’ eligibility for two nationally standardized physical fitness awards. The assessments consisted of curl-ups, shuttle run, endurance 1 mile run/walk, pull-ups, and sit and reach. The Presidential Physical Fitness Award was
awarded to students who scored at or above the 85th percentile (based on the 1985 School Population Fitness Survey) on all five tests. Students were awarded the National Physical Fitness Award for scoring above the 50th percentile (based on the 1985 School Population Fitness Survey) on all five tests (President’s Council, 1986). A study designed to increase the physical activity of Swiss children aged 6-13 utilized the 20 meter shuttle run as a measure of change in aerobic fitness at 1 year follow-up (Zahner et al., 2006).

**Self-efficacy and Attitude Toward Exercise**

Changes in self-efficacy and attitude toward physical activity were measured by comparing pre- and post-test responses to questionnaires (Appendices A & B) developed by Motl et al. (2000). Both questionnaires contain eight items. On both questionnaires, respondents were asked to rate each item on a 5-point scale ranging from 1 (Disagree a lot) to 5 (Agree a lot). Motl et al. found that both measures contain factorial validity and invariance as unidimensional measures. The questionnaires were originally tested with two cohorts (N = 995 and N = 1797) of eighth grade girls (Motl et al., 2000).

Dishman et al. (2002) further evaluated the factorial invariance and latent mean structure of the questionnaires.
Factorial invariance evaluates the degree to which a questionnaire measures a construct similarly across groups. An analysis of latent mean structure is a strong indicator of group differences in a construct as measured by a questionnaire. The authors concluded that the questionnaires could be used in intervention studies to assess the mediating influences of self-efficacy and attitude toward physical activity with adolescent black and white females (Dishman et al.).

Dishman et al. (2004) used their self-efficacy questionnaire in a large randomized and controlled study to determine the effectiveness of the Lifestyle Education for Activity Program (LEAP) with adolescent females. Over 2000 students in 24 schools were assessed for changes in self-efficacy. The results suggest that the manipulation of self-efficacy through the school curriculum increased physical activity among white and black adolescents (Dishman et al.).

It should be noted that the attitude and self-efficacy questionnaires (Dishman et al., 2002, 2004; Motl et al., 2000) were only used with adolescent females. However, the face validity of the questionnaire to assess attitude and self-efficacy of males appears to be sound.
The questionnaires do not contain any gender-specific wording.

Physical Activity

Physical activity was measured and recorded each day by students in both the experimental and control groups based on daily pedometer step-counts. All students received a New Lifestyle’s SW-401 DIGI-walker pedometer (Appendix D). The pedometer's dimensions are 2" x 1.5" x .75" and it weighs 3/4ths of an ounce.

The justification for using this particular pedometer was two-fold. First, the PE Department at this school used this product in physical education classes and reported it to be durable and accurate for use with middle school students. Further, the pedometers used in this study were purchased by this school district. The pedometers were transferred to the PE Department within the school district for use with students. Thus, for purposes of continuity and familiarity for staff and students, it was suggested that the district purchase the same pedometers already in use at this school. In addition to the anecdotal reports from the PE Department, the accuracy of this brand has been established in previous studies (Bassett et al., 1996; Crouter, Schneider, Karabulut, & Bassett, 2003; Schneider,
Students recorded their daily pedometer step-count from the previous 24 hours using the Log It web site (Appendix C) which can be viewed at http://www.peclogit.org/logit.asp. This web site is a collaboration between PE Central, a health promotion web site for physical educators, parents, and students and New Lifestyles, a manufacturer of pedometers and other fitness products. PE Central can be viewed at http://www.pecentral.org/. This web site has several benefits for students compared to other web sites that allow users to log their physical activity. Log It allows students to set a personal daily step-count goal, view their step-count progress in a bar chart format and a monthly calendar format, compare their step-count progress to other students in this school as well as across the country, automatically convert steps entered to distance walked in miles and kilometers, log their steps for up to the previous six days, and set up a virtual hike through the United States and visit state capitals based on their step-count. Log It also has features that will assist the research aspects of the study. All data entered by students can be downloaded to EXCEL and/or be viewed on a
daily basis. The web site also offers a free printable certificate of participation (Appendix E) for students.

Recording of step-counts occurred daily in computer education classes. Support for the study from computer education teachers was achieved through the author’s collegial relationship with the teachers, the teachers’ student-centered approach to teaching, and the relative flexibility of their particular curriculum. Students recorded their step-counts on non-school days and weekend days in computer class on the next school day. All sixth grade students had daily computer education classes during the school day all year. Students were instructed to re-set their pedometers each day after recording their step-count.

Participant Feedback

Overall participant enjoyment and other feedback were ascertained using a questionnaire (Appendix F) developed by the researcher. There were no reliability or validity data available for the questionnaire.

Procedures

This study took place during the 2008-09 school year at a large public middle school within a large suburban school district near Philadelphia, PA. The school had approximately 900 students in grades six through eight.
The researcher has been employed at this school for the last six years as a certified school counselor. The researcher served as the sixth grade school counselor during the 2008-09 school year, the year the study was implemented. A time line for the study is included in Table 4 on the following page.

The intervention phase of the study occurred from January 28, 2009 through March 18, 2009. The intervention phase was 8 calendar weeks. Excluding weekends, scheduled school closings, and days for standardized testing, there were 33 school days in the intervention. Thirty days was the minimum number of school days needed for students to receive the 10 session curriculum. The rationale for selection of this time frame for the intervention was based on past experience that sixth grade students were well adjusted to middle school by the third marking period of sixth grade. It was believed that implementing the intervention any earlier might pose an unnecessary risk to student adjustment to middle school. There were 10 lessons in PE class during the intervention. Previous school-based studies justify the duration of this number of lessons. Frenn et al. (2005) found that eight school-based health promotion sessions increased physical activity among
Table 4. Time Line of the H.Y.P.P.E. Initiative 2008-09

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-intervention Presidential Fitness Assessments administered</td>
<td>October 2008</td>
</tr>
<tr>
<td>Parent/guardian letter mailed</td>
<td>November 2008</td>
</tr>
<tr>
<td>Parent/guardian informational meeting</td>
<td>November 2008</td>
</tr>
<tr>
<td>Student informational meetings</td>
<td>January 2009</td>
</tr>
<tr>
<td>Pre-intervention student questionnaires administered</td>
<td>January 2009</td>
</tr>
<tr>
<td>Pre-intervention (2\textsuperscript{nd} marking period) GPAs</td>
<td>January 2009</td>
</tr>
<tr>
<td>Recorded</td>
<td></td>
</tr>
<tr>
<td>Base-line physical activity collected</td>
<td>January 2009</td>
</tr>
<tr>
<td>Intervention phase</td>
<td>January - March 2009</td>
</tr>
<tr>
<td>Post-intervention Presidential Fitness Assessments administered</td>
<td>April 2009</td>
</tr>
<tr>
<td>Intervention (3rd marking period) GPAs recorded</td>
<td>April 2009</td>
</tr>
<tr>
<td>Student Feedback Questionnaires Administered</td>
<td>April 2009</td>
</tr>
<tr>
<td>Four-week follow-up of physical activity collected</td>
<td>April 2009</td>
</tr>
<tr>
<td>Post-intervention (3\textsuperscript{rd} marking period) GPAs</td>
<td>June 2009</td>
</tr>
<tr>
<td>recorded</td>
<td></td>
</tr>
<tr>
<td>Data analysis</td>
<td>July-September 2009</td>
</tr>
</tbody>
</table>
seventh grade students. Schofield et al. (2005) found that after six weeks, short-term improvements in physical activity were noted in an intervention that used pedometers with low-active adolescent females.

The H.Y.P.P.E. (Helping Youth Pursue Physical Activity and Exercise) Initiative was approved for implementation by the school district’s Assistant Superintendent of Schools and building administration at the school (see Appendix G). It was introduced to students and parents in November 2008 by letter (Appendix H). Written parental consent (Appendix I) and student assent (Appendix J) were required for participation.

The educational components of the intervention of this study were considered part of the school’s curriculum. Parents of all participants were invited by letter and through the school’s Home and School Association’s e-mail
list serve to attend an evening meeting held at this school on November 19, 2008. The researcher and a representative from a local fitness center provided parents with an overview of the H.Y.P.P.E Initiative and an opportunity to answer questions.

The local fitness center supported the H.Y.P.P.E. Initiative by offering incentives to a limited number of students who successfully completed the study as well as facilitating a fitness field day for all 6th grade students including those not participating in H.Y.P.P.E. All 6th grade students took part in the indoor fitness field day (Appendix K) that included a rotation through fitness stations including martial arts, sport skill development, and cardiovascular stations. The field day on January 26, 2009, served as the “kickoff” event for H.Y.P.P.E.

During the intervention period, students involved in H.Y.P.P.E. had complimentary use of the local fitness club’s age appropriate group fitness classes, including martial arts and sport specific training. A parent was also invited to use the club at no cost to them while their child attended group classes. Students who successfully completed H.Y.P.P.E. were eligible to participate in a random lottery to win complimentary use of the local fitness center for 3 months after the study. The
researcher also facilitated small group student meetings in January 2009 to explain the initiative and answer questions.

Students in both conditions received a New Lifestyles SW-401 DIGI-Walker pedometer in the first PE class that occurred during the intervention period. Physical education (PE) classes were either 42 or 49 minutes per class depending on the letter day of the academic cycle. There are six days in the academic cycle (A through F) and students have PE one period every third day of the cycle for a total of two days per six-day cycle. All students had one 42 minute period and one 49 minute period for a total of 91 minutes of PE per six-day cycle.

The experimental group used pedometers in and out of school for the entire intervention. Students were encouraged to wear their pedometers at all times except when bathing, swimming, and sleeping. They logged their PA on a daily basis in computer education classes on the Log It web site. Students in the experimental group received verbal prompts in PE class to attain 10,000 steps per day. The rationale for not using higher step-counts that were referenced in chapter 2 is that students in this school were significantly involved in extra-curricular activities and have a rigorous academic course of studies. It was
believed that setting a more reasonable daily step-count goal would limit attrition during the study. Furthermore, a more reasonable step-count served as a realistic motivation, not an unrealistic deterrent. Students in the experimental condition also received verbal prompts in PE class to attain a step-count goal in PE class. Scruggs (2007) suggests that 60-62 steps per minute in PE are the cutoff for determination of meeting physical activity guidelines. Based on estimation that students will be physically active approximately 40 minutes during PE class, it was considered to use 2400 steps as the goal for the experimental classes. However, based on input from the PE teachers, students regularly surpass 2400 steps using the current curriculum. It was decided that 3200 steps per class was a reasonable and attainable goal for the experimental classes. The experimental group also received a modified PE curriculum (Appendix L) that included a pedometer-based activity and PA promotion knowledge and skills via kinesthetic learning. The PA promotion knowledge and techniques are detailed in the Curriculum section.

The control group received a pedometer and the standard PE curriculum (Appendix M) including traditional PE activities like basketball and volleyball. They did not
receive verbal prompts to attain a daily step-count for the day. They were encouraged to attain a PE step-count of 2000 steps. This was the current goal for all students in PE class at this school. Students in the control condition did not receive any of the PA promotion knowledge or skills in PE class or anywhere else in school. The summary of the treatment conditions are listed below in Table 5.

Table 5. Summary of Treatment Conditions

<table>
<thead>
<tr>
<th>Experimental</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students used pedometers in and out of PE class</td>
<td>Students used pedometers in and out of PE class</td>
</tr>
<tr>
<td>Students logged steps in computer class</td>
<td>Students logged steps in computer class</td>
</tr>
<tr>
<td>PA knowledge and promotion taught via kinesthetic learning in PE</td>
<td>No PA knowledge or promotion taught in PE</td>
</tr>
<tr>
<td>Format of classes 1) pedometer-based activity, 2) kinesthetic learning, 3) cool down</td>
<td>Standard PE curriculum, non-pedometer-based activities (basketball, floor hockey)</td>
</tr>
<tr>
<td>Increased step-count goal for PE=3200</td>
<td>Current step-count goal for PE=2400</td>
</tr>
<tr>
<td>Prompts in PE for daily step-count goal of 10,000 steps</td>
<td>No prompts in PE for daily step-count goal</td>
</tr>
<tr>
<td>Pre/post test measure of PA, grades, fitness tests</td>
<td>Pre/post test measure of PA, grades, fitness tests</td>
</tr>
<tr>
<td>Students eligible for lottery incentives and use of local fitness facility</td>
<td>Students eligible for lottery incentives and use of local fitness facility</td>
</tr>
</tbody>
</table>
Data Collection

Data collection began in November 2008 by recording students' pre-intervention physical fitness assessments. Physical fitness assessments took place in October 2008. Students took the pre-intervention self-efficacy and attitude questionnaires in January 2008 during the school day. Baseline data of physical activity were collected from January 28 to February 4, 2009. Students were not given any step-count prompts or daily step-count goals during the baseline period. Students recorded their step-count from the previous 24 hours using the Log It web site. Pre-intervention GPAs from the second marking period were recorded at the conclusion of the marking period on January 25, 2009. GPAs (during the intervention) from the third marking period were recorded on April 3, 2009 and post-intervention GPAs were recorded at the conclusion of the fourth marking period in June, 2009.

Post-intervention self-efficacy and attitude questionnaires were administered in school at the conclusion of the eight week intervention period. Post-intervention physical fitness scores were collected in April 2009. Follow-up step-counts were obtained from April 21 through April 27. Students recorded their step-counts in computer class using the Log It website. Data on
student step-counts were retrieved and recorded from the Log It web site on a weekly basis. Teachers in computer education classes conducted daily pedometer checks to verify the accuracy of student self-reporting. The teachers selected the students to verify from a list supplied by the researcher that was generated by an Excel function that randomly generates lists. Teachers verified the data entered for one student every class period. At the conclusion of the physical activity follow-up data collection period, students took the Student Feedback Survey in May 2009.

Curriculum

The experimental group received a modified school-based PE curriculum intended to increase their physical activity. The curriculum was taught in PE classes by certified PE teachers. Support from the PE staff was gained through the author’s collegial relationship with the teachers and school administration’s approval of the teachers receiving credit to satisfy non-teaching contractual obligations. Each teacher received 14 hours of credited time for their contribution to the creation and delivery of the curriculum.

The lessons were created through collaboration of the researcher and PE staff at this school. One PE teacher and
the author provided the training for the PE department which included a review of the PE lessons and aims of the study. They were based on PA Department of Education Health and PE standards and current recommendations from NASPE. The author observed several lessons to ensure quality control of lesson content. The topics were taught to students using kinesthetic teaching practices. The 10 experimental lessons and 10 control lessons are presented in Appendix L. The physical activity knowledge and skills taught to the experimental group via kinesthetic learning are listed below. These topics were adapted from the Trial of Activity For Adolescent Girls (TAGG) Health Education and Activity Challenges 8th Grade Teachers’ Manual developed by Felton et al. (2008).

1. Definition of MVPA
2. Examples of MVPA
3. Daily step-count goals
4. Self-Monitoring of PA techniques using pedometer, heart rate, physical fitness tests
5. Benefits of self-monitoring
6. Goal-setting strategies
7. Physical benefits of physical activity
8. Social benefits of physical activity
9. Barriers of physical activity
10. Problem solving Strategies

11. Social support and physical activity

12. Replacing sedentary activity with physical activity


14. Physical activity helps improve performance in sport and dance, etc.

Data Analysis

Repeated-measures analyses of variance (ANOVAs) were completed for hypotheses one through seven. The major point of interest for all ANOVA analyses was to determine if a significant interaction existed. Main effects were secondary points of interest. Pre- and post-test average steps per day by week, GPAs, attendance, tardiness, physical fitness test scores, and self-efficacy toward PA questionnaire responses and attitude toward PA responses were compared between the control and experimental groups in these analyses. Except for Tardiness, the ANOVA indicated no significant difference in dependent measures between groups at pre-test. Due to the difference in Tardiness at pre-test, a subsequent analysis of covariance (ANCOVA) was conducted on this variable. The pre-test
scores functioned as the covariate and equated the groups at the onset of the study for Tardiness.

Paired sample t-tests, using two-tailed alpha set at .05, were completed to detect changes in all dependent measures from pre to post-test for the control group and pre to post-test for the experimental group. A more conservative analysis using two-tails was selected because there were no original hypotheses stated for the directionality of any of the dependent measures for the control group.

Pearson Correlations were also completed to accomplish the third aim of the study which was to determine whether there were any specific associations between increased step-counts and academic and fitness dependent measures.
CHAPTER 4
RESULTS AND DISCUSSION

There were three main purposes of this study. The primary purpose of the study was to determine the efficacy of an intervention to increase physical activity consisting of a 10 lesson school-based curriculum combined with self-monitoring among sixth grade students in the experimental condition relative to sixth grade students in the control condition. A secondary aim of the study was to determine whether the experimental group increased their grades, physical fitness, self-efficacy, and attitude about physical activity relative to the control group. The third aim was to determine whether increased physical activity was associated with academic and fitness dependent measures.

Demographic Information

An overview of the demographic information is provided in Table 6. A total of 110 students completed the study. The control group was comprised of 49 students and the experimental group was comprised of 61 students. A Chi-square analysis revealed that that were no significant
differences noted for gender \((p = .698)\) or ethnicity \((p = .211)\).

Table 6. Demographic Information

<table>
<thead>
<tr>
<th>Condition</th>
<th>Age</th>
<th>Gender</th>
<th>Ethnicity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(11.88 \pm .36)</td>
<td>19</td>
<td>30 3 2 44</td>
</tr>
<tr>
<td>Control</td>
<td>(12.02 \pm .42)</td>
<td>27</td>
<td>34 9 5 47</td>
</tr>
</tbody>
</table>

*Note. Age is reported as mean ± standard deviation. AA is African-American, AS is Asian, and C is Caucasian.*

**General Tabulations**

Compliance rates are particularly relevant in exercise and physical activity intervention studies. Low compliance or adherence rates do not allow participants to gain the full impact of the intervention. Compliance was defined in this study by whether a student logged his/her daily step-counts for three or more times in a week. It was reported by school staff and students and observed by the author that the primary reason for students not logging their steps was that students did not wear their pedometers and therefore, had no step-count to log. Compliance was either achieved or not on a weekly basis. Table 7 depicts the weekly compliance rates for both groups and the total
compliance for all participants in the current study. The compliance rates were highest for both groups during the middle of the intervention (weeks 4 & 5 for the control group and weeks 4 & 6 for the experimental group). The lowest rate of compliance for both groups occurred during week three. The greatest difference in compliance occurred during week seven. During week seven the control group had a compliance rate 9.1 percentage points higher than the experimental group. The control group had a higher rate of

Table 7. Total Number and Percent of Students that Achieved Compliance by Week

<table>
<thead>
<tr>
<th>Week</th>
<th>Control (N = 49)</th>
<th>Experimental (N = 61)</th>
<th>Total (N=110)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>37 (75.5%)</td>
<td>47 (77.0%)</td>
<td>84 (76.3%)</td>
</tr>
<tr>
<td>2</td>
<td>39 (79.6%)</td>
<td>45 (73.7%)</td>
<td>84 (76.3%)</td>
</tr>
<tr>
<td>3</td>
<td>33 (67.3%)</td>
<td>39 (63.9%)</td>
<td>72 (65.5%)</td>
</tr>
<tr>
<td>4</td>
<td>41 (83.7%)</td>
<td>50 (82.0%)</td>
<td>91 (82.3%)</td>
</tr>
<tr>
<td>5</td>
<td>41 (83.7%)</td>
<td>47 (77.0%)</td>
<td>88 (80.0%)</td>
</tr>
<tr>
<td>6</td>
<td>38 (77.6%)</td>
<td>50 (82.0%)</td>
<td>88 (80.0%)</td>
</tr>
<tr>
<td>7</td>
<td>39 (79.6%)</td>
<td>43 (70.5%)</td>
<td>82 (74.5%)</td>
</tr>
<tr>
<td>11</td>
<td>38 (77.6%)</td>
<td>47 (77.0%)</td>
<td>85 (77.3%)</td>
</tr>
<tr>
<td>All Weeks Combined</td>
<td>39 (79.6%)</td>
<td>46 (75.4%)</td>
<td>85 (77.3%)</td>
</tr>
</tbody>
</table>

Note. Week 11 was the four-week follow-up and a non-intervention week.
compliance than the experimental group six out of the seven weeks during the intervention, as well as the follow-up week. The control group’s total weekly mean compliance (79.6%) was greater than the experimental group’s total mean weekly compliance (75.4%). Figure 2 depicts the frequency of weeks in compliance for all students.

Figure 2. Frequency of Weeks in Compliance

Figure 2 indicates that 48 students (42.3%) were compliant for eight weeks of the study which was the maximum number of weeks that a student could have been compliant. Overall, 80 (72.3%) of the students were compliant for six or more weeks. Only 14 (12.7%) of the students were compliant for two or fewer weeks.
The number of participants that did and did not average two step-count benchmarks during week 1, week 7, and week 11 were tabulated. One of the two step-count benchmarks was 10,000 steps per day because it was the explicit step-count goal for the experimental group and it is a daily step-count total identified as a desirable level of daily physical activity (Choi, Pak, Choi, & Choi, 2007). The number of boys and girls that did and did not average 10,000 steps per day is represented in Table 8. The second benchmark was derived from the President’s Council on Physical Fitness and Sports (2002). This benchmark prescribes 13,000 steps per day for boys and 11,000 steps per day for girls. The number of boys that did and did not average 13,000 steps per day for the week appears in Table 9. The number of girls that did and did not exceed a weekly average of 11,000 steps per day appears in Table 10.

A review of Tables 8 through 10 showed a notable increase in the number of students that exceeded all of the step-count benchmarks from week 1 to week 7. Increases from week 7 to week 11 were also noted in the total number of students that exceeded 10,000 steps per day and for females that exceeded 11,000 steps per day. The number of males that exceeded 13,000 steps per day remained constant between week 7 and week 11.
Table 8. Total Number of Boys and Girls that Did and Did Not Average 10,000 Steps per Day

<table>
<thead>
<tr>
<th></th>
<th>Week 1 N=84</th>
<th>Week 7 N=82</th>
<th>Week 11 N=85</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>G</td>
<td>B</td>
<td>G</td>
</tr>
<tr>
<td>&lt;10,000 Steps Per Day</td>
<td>18</td>
<td>33</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>(21.4%)</td>
<td>(39.3%)</td>
<td>(13.4%)</td>
</tr>
<tr>
<td>≥10,000 Steps Per Day</td>
<td>21</td>
<td>12</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>(25.0%)</td>
<td>(14.9%)</td>
<td>(34.1%)</td>
</tr>
<tr>
<td>No Data</td>
<td>7</td>
<td>19</td>
<td>7</td>
</tr>
</tbody>
</table>

Note. Percentages were calculated based on the total N per week. The N for No Data was not included in the total N. B = boys; G = girls.

More than 60% of all the students were below 10,000 steps per day at baseline. By week 11, over 60% of the students exceeded 10,000 steps per day. According to Table 9, 15.4% of the boys exceeded 13,000 steps per day at week 1. The percent of boys who hit this benchmark by week 11 improved to 38.5%. Girls improved from 13.3% of them hitting the 11,000 step per day benchmark to 37.2% by week 11.
Table 9. Total Number of Boys that Did and Did Not Average 13,000 Steps per Day

<table>
<thead>
<tr>
<th></th>
<th>Week 1 N=39</th>
<th>Week 7 N=39</th>
<th>Week 11 N=39</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;13,000 Steps per Day</td>
<td>33 (84.6%)</td>
<td>24 (61.5%)</td>
<td>24 (61.5%)</td>
</tr>
<tr>
<td>&gt;13,000 Steps Per Day</td>
<td>6 (15.4%)</td>
<td>15 (38.5%)</td>
<td>15 (38.5%)</td>
</tr>
<tr>
<td>No Data</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>

Note. Percentages were calculated based on the total N per week.

Table 10. Total Number of Girls that Did and Did Not Average 11,000 Steps per Day

<table>
<thead>
<tr>
<th></th>
<th>Week 1 N=45</th>
<th>Week 7 N=43</th>
<th>Week 11 N=43</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;11,000 Steps per Day</td>
<td>39 (86.7%)</td>
<td>30 (69.8%)</td>
<td>27 (62.8%)</td>
</tr>
<tr>
<td>&gt;11,000 Steps Per Day</td>
<td>6 (13.3%)</td>
<td>13 (30.2%)</td>
<td>16 (37.2%)</td>
</tr>
<tr>
<td>No Data</td>
<td>19</td>
<td>31</td>
<td>18</td>
</tr>
</tbody>
</table>

Note. Percentages were calculated based on the total N per week.
Data Exclusions

A preliminary multiple regression was conducted to determine the unique contribution Condition (control vs. experimental) and Log (<3 logs per week vs. >3 logs per week) had on the mean step-count of the baseline week (week 1). The results of the regression yielded a significant model of prediction ($p = .001$). Condition ($p = .35$) did not make a significant contribution to the baseline mean step-count. Log ($p = .001$) made a statically significant, unique contribution to the overall prediction. The number of times per week participants recorded their step-counts (often versus not often) had a significant effect on the dependent variable. Results of the multiple regression appear in Table 11. These results and previous studies (Lubans, Morgan, Callister, & Collins, 2009; Rowe et al., 2004; Trost et al., 2000) noting the reliability of using three or more data points per week to estimate PA were considered relevant in determining the data exclusions. Data from any student who did not log his/her step-counts for a minimum of three times per week were not included in the subsequent step-count analyses.
Table 11. Results of Multiple Regression Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Partial (sr)</th>
<th>Semi-Partial (sr^2)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition</td>
<td>-.08</td>
<td>.007</td>
<td>.35</td>
</tr>
<tr>
<td>Log</td>
<td>-.36</td>
<td>.130</td>
<td>.001*</td>
</tr>
</tbody>
</table>

Note. Significance noted at $p < .05$. Log was a categorical variable (<3 logs per week vs. ≥ 3 logs per week).

Results for Hypotheses

Hypothesis 1 - The experimental group will significantly increase their physical activity relative to the control group.

Based on the literature reviewed about health promotion school curricula, it was hypothesized that the experimental group would attain higher rates of physical activity compared to the control group. In order to test this hypothesis, a repeated-measures analysis of variance (ANOVA) was completed using data from weeks 1-7 and 11. Step count data were only included in this analysis for students that achieved compliance (three or more logs in a particular week). Students who had one or more weeks of data excluded in this analysis did not preclude his/her data for inclusion in the analysis for previous or subsequent weeks. The number of students in compliance by
week that appears in Table 7 on page 89 also represent the number of students that were included in this analysis by week. Results of the Step Count ANOVA appear below in Table 12.

Table 12. ANOVA Results for Step Count for Weeks 1-7 and 11

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>n²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>2.305E8</td>
<td>1</td>
<td>2.305E8</td>
<td>24.238</td>
<td>.000*</td>
<td>.183</td>
</tr>
<tr>
<td>Group</td>
<td>2.163E7</td>
<td>1</td>
<td>2.163E7</td>
<td>.397</td>
<td>.530</td>
<td>.004</td>
</tr>
<tr>
<td>Linear Interaction</td>
<td>339,234.0</td>
<td>1</td>
<td>339,234.0</td>
<td>.036</td>
<td>.851</td>
<td>.000</td>
</tr>
<tr>
<td>Cubic Interaction</td>
<td>2.570E7</td>
<td>1</td>
<td>2.570E7</td>
<td>4.910</td>
<td>.029*</td>
<td>.044</td>
</tr>
</tbody>
</table>

Note. Significant difference at $p < .05$

As indicated from the ANOVA results for Step Count, there was a significant main effect for Time, but not for Group. The linear interaction for Step Count was not significant. There was a significant cubic interaction detected. The cubic interaction can be better understood by reviewing Figure 3 on page 100. Figure 3 revealed that both groups started out and ended with relatively the same step-count values, but arrived at those values in very different ways. The control group maintained steady weekly step-count increases that peaked at follow-up. In contrast, the experimental group started out with small step-count gains, made very large step-count gains in the
final weeks of the study, and then dipped well below the control group at follow-up to nearly baseline step-counts.

To further test this hypothesis, average daily step-counts by week were compared between the experimental and control group for all weeks of the study. A simple comparison between the treatment conditions of the average daily step-count by week is listed in Table 13 on page 98. As indicated by Table 13, there were no significant differences between the groups at baseline. Thus, it was determined that an independent samples t-test, with alpha set at .05 would be an appropriate statistical analysis. Results of the independent t-test appear in Table 14 on page 99. The results of the independent t-test did not yield any significant differences in average daily step-counts by week between the treatment conditions for any weeks of the study. While not significant, the control group outpaced the experimental group for five out of the six intervention weeks (weeks 2 through 6) and the four-week follow-up (week 11). Although not significant, the experimental group demonstrated a higher step-count than the control group at baseline (week 1) and the last week of the intervention (week seven). An explicit goal of 10,000 steps per day was never stated to the control group.
Table 13. Average Daily Step Counts by Week

<table>
<thead>
<tr>
<th>Week</th>
<th>Control</th>
<th>Experimental</th>
</tr>
</thead>
<tbody>
<tr>
<td>1*</td>
<td>9,325 ± 2,861</td>
<td>9,561 ± 3,167</td>
</tr>
<tr>
<td>2</td>
<td>10,234 ± 3,890</td>
<td>9,931 ± 3,183</td>
</tr>
<tr>
<td>3</td>
<td>10,449 ± 4,799</td>
<td>9,165 ± 3,834</td>
</tr>
<tr>
<td>4</td>
<td>10,510 ± 3,936</td>
<td>9,906 ± 3,305</td>
</tr>
<tr>
<td>5</td>
<td>10,764 ± 4,331</td>
<td>9,933 ± 3,604</td>
</tr>
<tr>
<td>6</td>
<td>10,929 ± 4,005</td>
<td>10,530 ± 3,507</td>
</tr>
<tr>
<td>7</td>
<td>10,782 ± 4,909</td>
<td>11,722 ± 4,526</td>
</tr>
<tr>
<td>11‡</td>
<td>11,174 ± 3,604</td>
<td>10,116 ± 3,882</td>
</tr>
</tbody>
</table>

Note. * Week 1 was the baseline, non-intervention week. ‡ Week 11 was a non-intervention week. All data are reported as mean ± standard deviation.

However, the average daily step-count by week for the control group was over this goal for all of the weeks of the study except at baseline. Despite an explicit goal of 10,000 steps per day being encouraged with the experimental group, they were only above this marker during three out of eight possible weeks (weeks 7-8 & 11). The experimental group did not reach this marker until week 6 of the study, while the control group surpassed 10,000 steps during the second week. The largest disparity in Step Count between
Table 14. Results of Independent t-test for Step Count

<table>
<thead>
<tr>
<th>Week</th>
<th>t</th>
<th>df</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-.353</td>
<td>82</td>
<td>.725</td>
</tr>
<tr>
<td>2</td>
<td>.393</td>
<td>82</td>
<td>.695</td>
</tr>
<tr>
<td>3</td>
<td>1.269</td>
<td>71</td>
<td>.209</td>
</tr>
<tr>
<td>4</td>
<td>.796</td>
<td>89</td>
<td>.428</td>
</tr>
<tr>
<td>5</td>
<td>.867</td>
<td>87</td>
<td>.388</td>
</tr>
<tr>
<td>6</td>
<td>.497</td>
<td>86</td>
<td>.621</td>
</tr>
<tr>
<td>7</td>
<td>-.901</td>
<td>80</td>
<td>.892</td>
</tr>
<tr>
<td>11</td>
<td>1.634</td>
<td>83</td>
<td>.106</td>
</tr>
</tbody>
</table>

Note. Significant difference $p < .05$.

The groups occurred during weeks 3, 7, and 11. The control group outpaced the experimental group during two out of those three weeks by 1,272 steps (week three) and 1,439 steps (week 11). The experimental group’s greatest step-count advantage over the control group occurred during the last week of the intervention (week seven) and was 940 steps per day. A visual account of the changes in average daily step-count by week for both groups is presented in Figure 3 on the following page.

Analyses of Step Count were also performed to determine whether there were any significant differences by gender or by low-active versus high-active students.
A repeated measures analysis of variance (ANOVA) indicated that there were no significant interactive effects for Gender ($p = .785$). A repeated measures analysis of covariance (ANCOVA) was completed on Step Count with the baseline week step-count serving as the covariate. Results of the ANCOVA indicated that there was no significant effect for Time, Group, or interaction.

**Results for Hypothesis 2**

Hypothesis 2 - The experimental group will significantly increase their physical activity during the intervention compared to their baseline physical activity.

The main effect for Time ($p = .000$) that appears in Table 12 on page 96 partially supports hypothesis 2. The
significant main effect for Time was obtained from the ANOVA completed using data from weeks 1-7 and 11. A subsequent ANOVA was completed using data from only weeks 1-7 to better characterize the hypothesis which speculated that the step-counts would increase during the intervention. The follow-up week was not explicitly included as part of the original hypothesis. Results of the ANOVA using step-counts from only weeks 1-7 indicated a significant main effect for Time \((p = .000)\) as well.

A one-way repeated measures ANOVA was completed for the experimental group on Step Count to further test hypothesis 2. A significant main effect for Time on Step Count \((p = .003)\) was detected. This finding supported hypothesis 2.

Results for Hypothesis 3

Hypothesis 3 - The control group will significantly increase their physical activity during the intervention compared to their baseline physical activity.

The main effect of Time for Step Count \((p = .000)\) that appears in Table 12 on page 96 partially supported hypothesis 3. The significant main effect for Time reported in Table 12 was obtained from an ANOVA completed using data from weeks 1-7 and 11. A subsequent ANOVA was completed using data from only weeks 1-7 to better
characterize the hypothesis which speculated that Step Count would increase during the intervention. The follow-up week was not explicitly included as part of the original hypothesis. Results of the ANOVA that included only weeks 1-7 indicated a significant main effect for Time \( (p = .000) \) as well.

A one-way repeated measures ANOVA was completed for the control group on Step Count to further test hypothesis 3. A significant main effect for Time on Step Count \( (p = .004) \) was detected. This finding supported hypothesis 3.

Results for Hypothesis 4

Hypothesis 4 - The experimental group will significantly improve their grades relative to the control group.

It was hypothesized that greater physical activity among the experimental group would be associated with higher academic performance for the experimental group relative to the control group. To expand this hypothesis, and further explore the impact of the intervention on other scholastic measures, it was deemed important to conduct analyses not only comparing changes in GPA, but also changes in attendance and tardiness. It is believed that in addition to grades, rates of attendance and tardiness are associated with school achievement. Comparative pre-
and post-test GPAs, number of days absent, and number of
days tardy appear in Table 15 on the following page.

A repeated-measures analysis of variance (ANOVA) was
performed on GPA and Attendance. An ANOVA was an
acceptable form of analysis for these variables because no
significant difference existed between conditions at pre-
test. An analysis of covariance (ANCOVA) was performed on
Tardiness because a significant difference at pre-test
between conditions was detected. ANOVA results for GPA are
appear in Table 16.

As noted in Table 16 on page 105, there was a
significant main effect for Time, suggesting GPA
significantly improved for both groups. The Group main
effect was not significant. Further, there was not a
significant interaction.

A repeated-measures analysis of variance was conducted
on Attendance. Results of the ANOVA are reported in table
17 on page 105. As indicated by Table 17, there was a
significant main effect for Time, suggesting the number of
days significantly decreased for both groups. The Group
main effect was not significant. There was not a
significant interaction for Attendance.
Table 15. Comparison of Pre-Test, Intervention, and Post-Test Scholastic Variables

<table>
<thead>
<tr>
<th>Condition</th>
<th>GPA</th>
<th>Attendance</th>
<th>Tardiness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-Test (Q2)</td>
<td>Intervention (Q3)</td>
<td>Post-Test (Q4)</td>
</tr>
<tr>
<td>Control</td>
<td>3.46 ± .61</td>
<td>3.62 ± .47*</td>
<td>3.67 ± .30‡</td>
</tr>
<tr>
<td>Experimental</td>
<td>3.41 ± .53</td>
<td>3.59 ± .43*</td>
<td>3.60 ± .47‡</td>
</tr>
</tbody>
</table>

Note. All data are reported as mean ± standard deviation. *p < .05 for pre-test to intervention. †p < .05 for intervention to post-test. ‡p < .05 for pre-test to post-test. GPA values are based on 4.00 maximum scale. Attendance refers to the number of days a student was absent from school per marking period. Tardiness refers to the number of days a student was late to school per marking period.
Table 16. ANOVA results for GPA

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>n²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>2.57</td>
<td>2</td>
<td>1.29</td>
<td>14.09</td>
<td>.000*</td>
<td>.115</td>
</tr>
<tr>
<td>Group</td>
<td>0.23</td>
<td>1</td>
<td>0.23</td>
<td>0.48</td>
<td>.491</td>
<td>.004</td>
</tr>
<tr>
<td>Interaction</td>
<td>0.02</td>
<td>2</td>
<td>0.10</td>
<td>0.11</td>
<td>.896</td>
<td>.001</td>
</tr>
</tbody>
</table>

Note. Significant difference at $p < .05$

Table 17. ANOVA results for Attendance

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>n²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>.18</td>
<td>1</td>
<td>.18</td>
<td>.03</td>
<td>.870</td>
<td>.000</td>
</tr>
<tr>
<td>Interaction</td>
<td>8.35</td>
<td>2</td>
<td>4.17</td>
<td>1.37</td>
<td>.260</td>
<td>.013</td>
</tr>
</tbody>
</table>

Note. *Significant difference at $p < .05$

An analysis of covariance (ANCOVA) was performed on Tardiness to covary the pre-test scores for the number of days tardy during the second marking period. ANCOVA results for Tardiness are shown in Table 18 below.

Table 18. ANCOVA Results for Tardiness

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>n²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>.50</td>
<td>1</td>
<td>.50</td>
<td>.86</td>
<td>.356</td>
<td>.008</td>
</tr>
<tr>
<td>Group</td>
<td>.43</td>
<td>1</td>
<td>.43</td>
<td>.75</td>
<td>.592</td>
<td>.003</td>
</tr>
<tr>
<td>Interaction</td>
<td>3.21</td>
<td>1</td>
<td>3.20</td>
<td>3.97</td>
<td>.049*</td>
<td>.036</td>
</tr>
</tbody>
</table>

Note. *Significant difference at $p < .05$
The results of the ANCOVA in Table 18 indicate there were no significant main effects for Time or Group. There was a significant interaction effect noted for Tardiness. Thus, there was a unique impact of the experimental intervention that resulted in significantly fewer days tardy for the experimental group between data collection points.

A paired sample t-test, with alpha set to .05, was completed for both groups comparing pre-test to intervention, intervention to post-test, and pre- to post-test for all scholastic variables.

As indicated in Table 15 on page 104, a significant increase in GPA from pre-test to post-test was noted for both groups. Tardiness significantly decreased from pre-test to intervention for the experimental group, while it significantly increased for the control group. Improvements in Tardiness from pre-test to post-test were only noted in the experimental group. The most notable difference among all of the scholastic variables occurred in the experimental group from intervention to post-test for Attendance ($t (60) = 3.54, p = .001$).
Results for Hypothesis 5

Hypothesis 5 - The experimental group will significantly improve on measures of physical fitness relative to the control group.

It was predicted that increased physical activity would cause improved standardized assessments of physical fitness. To test this hypothesis, a repeated-measures analysis of variance (ANOVA) was completed for all physical fitness tests. There were no significant differences between the groups at pre-test on any physical fitness test and, thus, an ANOVA was an acceptable form of analysis. ANOVA results for the physical fitness tests appear below in Tables 19 through 23.

Results of the ANOVA for Curl Up in Table 19 indicated that there were no significant main effects or a significant interaction. Mean scores for Curl Up appear on page 110.

Table 19. ANOVA Results for Curl Up

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>n²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>42.03</td>
<td>1</td>
<td>42.03</td>
<td>.17</td>
<td>.683</td>
<td>.002</td>
</tr>
<tr>
<td>Group</td>
<td>2887.48</td>
<td>1</td>
<td>2887.48</td>
<td>1.93</td>
<td>.168</td>
<td>.018</td>
</tr>
<tr>
<td>Interaction</td>
<td>68.47</td>
<td>1</td>
<td>68.47</td>
<td>.27</td>
<td>.603</td>
<td>.003</td>
</tr>
</tbody>
</table>

Note. *Significant difference at p < .05
Table 20. ANOVA Results for Sit and Reach

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>n²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>448.53</td>
<td>1</td>
<td>448.53</td>
<td>2.69</td>
<td>.104</td>
<td>.025</td>
</tr>
<tr>
<td>Group</td>
<td>7664.00</td>
<td>1</td>
<td>7664.00</td>
<td>5.97</td>
<td>.026*</td>
<td>.046</td>
</tr>
<tr>
<td>Interaction</td>
<td>529.20</td>
<td>1</td>
<td>529.00</td>
<td>3.17</td>
<td>.078</td>
<td>.029</td>
</tr>
</tbody>
</table>

Note. *Significant difference at p < .05

Results of the ANOVA for Sit and Reach indicated that there was a significant main effect for Group, but not Time. There was not a significant interaction for Sit and Reach. Mean scores for Sit and Reach appear on page 110.

As noted in Table 21, there was a significant main effect for Time, but not for Group. The interaction was not significant for Pull Up. Mean scores for Pull Up appear on page 110.

Table 21. ANOVA Results for Pull Up

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>n²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>1249.41</td>
<td>1</td>
<td>1249.41</td>
<td>5.28</td>
<td>.024*</td>
<td>.055</td>
</tr>
<tr>
<td>Group</td>
<td>1325.80</td>
<td>1</td>
<td>1325.80</td>
<td>.91</td>
<td>.343</td>
<td>.010</td>
</tr>
<tr>
<td>Interaction</td>
<td>1.56</td>
<td>1</td>
<td>1.56</td>
<td>1.56</td>
<td>.935</td>
<td>.000</td>
</tr>
</tbody>
</table>

Note. *Significant difference at p < .05
Table 22. ANOVA Results for Shuttle Run

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>n²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>5743.20</td>
<td>1</td>
<td>5743.20</td>
<td>24.39</td>
<td>.000*</td>
<td>.191</td>
</tr>
<tr>
<td>Group</td>
<td>632.81</td>
<td>1</td>
<td>632.81</td>
<td>.65</td>
<td>.422</td>
<td>.006</td>
</tr>
<tr>
<td>Interaction</td>
<td>393.49</td>
<td>1</td>
<td>393.49</td>
<td>1.67</td>
<td>.199</td>
<td>.016</td>
</tr>
</tbody>
</table>

Note. *Significant difference at p < .05

For Shuttle Run, Table 22 revealed a significant main effect for Time, but not for Group. There was not a significant interaction for Shuttle Run. Mean scores for Shuttle Run appear on page 110.

Table 23. ANOVA results for Mile Run

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>n²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>642.01</td>
<td>1</td>
<td>642.01</td>
<td>2.60</td>
<td>.111</td>
<td>.006</td>
</tr>
<tr>
<td>Group</td>
<td>641.58</td>
<td>1</td>
<td>641.58</td>
<td>.55</td>
<td>.460</td>
<td>.027</td>
</tr>
<tr>
<td>Interaction</td>
<td>882.15</td>
<td>1</td>
<td>882.15</td>
<td>3.57</td>
<td>.062</td>
<td>.037</td>
</tr>
</tbody>
</table>

Note. *Significant difference at p < .05

As Table 23 indicated, there were no significant main effects. The interaction effect for Mile Run approached significance (p = .062).

Paired sample t-tests were completed comparing the mean change from pre-to post-test for physical fitness national percentile scores for both groups. Table 24
Table 24. Comparison of Physical Fitness National Percentile Scores

<table>
<thead>
<tr>
<th>Condition</th>
<th>Pre-Test (Q2)</th>
<th>Post-Test (Q4)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Curl Up</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>65.8 ± 29.0</td>
<td>66.1 ± 29.6</td>
</tr>
<tr>
<td>Experimental</td>
<td>59.6 ± 28.9</td>
<td>57.6 ± 30.2</td>
</tr>
<tr>
<td><strong>Sit &amp; Reach</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>75.9 ± 26.8</td>
<td>75.6 ± 27.5</td>
</tr>
<tr>
<td>Experimental</td>
<td>60.7 ± 29.8</td>
<td>67.7 ± 30.7*</td>
</tr>
<tr>
<td><strong>Pull Up</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>61.7 ± 24.6</td>
<td>66.7 ± 25.0*</td>
</tr>
<tr>
<td>Experimental</td>
<td>56.1 ± 34.0</td>
<td>61.5 ± 30.3</td>
</tr>
<tr>
<td><strong>Shuttle Run</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>67.7 ± 23.2</td>
<td>59.9 ± 28.2*</td>
</tr>
<tr>
<td>Experimental</td>
<td>66.9 ± 22.1</td>
<td>53.7 ± 24.8*</td>
</tr>
<tr>
<td><strong>Mile Run</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>55.4 ± 30.2</td>
<td>56.0 ± 29.4</td>
</tr>
<tr>
<td>Experimental</td>
<td>56.1 ± 22.5</td>
<td>48.0 ± 25.8*</td>
</tr>
</tbody>
</table>

*Note. All data are reported as mean ± standard deviation. Scores represent national percentiles. *Significant change p < .05
page 110 detailed the pre- and post-test physical fitness mean scores.

Results of the paired sample t-test revealed significant improvements in national percentile scores from pre-to post-test for the control group only on Pull Up. Significance was noted for worsened performance from pre-to post-test for the control group on Shuttle Run. The experimental group significantly improved from pre-to post-test only on Sit and Reach. Significantly decreased performance was noted for the experimental group between the two time points for Shuttle Run and Mile Run.

Results for Hypothesis 6

Hypothesis 6 - The experimental group will significantly improve their measures of self-efficacy to be physically active relative to the control group.

Changes in self-efficacy were assessed using an eight-item questionnaire developed and originally tested by Motl et al. (2000). Dishman et al. (2004) used this instrument in a large randomized study and concluded that PA increased in The Lifestyle Education for Activity Program (LEAP) by manipulating self-efficacy through a school-based curriculum. Hence, it was believed that the students in the experimental group would significantly increase their
self-efficacy compared to the control group because they received the experimental school curriculum.

A repeated-measures analysis of variance (ANOVA) was computed for Self-efficacy. Results of the ANOVA computed for Self-efficacy appear in Table 25.

Table 25. ANOVA Results for Self-Efficacy

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>n²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>58.97</td>
<td>1</td>
<td>58.97</td>
<td>1.10</td>
<td>.299</td>
<td>.010</td>
</tr>
<tr>
<td>Group</td>
<td>.53</td>
<td>1</td>
<td>.53</td>
<td>.05</td>
<td>.820</td>
<td>.000</td>
</tr>
<tr>
<td>Interaction</td>
<td>2.18</td>
<td>1</td>
<td>2.18</td>
<td>.21</td>
<td>.645</td>
<td>.002</td>
</tr>
</tbody>
</table>

Note. *Significant difference at p < .05

Table 26. Pre- and Post-Test Comparison of Self-Efficacy Questionnaire Total Scores

<table>
<thead>
<tr>
<th>Condition</th>
<th>Pre-Test</th>
<th>Post-Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>32.1 ± 4.9</td>
<td>32.2 ± 4.5</td>
</tr>
<tr>
<td>Experimental</td>
<td>31.2 ± 6.2</td>
<td>30.9 ± 6.5</td>
</tr>
</tbody>
</table>

Note. All data are reported as mean ± standard deviation.

As indicated in the table 25, there were no significant main effects or interaction for Self-efficacy.

Paired sample t-tests were conducted to determine whether significant differences existed on Self-efficacy for pre-test to post-test for both treatment conditions.
Pre- and post-test self-efficacy questionnaire total scores are presented in Table 26 on the previous page. There were no significant changes for Self-Efficacy for either group.

Results for Hypothesis 7

Hypothesis 7 - The experimental group will significantly improve their attitude toward physical activity relative to the control group.

It was predicted that increased PA of the experimental group would cause increased attitude toward PA based on the same assumptions detailed in hypothesis 6. Further, Dishman et al. (2002) concluded that the instrument was a satisfactory measure of changes in attitude toward exercise.

A repeated-measures analysis of variance (ANOVA) was computed for Attitude. Results of the ANOVA computed for Attitude appear below in Table 27.

Table 27. ANOVA results for Attitude

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>n²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>96.49</td>
<td>1</td>
<td>96.49</td>
<td>2.49</td>
<td>.117</td>
<td>.023</td>
</tr>
<tr>
<td>Ex-Control</td>
<td>.17</td>
<td>1</td>
<td>.17</td>
<td>.02</td>
<td>.890</td>
<td>.000</td>
</tr>
<tr>
<td>Time X Ex-Control</td>
<td>1.71</td>
<td>1</td>
<td>1.71</td>
<td>.20</td>
<td>.658</td>
<td>.002</td>
</tr>
</tbody>
</table>

Note. *Significant difference at p < .05
A review of Table 27 indicated that there were no significant main effects or interaction effect for Attitude.

Paired Sample t-tests were conducted to determine whether significant differences existed on Attitude for pre-test to post-test for both treatment conditions.

Table 28. Pre- and Post-Test Comparison of Attitude Questionnaire Total Scores

<table>
<thead>
<tr>
<th>Condition</th>
<th>Pre-Test</th>
<th>Post-Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>32.1 ± 3.34</td>
<td>32.3 ± 4.92</td>
</tr>
<tr>
<td>Experimental</td>
<td>30.9 ± 5.22</td>
<td>30.8 ± 5.48</td>
</tr>
</tbody>
</table>

*Note. All data are reported as mean ± standard deviation.*

A review of Table 28 showed no significant changes on the total score for either group.

Results from Participant Feedback Questionnaire

Responses were tabulated from the Student Feedback Questionnaire and are reported below in Table 29 on pages 115-119. Table 30 on page 121 shows the comparison of self-recalled step-counts with recorded step-counts. The data for this table were gathered by combining the responses of all students from item 7 on the Student Feedback Questionnaire. This item asked students to recall
Table 29. Student Feedback Questionnaire Response Results

<table>
<thead>
<tr>
<th>Condition</th>
<th>Response Item</th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participating in H.Y.P.P.E. made me more aware of how much physical activity I was getting <strong>during</strong> the initiative.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control (N=47)</td>
<td></td>
<td>17</td>
<td>21</td>
<td>5</td>
<td>4</td>
<td>0</td>
<td>4.09</td>
</tr>
<tr>
<td>Experimental (N=49)</td>
<td></td>
<td>17</td>
<td>21</td>
<td>9</td>
<td>2</td>
<td>0</td>
<td>4.08</td>
</tr>
<tr>
<td>Participating in H.Y.P.P.E. made me more aware of how much physical activity I was getting <strong>after</strong> the initiative.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control (N=47)</td>
<td></td>
<td>12</td>
<td>21</td>
<td>10</td>
<td>4</td>
<td>0</td>
<td>3.87</td>
</tr>
<tr>
<td>Experimental (N=49)</td>
<td></td>
<td>11</td>
<td>21</td>
<td>15</td>
<td>1</td>
<td>1</td>
<td>3.82</td>
</tr>
<tr>
<td>Participating in H.Y.P.P.E increased my physical activity <strong>during</strong> the initiative.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control (N=47)</td>
<td></td>
<td>10</td>
<td>19</td>
<td>14</td>
<td>4</td>
<td>0</td>
<td>3.74</td>
</tr>
<tr>
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<td>11</td>
<td>11</td>
<td>6</td>
<td>1</td>
<td>3.88</td>
</tr>
</tbody>
</table>

*Note.* SA = strongly agree, A = agree, N = neutral, D = disagree, SD = strongly disagree.
Participating in H.Y.P.P.E increased my physical activity after the initiative.

<table>
<thead>
<tr>
<th></th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (N=47)</td>
<td>7</td>
<td>18</td>
<td>19</td>
<td>3</td>
<td>0</td>
<td>3.62</td>
</tr>
<tr>
<td>Experimental (N=49)</td>
<td>15</td>
<td>12</td>
<td>16</td>
<td>5</td>
<td>1</td>
<td>3.73</td>
</tr>
</tbody>
</table>

Overall, I enjoyed the H.Y.P.P.E. Initiative.

<table>
<thead>
<tr>
<th></th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (N=47)</td>
<td>8</td>
<td>24</td>
<td>13</td>
<td>2</td>
<td>0</td>
<td>3.81</td>
</tr>
<tr>
<td>Experimental (N=49)</td>
<td>13</td>
<td>21</td>
<td>11</td>
<td>3</td>
<td>1</td>
<td>3.86</td>
</tr>
</tbody>
</table>

Specifically, I enjoyed wearing my pedometer.

<table>
<thead>
<tr>
<th></th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (N=44)</td>
<td>9</td>
<td>20</td>
<td>12</td>
<td>3</td>
<td>0</td>
<td>3.80</td>
</tr>
<tr>
<td>Experimental (N=49)</td>
<td>17</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>4</td>
<td>3.57</td>
</tr>
</tbody>
</table>

Specifically, I enjoyed using the Log It website.

<table>
<thead>
<tr>
<th></th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (N=44)</td>
<td>6</td>
<td>13</td>
<td>15</td>
<td>7</td>
<td>3</td>
<td>3.27</td>
</tr>
<tr>
<td>Experimental (N=49)</td>
<td>6</td>
<td>5</td>
<td>23</td>
<td>8</td>
<td>3</td>
<td>2.82</td>
</tr>
</tbody>
</table>

Note. SA = strongly agree, A = agree, N = neutral, D = disagree, SD = strongly disagree.
Specifically, I enjoyed the fitness field day.

<table>
<thead>
<tr>
<th></th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (N=46)</td>
<td>20</td>
<td>14</td>
<td>11</td>
<td>1</td>
<td>0</td>
<td>4.15</td>
</tr>
<tr>
<td>Experimental (N=49)</td>
<td>20</td>
<td>13</td>
<td>12</td>
<td>2</td>
<td>2</td>
<td>3.96</td>
</tr>
</tbody>
</table>

Specifically, I enjoyed the information I learned in PE class.

<table>
<thead>
<tr>
<th></th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (N=44)</td>
<td>3</td>
<td>16</td>
<td>20</td>
<td>5</td>
<td>0</td>
<td>3.39</td>
</tr>
<tr>
<td>Experimental (N=46)</td>
<td>9</td>
<td>6</td>
<td>16</td>
<td>9</td>
<td>6</td>
<td>3.48</td>
</tr>
</tbody>
</table>

Specifically, I enjoyed getting my H.Y.P.P.E. t-shirt.

<table>
<thead>
<tr>
<th></th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (N=46)</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td>0</td>
<td>1</td>
<td>3.89</td>
</tr>
<tr>
<td>Experimental (N=46)</td>
<td>13</td>
<td>10</td>
<td>17</td>
<td>6</td>
<td>0</td>
<td>3.65</td>
</tr>
</tbody>
</table>

Did you participate in fitness classes offered at The Aquatic and Fitness Center?

<table>
<thead>
<tr>
<th></th>
<th>Control (N=47)</th>
<th>Experimental (N=49)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>4.3%</td>
<td>12.2%</td>
</tr>
<tr>
<td>No</td>
<td>95.7%</td>
<td>87.8%</td>
</tr>
</tbody>
</table>
Note. SA = strongly agree, A = agree, N = neutral, D = disagree, SD = strongly disagree.

During the initiative I got approximately:

<table>
<thead>
<tr>
<th></th>
<th>Control (N=47)</th>
<th>Experimental (N=49)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000-2,999 steps per day</td>
<td>6.4%</td>
<td>6.1%</td>
</tr>
<tr>
<td>3,000-4,999 steps per day</td>
<td>6.4%</td>
<td>4.1%</td>
</tr>
<tr>
<td>5,000-6,999 steps per day</td>
<td>4.3%</td>
<td>6.1%</td>
</tr>
<tr>
<td>7,000-8,999 steps per day</td>
<td>14.9%</td>
<td>12.4%</td>
</tr>
<tr>
<td>9,000-10,999 steps per day</td>
<td>32.0%</td>
<td>20.4%</td>
</tr>
<tr>
<td>11,000-12,999 steps per day</td>
<td>14.9%</td>
<td>28.6%</td>
</tr>
<tr>
<td>13,000-14,999 steps per day</td>
<td>8.5%</td>
<td>10.2%</td>
</tr>
<tr>
<td>15,000 or more steps per day</td>
<td>12.8%</td>
<td>8.2%</td>
</tr>
</tbody>
</table>

The following things made me more aware of how much physical activity I was getting during the initiative:

<table>
<thead>
<tr>
<th></th>
<th>Control (N=47)</th>
<th>Experimental (N=49)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wearing a pedometer</td>
<td>45.1%</td>
<td>41.5%</td>
</tr>
<tr>
<td>Using the Log It Website to record my steps</td>
<td>34.1%</td>
<td>30.1%</td>
</tr>
<tr>
<td>Information I learned in PE class</td>
<td>14.3%</td>
<td>12.8%</td>
</tr>
<tr>
<td>I was not aware of how much PA I was getting</td>
<td>6.5%</td>
<td>14.9%</td>
</tr>
</tbody>
</table>
The following things made me more aware of how much physical activity I was getting after the initiative.

<table>
<thead>
<tr>
<th></th>
<th>Control (N=47)</th>
<th>Experimental (N=49)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wearing a pedometer</td>
<td>30.1%</td>
<td>26.9%</td>
</tr>
<tr>
<td>Using the Log It Website to record my steps</td>
<td>20.0%</td>
<td>20.5%</td>
</tr>
<tr>
<td>Information I learned in PE class</td>
<td>32.0%</td>
<td>29.5%</td>
</tr>
<tr>
<td>I was not aware of how much PA I was getting</td>
<td>17.3%</td>
<td>23.7%</td>
</tr>
</tbody>
</table>

I did not participate in fitness classes offered at The Aquatic and Fitness Center for the following reasons (select all that apply):

<table>
<thead>
<tr>
<th></th>
<th>Control (N=45)</th>
<th>Experimental (N=45)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I was not interested in the classes.</td>
<td>48.9%</td>
<td>35.5%</td>
</tr>
<tr>
<td>I did not have a ride to the classes.</td>
<td>13.3%</td>
<td>17.8%</td>
</tr>
<tr>
<td>I was doing something else when the classes were offered.</td>
<td>62.2%</td>
<td>62.2%</td>
</tr>
<tr>
<td>I did not know about the classes.</td>
<td>11.1%</td>
<td>11.1%</td>
</tr>
</tbody>
</table>
how many steps they averaged per day during H.Y.P.P.E. within designated step-count ranges. The week 11 recorded step-counts for this table were gleaned from both non-compliant (less than 3 logs per week) students and compliant students. Non-compliance data were included in this table to achieve relative equity with the number of students that responded to the Student Feedback Questionnaire. Frequencies were generated for the recorded step-count data by placing the week 11 average daily step-counts into the same designated ranges used in item 7 on the Student Feedback Questionnaire. The self-recalled step-count frequencies were strikingly similar to the recorded step-count frequencies. The Student Feedback Questionnaires were completed anonymously. Therefore, it was not possible to determine how accurate each individual student was in recalling his or her own recorded step-count. The largest discrepancy (4.3 percentage points) between the self-recalled and recorded step-counts existed in the 3,000-4,999 step-count range. There was no discrepancy whatsoever between the frequencies of the self-recalled and the week 11 recorded 9,000-10,999 step-count range. This is notable because of the fact that the explicit 10,000 step-count goal for the experimental group
Table 30. Frequencies of Student Self-Recalled Step-Count Ranges Compared to Student-Recorded Step-Counts Ranges

<table>
<thead>
<tr>
<th>Steps Range</th>
<th>Self-Recalled (N=96)</th>
<th>Week 11 Recorded (N=100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000-2,999 Steps</td>
<td>6 (6.3%)</td>
<td>5 (5.0%)</td>
</tr>
<tr>
<td>3,000-4,999 Steps</td>
<td>7 (7.3%)</td>
<td>3 (3.0%)</td>
</tr>
<tr>
<td>5,000-6,999 Steps</td>
<td>5 (5.2%)</td>
<td>7 (7.0%)</td>
</tr>
<tr>
<td>7,000-8,999 Steps</td>
<td>13 (13.5%)</td>
<td>12 (12.0%)</td>
</tr>
<tr>
<td>9,000-10,999 Steps</td>
<td>25 (26.0%)</td>
<td>25 (25.0%)</td>
</tr>
<tr>
<td>11,000-12,999 Steps</td>
<td>21 (21.9%)</td>
<td>25 (25.0%)</td>
</tr>
<tr>
<td>13,000-14,999 Steps</td>
<td>9 (9.6%)</td>
<td>13 (13.0%)</td>
</tr>
<tr>
<td>15,000 or more Steps</td>
<td>10 (9.6%)</td>
<td>10 (10.0%)</td>
</tr>
</tbody>
</table>

was within this range. The highest frequency for both the self-recalled (25 students) and recorded step-count (25 students) ranges also occurred in the 9,000-10,999 range. Additionally, there was no discrepancy whatsoever for the 15,000 or more steps per day range. This was the highest step-count range category.
Discussion for Hypotheses

Hypothesis 1. It was predicted that the intervention administered to the experimental group would yield significantly greater physical activity for the experimental group relative to the control group. The intervention consisted of self-monitoring through the use of a pedometer, logging daily pedometer step-counts, receiving prompts twice every six days in PE class to attain 10,000 steps per day, prompting students to attain a 1,200 higher step-count goal in PE than the students in the control group, and an enhanced PE curriculum including topics adapted from the Trial of Activity For Adolescent Girls (TAGG) Health Education and Activity Challenges 8th Grade Teachers’ Manual developed by Felton et al. (2008).

The hypothesis was tested by completing a repeated measures analysis of variance (ANOVA) on Step Count. The nonsignificant findings for Group ($p = .530$) and Linear Interaction ($p = .851$) do not support hypothesis 1. However, the interesting finding of a significant cubic interaction does validate hypothesis 1. The interpretation of the cubic interaction is that both groups started out with the essentially same step-count and finished the study (week 7) at essentially the same step-count, but the step-counts for each group were vastly different as they
progressed through the study. The control group’s step-count was considerably higher than experimental group’s step-count during the first several weeks of the study. Toward the end of the study, the control group slowed down, while the experimental group made huge gains, and ultimately, outpaced the control group by the final week of the study (week 7) by over 1000 steps per day. The disappointing, but final interpretation of the significant cubic interaction showed that the control group jumped back ahead of the experimental group at follow-up (week 11), four weeks after the conclusion of the intervention. The significant cubic interaction is depicted Figure 3 on page 100.

A review of Figure 3 highlights the slow, but steady pace of the control group between weeks two through six, whereas the experimental group made very sharp gains between weeks three and four, five and six, and notably between weeks six and seven of over 1000 steps. Optimistically, it can be concluded that the specific PE curriculum for the experimental group was responsible for these sharp gains in steps because over the course of the intervention, prompts, step-count goals, and logging of steps remained constant. It is instructive to decipher which particular lessons students in the experimental
condition received during the weeks in which sharp gains were detected to determine which lessons had the greatest impact on Step Count. Between weeks 3 and 4, lessons number 4 (FITT - frequency, intensity, time, and type of physical activity) and number 5 (barriers to attaining physical activity) were taught. Between weeks 5 and 6, lessons number 8 (self-talk) and 9 (replacing sedentary behaviors) were taught. During the last notable step-count jump between weeks 6 and 7, lesson number 10 was taught in which students created public service announcements about the benefits of physical activity. This was the culminating activity for the H.Y.P.P.E. PE curriculum and required students to synthesize the information they learned during the previous weeks in PE. It is possible that something about these particular lesson topics produced the notable step-count jumps during these weeks among the experimental group.

It is also interesting to note the sharp dip in Step Count for the experimental group from week two to three. Interestingly, students only received one PE lesson between these weeks because of the school being closed. They received lesson 3 (benefits of physical activity). It should also be considered that students were out of school two extra days that week. This is an important
consideration because adolescents obtain significantly less moderate to vigorous physical activity during the weekend compared to weekdays (Trost et al., 2000) and adults attain fewer average steps during the weekend compared to weekdays (Tudor-Locke et al., 2008).

The results of the simple t-tests provided additional data analysis relevant to the discussion of hypothesis 1. The results did not support hypothesis 1 in that the analysis failed to detect any statistically significant difference between the conditions during baseline, six weeks of intervention, or at four-week follow-up. The interpretation of these findings is generally straightforward. The non-significant t-test results, coupled with the significant cubic interaction created an overall murky discussion of the hypothesis 1. Further complicating the discussion is the fact that the control group attained higher step-counts for more weeks of the study than the experimental group, had more weeks that averaged more than 10,000 steps per day than the experimental group, and outpaced the experimental group on two of the three weeks for which the greatest step-count disparity between the groups was noted. Exploration of the non-significant results obtained from the t-test is a necessary part of the discussion of hypothesis 1.
There are several viable explanations for why there were no significant differences between the conditions for Step Count. It was previously suggested that the curriculum accounted for sharp upturns in step-count for the experimental group during certain weeks. It is possible that the curriculum, taken as a whole, was not effective enough to produce statistically significant results that were superior to pedometer use and self-monitoring used by the control group. In essence, the discussion of hypothesis 1 leads to the question of why did the combination of all facets of the experimental curriculum not outperform the control condition?

An exploration of the curriculum itself is helpful in answering this question. The H.Y.P.P.E. curriculum was based on the Trial of Activity for Adolescent Girls (TAGG) Health Education and Activity Challenges 8th Grade Teachers’ Manual developed by Felton et al. (2008). There were several limitations of the H.Y.P.P.E. curriculum compared to the TAGG curriculum, which was funded by the National Heart, Lung, and Blood Institute of the National Institutes of Health.

Teachers who implemented the TAGG intervention participated in a highly structured training that included two specific goals. The purpose of the two training goals
was to give teachers a clear understanding of the theoretical constructs contained in the lessons and to secure buy-in to effectively teach the lessons. The TAGG teachers also received a thorough teaching manual containing the scope and sequence for all TAGG lesson plans (Felton et al., 2008). While the PE teachers in H.Y.P.P.E. were highly qualified, they did not receive comparable training on the intervention compared to the TAGG teachers. The author also observed less than optimal teacher buy-in, interest in the study, and eagerness to participate. These factors had the potential to negatively impact the delivery of the PE curriculum designed to promote physical activity.

Other questions can be raised regarding the efficacy of the H.Y.P.P.E. curriculum in comparison to the TAGG (Felton et al., 2008) curriculum. The TAGG intervention called for a two-year intervention, while the H.Y.P.P.E. curriculum was implemented in 10 lessons over the course of six weeks (Stevens et al., 2005). It would have been desirable to have sharpened the focus of the H.Y.P.P.E. curriculum to cover fewer topics in greater detail than to cover many topics. Another difference between the implementation of the curriculum was that the TAGG curriculum (Felton et al.) was specifically designed to be used exclusively with girls. Both boys and girls
participated in H.Y.P.P.E. It was determined by the author and the PE teacher who consulted with the author on the development of the curriculum that the lessons did not appear to contain any gender biased materials. However, the efficacy of the curriculum topics for use with boys was not previously determined in the development of the TAGG lesson topics (Stevens et al.).

The final potential theory of why there was no significant difference between the conditions for their step-counts is that the developmental stage of the participants needs to be considered. One of the developmental tasks for middle school students is to assert their independence (Nielsen, 1991). This means students who are actively engaged in this process often assert their independence by resisting authority, experimenting with risky or unhealthful behavior, and generally rebelling against authority. Thus, it can be speculated that the less than expected impact of the H.Y.P.P.E. curriculum could be attributed to students resisting the health-related school curriculum.

One highly visible, nationally implemented school-based health promotion campaign with little success was Project DARE (Drug Abuse Resistance Education). A 10-year follow up study indicated that DARE, a 6th grade anti-drug
curriculum, had no impact on students’ subsequent alcohol, cigarette, and marijuana use (Lynam et al., 1999). Data gathered in 2007 from over 5,000 students in the community and school in which H.Y.P.P.E. took place using the Search Institute’s Profiles of Student Life: Attitudes and Behaviors Survey (Search Institute, 1999) revealed the age for first time use of alcohol and marijuana is earlier than the national average based on the Results from the 2008 National Survey on Drug Use and Health: National Findings (Substance Abuse and Mental Health Services Administration, 2009). Despite the implementation of DARE and other more efficacious prevention curricula including Second Step (Fitzgerald & Edstrom, 2006), it can be hypothesized that students in this particular school could be somewhat impervious to health promotion curricula and specific prompting to attain a suggested step-count. Thus, a less than expected impact of the H.Y.P.P.E. intervention to produce greater physical activity among the experimental group was attained.

One final point worth noting is that it can be argued that the design of this study allowed for the comparison of two distinct interventions. As previously outlined, the experimental group received a multi-dimensional intervention including self-monitoring, logging daily step-
counts, teacher prompting, and an enhanced PE curriculum. The results of the step-count analysis denote that the control group’s use of a pedometer and logging of steps was equally and, based on some measures, more efficacious than the experimental intervention. Thus, it can be concluded that there is potential to increase physical activity via the combination of pedometer use and self-monitoring as was evidenced by the control group in H.Y.P.P.E. This conclusion is explored in more detail in the discussion of hypothesis 3.

Hypothesis 2. It was expected that the experimental group would significantly increase their physical activity from baseline to the conclusion of the intervention. To test this hypothesis, two repeated-measures analyses of variance (ANOVAs) were completed on Step Count. One ANOVA was completed using data available for weeks 1-7 and 11. The second ANOVA was completed for only weeks 1-7. The results of both ANOVAs yielded significant main effects for Time (p = .000). These results partially supported hypothesis 2. The results of the one-way ANOVA on Step Count (p = .003) more conclusively supported hypothesis 2.

It was already proposed in the discussion of hypothesis 1 that the H.Y.P.P.E. curriculum might not have been strong enough to produce a significant linear
interaction or main effect for Group, but it did produce a significant cubic interaction. Thus, at some points in the study, the experimental group significantly outpaced the control group and made several notable jumps in Step Count including one gain of over 1000 steps per day for the week.

The change in Step Count for the experimental group showed a striking increase in their average daily step-count from baseline to week 7 by 2,161 steps per day and a more modest gain from baseline to week 11 by 556 steps per day. It was suggested in the discussion of hypothesis 1 that specific curriculum topics contributed to the weekly step-count "jumps" noted in the experimental group. Thus, it follows that certain parts of the curriculum contributed to the significant main effect for Time on Step Count for the experimental group.

It should be mentioned that since both groups significantly increased their step-counts and the design of the study did not allow for a comparison group that did not receive any intervention, other possible factors need to be considered in explaining the significant main effect of Time on Step Count. The time of year when the study occurred needs to be considered as one alternative factor.

Current research with adults on the seasonal variation of physical activity, including the highly cited Framingham
Study (Dannenberg, Keller, Wilson, & Castelli, 1989), suggests that men and women are more active during the summer months (Matthews et al., 2001) and physical activity actually declines during winter months (Uitenbroek, 1993). A review of articles concerning the impact of seasonal variation on physical activity for children revealed that in very young children there was a slight, but significant amount of increased physical activity detected in the spring and summer months (Fisher et al., 2005), there were higher levels of physical activity in the spring and summer for 8-10 year olds, but not 14-16 year olds (Kristensen et al., 2008), greater energy expenditure for 4-10 year olds in spring and summer was noted (Goran et al., 1998), and that 9 and 15 year olds had a greater likelihood of meeting physical activity recommendations in the spring and summer (Kolle, Steene-Johannessen, Andersen, & Anderssen, 2009). The abundance of research does not support the notion of seasonality contributing to the step-count increase noted for the experimental condition in H.Y.P.P.E. because the main intervention occurred during the winter months of February and March. Further, the notion of seasonality impacting Step Count for the experimental group is further dismissed by the fact that Step Count declined (from week 7 to 11) at four-week follow-up in April during spring.
Other possible explanations for the significant increase in Step Count can be drawn from documented correlates of physical activity among adolescents. Van Der Horst et al. (2007) conducted a review of 60 existing studies on the correlates of physical activity among youth. They identified that gender (male), self-efficacy, parental physical activity (for boys), and parental support had positive associations with physical activity among 4-12 year olds.

Parental influence was shown to influence adolescent physical activity (Anderssen & Wold, 1992; Sallis et al. 2000). This factor was not specifically measured in the current study. However, one piece of available data did not suggest that parental physical activity changed during the intervention period. This piece of data is not a comprehensive assessment of parental physical activity during the study. Students in H.Y.P.P.E. were given the opportunity to attend a local health and fitness club at no cost to them during the study. Student self-reported data indicated that only 12.7% of the experimental group attended a group fitness class at a local fitness facility one or more times. In order for students to attend a class, they needed to be accompanied to the club by a parent and the parent was able to use the facility
simultaneously with his or her child also at no cost. Participation in this optional component of the study was regrettably poor, and at the request of the fitness club needed to be discontinued due to very low attendance (this point is discussed further in Chapter 5). There are no available data to support that a change in parental behavior influenced the increased step-count noted in the experimental group or that the behavior of parents in the experimental group was any different than the behavior of parents of students in the control group.

Self-efficacy was one of the dependent measures in H.Y.P.P.E. Pre- and post-test scores showed no significant difference for the experimental group in Self-Efficacy based on the eight-item questionnaire developed by Motl et al. (2000). The notion that self-efficacy did not appear to be a mechanism responsible for increased physical activity in this study is further explored in the discussion of hypothesis 6.

The role of reactivity also needs to be explored as a potential contributor to the increased step-counts noted in this study. Reactivity is defined as a participant’s change in behavior in response to being observed or monitored rather than the change in behavior occurring as a participant’s response to an intervention. Typically, one
would expect reactivity to be most prevalent at the onset of a pedometer study and diminish over subsequent days. In fact, Southard and Southard (2006) attributed step-count increases during the baseline period in their study to reactivity. Despite speculation about reactivity, most of the research fails to demonstrate that reactivity is a threat to assessing physical activity of youth with pedometry (Tudor-Locke, McClain, Hart, Sisson, & Washington, 2009).

The concept of reactivity as applied to H.Y.P.P.E. is complex. First, the data indicated that Step Count during the baseline week was lower than the subsequent weeks, and therefore, dispelled the argument that reactivity was a negative factor at the onset of this study. Second, the concept of reactivity needs to be viewed from distinct researcher and practitioner contexts. It is understood that a researcher, implementing a multi-dimensional physical activity intervention, should be cognizant of participant reactivity to pedometers. This awareness is necessary to pinpoint to which facets of the intervention the participants reacted. From a practitioner’s perspective, it is preferred that students receive feedback (from pedometers) and react to it. Thus, from a practical standpoint, reactivity to pedometers is desirable. This is
the crux of the rationale used to explain the significant step-count increase of the control group in H.Y.P.P.E. The value of feedback is explored more extensively in the discussion of hypothesis 3.

One last point regarding reactivity is necessary. It is critical for practitioners and researchers to have accurate assessments of physical activity to combat the obesity epidemic (Sirard & Pate, 2001). The author asserts that it is equally important for children to have accurate assessments of their own physical activity if it is expected for them to have any realistic understanding of how much activity they are getting or should be getting. Not providing students with this tool would be analogous to teaching students mathematical concepts, but never giving them an accurate assessment of what they learned or how they applied their knowledge. It would be both naive and unsound teaching practice to do so. The emphasis of pedometry to not only measure, but also act as an effective moderator of physical activity among adolescents, emerged as a central conclusion of this study.

It can be safely concluded that seasonality had no impact on Step Count and reasonably concluded that parental influence, self-efficacy, and gender remained static over the course of the study and did not significantly
contribute to the significant increase in Step Count as predicted in hypothesis 2. Reactivity to pedometers did play a role in producing higher step-counts, but this is not viewed as a negative outcome.

The discussion of hypothesis 2 leads to a comparison of the step-count rates found in H.Y.P.P.E. to other studies aimed at increasing step-counts. A note of caution should be applied when comparing step-counts between studies because variability exists in different brands and models of pedometers to accurately count steps (Schneider, et al., 2004; Schneider et al., 2003). Schneider and colleagues (2003) rated the New Lifestyles brand as one of the most accurate pedometers based on their comparison of 10 pedometers. In that study, the New Lifestyles 2000 model was tested, not the New Lifestyles 401 that was used in H.Y.P.P.E. The 401 model was selected for H.Y.P.P.E. because of the documented brand accuracy (Schneider et al., 2003) of New Lifestyles and the relative affordability. The 401 model is approximately $45 less than the 2000 model.

Hundreds of studies have been conducted in schools to promote physical activity. For the comparative portion of the discussion of hypothesis 2, only studies that closely approximate H.Y.P.P.E. in some fashion were reviewed. Zizzi and colleagues (2006) published a study conducted
with high school students that very closely approximates H.Y.P.P.E. Eighty-four students were randomly stratified (based on recent physical activity history) to the Goal and No Goal groups. Both groups were asked to wear pedometers for three weeks, after one week of wearing them for acclimation purposes. Participants were given a log sheet to record their steps each week and as a reminder to wear their pedometers. Additionally, the Goal group was asked to create a daily step-count goal after wearing their pedometer for one week. Participants did not receive feedback as to whether they met their goals or not, but did receive weekly handouts that contained information about overcoming barriers, goal setting guidelines, and caloric expenditure. The No Goal group simply wore their pedometers and reported their steps on a weekly basis.

There were no significant increases detected in step-count for either group in the study. The week one step-count for the Goal group was 8,835 and was 9,014 after three weeks, which resulted in a non-significant increase of less than 200 steps. The No Goal group had a week one step-count of 9,023 steps and week three step-count of 9,486 resulting in a non-significant difference of over 450 steps. The authors cited a relatively short intervention period and the fact that the participants recorded their
steps on a weekly, rather than a daily basis, as contributing factors to the non-significant results (Zizzi et al., 2006).

It is worth noting some of the differences between Zizzi et al.'s (2006) study and H.Y.P.P.E. as potential explanations to account for the differences in obtained step-counts. First, the sample in Zizzi et al.'s study was drawn from four rural West Virginia high schools and had a participant age range from 14-17 years. The sample in the H.Y.P.P.E. study was drawn from one highly affluent suburban middle school in close proximity to Philadelphia, PA. According to the Centers for Disease Control and Prevention (2008), West Virginia ranks among the six highest states for adult obesity. Comparatively, Pennsylvania's rate of adult obesity is four percentage points lower than West Virginia. Further, Shore et al. (2008) reported a less than average rate of obesity for the school setting of H.Y.P.P.E. compared to national rates of adolescent obesity. It is reasonable to conclude that the geographic region of the participants and their age difference could have predisposed the samples to different responses to a similar intervention.

A second difference between the Zizzi et al. (2006) study and H.Y.P.P.E. was the degree to which the
intervention took place in school and was implemented by school staff. Beyond original recruitment, it did not appear that teachers in the Zizzi et al. study had daily contact with students as part of the intervention. Conversely, the students in both conditions in H.Y.P.P.E. received daily prompts from their computer education teachers to log their steps and reminders to wear their pedometers if they did not have them in class. Additionally, the experimental group received prompts to attain a daily 10,000 step-count and an increased PE class step-count goal twice every six days. This facet of H.Y.P.P.E. might have contributed to the unexpectedly high level of total combined compliance (three logs or more per week) for the study (77%). Even though the rate of pedometer attrition data in the Zizzi et al. study was 78% (derived from the inverse of a 22% rate of attrition for pedometer data), it can be concluded that the higher level of teacher implementation contributed to a significant step-count increase in H.Y.P.P.E.

Oliver et al. (2006) proposed that physical activity should be integrated into the school curriculum. In their study, a four-week, pedometer-based curriculum was integrated into thematic lessons in English, social studies, mathematics, and a virtual walk around New Zealand
with 5th and 6th grade students in New Zealand. Their intervention did not elicit significantly higher step-counts at post-test, but the baseline step-counts of their sample (18,055 steps per day for boys and 14,719 steps per day for girls) were exceptionally higher in this study than in any other available step-count data (Oliver et al.). The level of curriculum integration in H.Y.P.P.E. was not as extensive as suggested by Oliver et al., but is more pronounced than what existed in Zizzi et al.’s (2006) study. It is worth pointing out that the Log It Website that students used in H.Y.P.P.E. had a virtual walk feature. Students had full access to this feature, but it was not a requirement of H.Y.P.P.E. It is unknown by the author if, or how many, students used this feature.

One final distinction between the Zizzi et al. (2006) study and H.Y.P.P.E. is the frequency with which students recorded their step-counts. Students in the Zizzi et al. study recorded their step-counts only once per week. In comparison, the students in H.Y.P.P.E. were asked to record their steps every day. Zizzi et al. pointed out that the infrequency of step-count recording was a limitation of their study, but no explanation was given as to why weekly step-count recording was selected over daily recording.

Results of a multiple regression completed in the
current study provided evidence that the number of times students recorded their step-counts during baseline (Log) \( (p = .001) \) was 17 times greater than the unique contribution of Condition \( (p = .350) \) on baseline step-count. This finding supports a major tenet of Bandura’s (1991) Social Cognitive Theory of Self-Regulation. According to Bandura (1991), “Intermittent self-monitoring, because it is only partially informative, also produces less effective self-regulation than does regular attention to one’s own performance” (p. 251).

Lubans, Morgan, Callister et al. (2009) used pedometers as one of the interventions in their school-based study designed to increase physical activity, decrease sedentary behavior, and improve healthy eating behavior among 124 adolescent participants. The experimental group received the intervention for 10 weeks, which consisted of an enhanced school sport program that focused on lifestyle physical activity, interactive lectures on physical activity, pedometers for self-monitoring, physical activity and nutrition handbooks, and social support in the form of e-mails. Students’ pedometers were sealed at all times except once a day each morning when a research assistant would record their step-counts and reseal the pedometer. Students were told their
step-count, but were not able to keep track of their steps as they accumulated during the day. The control group received a 10-week school sport program (this was not clearly defined in the article) (Lubans, Morgan, Callister et al.).

Comparative analysis of baseline and six-month follow-up data revealed that girls significantly increased their steps (999) over the course of the study, while control girls significantly decreased their steps (2781). Likewise, boys significantly increased their steps (956) over the course of the study, while control boys significantly decreased their steps (2409). The baseline-to-follow up step-count change for the experimental group in H.Y.P.P.E. was close to 300 steps less than the step-count change from baseline-to-follow-up for the experimental group in the Lubans, Morgan, Callister et al. (2009) study. While the difference in step-count change between the studies is relatively small, it can be argued the Lubans, Morgan, Callister et al. study had a more impactful result than H.Y.P.P.E. because the follow up period was 3.5 months greater and it also produced significant changes in healthy eating behavior. Consequently, the Lubans, Morgan, Callister et al. study contains greater potential utility than H.Y.P.P.E. in
preventing weight-gain because it addressed both sides of the energy balance equation.

Other differences between the studies were that the Lubans, Morgan, Callister et al. (2009) sample was two years older, used sealed pedometers, and utilized parent involvement (parents received monthly newsletters) to a greater extent than in H.Y.P.P.E. The association between parental influence and adolescent physical activity was already noted above.

Schofield et al. (2005) tested the comparative efficacy of a time-based (TIME group) exercise prescription versus a step-count (PED group) based recommendation to increase physical activity of low-active adolescent (mean age 15.8 years) females. A control group (CON) was also included in the study and did not receive exercise suggestions. The PED and TIME group received 12-week log books and attended small group weekly meetings with the primary researcher or research assistant for six weeks. The purpose of the meetings was to provide guidance to students on how to reach the suggested amount of physical activity. The PED group was encouraged to increase their daily physical activity by an average of 1-2000 steps for each week until they reached 10,000.
Step counts were compared at six weeks (conclusion of the intervention) and 12 weeks. The PED group had significantly more physical activity than the TIME group at six weeks, but the significant difference disappeared at 12 weeks. It was concluded that pedometer step-count goals prompted superior physical activity compared to time-based goals in the short-term (Schofield et al., 2005). The PED group increased the average daily step-count in this 12 week study by 2747 steps per day (Schofield et al.). This step-count increase was considerably higher compared to the baseline-to-follow-up step-count change exhibited by experimental group in H.Y.P.P.E.

There are some plausible reasons to account for the higher change in step-count found in the Schofield et al. (2005) compared to H.Y.P.P.E. The population in Schofield et al. was selected because they were considered low-active and, therefore, could have responded to the intervention in a different way than the students in H.Y.P.P.E. Another factor that distinguished the two study populations was the fact that in Schofield et al. all three groups had a rate of overweight or obese of over 30%. There was no weight or BMI data collected in the H.Y.P.P.E., but Shore et al. (2008) found that the overall rate for overweight in the
school where H.Y.P.P.E. was conducted was considerably less.

Another relative strength of the Schofield et al. (2005) study was the meetings in which the educational component of the intervention was delivered. The meetings were conducted in small groups of six to eight girls and facilitated by the principal researcher or research assistant. In H.Y.P.P.E., the curriculum was delivered in larger PE classes of up to 28 students. It is believed that the combination of the small group meetings and effectiveness of the principal researcher to teach the goal setting techniques contributed to a favorable step-count increase.

In summary of the discussion for hypothesis 2, it was concluded that the significant main effect for TIME on Step Count was influenced by the H.Y.P.P.E. intervention after ruling out other possible explanations, as well as from a comparative analysis of H.Y.P.P.E. to other current pedometer-based studies that produced significant step-count increases.

Hypothesis 3. It was predicted that the control group would significantly increase their physical activity from baseline to the conclusion of the intervention. To test this hypothesis, two repeated-measures analyses of variance
(ANOVA) were completed on Step Count. One ANOVA was completed using data available for weeks 1-7 and 11. The second ANOVA was completed for weeks 1-7. The results of both ANOVAs yielded significant main effects for Time ($p = .000$) and provided partial support for hypothesis 3. The one-way repeated measures ANOVA ($p = .004$) provided more conclusive support for hypothesis 3. The control group increased their average daily step-count from baseline to week seven by 1,458 steps per day and more impressively, from baseline to week 11 by 2,231 steps per day.

The most probable explanation for this finding is that the feedback students received on a daily basis from wearing their pedometers and recording their step-count provided the necessary stimulus for behavior change. A critical first step for an individual is to receive some type of feedback about his or her behavior. Feedback can take many forms.

DiClemente, Marinilli, Singh, and Bellino (2001) characterized three types of feedback to include Generic, Targeted, and Personalized. Under their classification system, pedometer use and daily logging of step-counts constitutes personalized feedback, whereby individuals receive personal information provided by some assessment procedure. DiClemente et al. offered seven possible
mechanisms of feedback. It is conceivable that the control group in H.Y.P.P.E. experienced five of the seven mechanisms including: 1) information, 2) motivation, 3) changed beliefs (about their own physical activity), 4) comparison (assuming students were aware of their peer’s step-counts), and 5) increased engagement in the information (students became more interested about physical activity) (DiClemente et al.). Personalized feedback is efficacious in changing habitual behavior patterns involving alcohol, tobacco, and nutrition (DiClemente et al.).

The usefulness of feedback to promote physical activity has been also been tested. Marcus et al. (2007) tested the efficacy of print versus phone individualized feedback interventions to promote physical activity among healthy sedentary adults. It was concluded that both types of feedback enhanced physical activity among sedentary adults, but that print feedback was more successful at producing long-term physical activity maintenance (Marcus et al., 2007). In H.Y.P.P.E. students received daily visual feedback at least once a day when they logged their step-count and potentially dozens more times if they kept close tabs on their pedometer throughout the day.
Commercial industry has capitalized on the scholarly research on feedback. Nike recently released the Nike+, which showcases the power of the personal metric using a highly technical device. This device can be synced to the Nike+ Web site to get a graphic account of a run or walk, including distance and pace up and down hills. In addition, the device can be programmed to give voice prompts about a runner’s current speed. Cumulative runner data can also be stored and compiled on the web site. Over 1.2 million runners have used Nike+ to log 130 million miles and burn 13 billion calories (McClusky, 2009).

A more succinct comparison between H.Y.P.P.E. and other studies is possible for hypothesis 3 for two reasons. First, the discussion of hypothesis 2 already contained an extensive comparative review of H.Y.P.P.E. with other pedometer studies and their respective step-count data. Second, hypothesis 3 is primarily concerned with the control group’s step-count increase. The control group, as noted previously, did receive an intervention that consisted of using a pedometer and logging their steps each day. There are fewer components of the intervention to discuss for the control group. Therefore, the utility of a comparative discussion can be boiled down to a review of studies that used self-monitoring exclusively as specific
intervention as was the case for the H.Y.P.P.E. control group.

Zizzi et al. (2006) was thoroughly reviewed in the discussion of hypothesis 2 which indicated that the usefulness of a school-based pedometer program to increase physical activity was tested. The pedometer was the primary intervention for all participants. The only difference between the treatment conditions was that the experimental group was asked to set daily step-count goals and the control was not. The control group in this study was almost identical to the control group in H.Y.P.P.E. The control group in Zizzi et al. did not increase their step-counts, whereas the H.Y.P.P.E. control group did. It was already proposed in the discussion of hypothesis 2 that H.Y.P.P.E. contained some favorable elements of design that could have produced the significant step-count change. Daily versus weekly step-count recording and a greater level of teacher involvement in H.Y.P.P.E. were already proposed as relative strengths.

Rodearmel et al. (2007) conducted a study that was designed to measure changes in diet and physical activity as promoted by the America on the Move Initiative. The experimental group was asked to increase their average daily step-count by 2000 steps per day above their baseline
step-count and eliminate 100 kcal/day. Families in the control group were not asked to change their behavior, but were asked to use pedometers to monitor their physical activity, and therein lies the similarity to the H.Y.P.P.E. control group. There was no significant difference at baseline for the average steps per day between the experimental (9265 steps per day) and the control group (9906 steps per day). The children in the experimental group did not fully meet their step-count targets, but did report significantly more steps than the control group throughout the six month study.

Rodearmel et al. (2007) included a figure similar to Figure 3 of the current study. Average daily step-counts by week were included for all 24 weeks. Inspection of Rodearmel et al.’s Figure 3 revealed that at week 7 (the last week of the H.Y.P.P.E. intervention), the control group appears to have increased their step-count by about 300 steps relative to baseline. This increase was much less compared to the control group in H.Y.P.P.E., who increased their average daily step-count by over 1,400 steps by week seven. This comparison, while interesting, should be approached with caution for two reasons. First, it is believed that week 7 (the last week of the H.Y.P.P.E. intervention) does not precisely correlate to week seven in
Rodearmel et al. because there were three more months left in the study. It is hypothesized that the frame of mind and disposition of participants in the final week of a 7-week study is potentially different than that of participants in week 7 of a 6 month study. Another major distinction between the studies was that H.Y.P.P.E. only targeted children, whereas Rodearmel et al. attempted to change the behavior of a family unit.

It is concluded that the significant increase in Step Count for the control group in H.Y.P.P.E. can be attributed to the impact of self-monitoring. H.Y.P.P.E. possessed some advantages over other studies that used self-monitoring only as intervention, including the use of teacher involvement and daily (versus weekly) recording of step-counts. Lubans, Morgan, and Tudor-Locke (2009) conducted a systematic review of studies using pedometers to promote physical activity among youth. They concluded:

The basic premise underlying the use of pedometers to increase physical activity is that the immediate visual feedback of cumulative step-counts increases individuals’ awareness of how their personal behavioural choice affects their physical activity. Used as part of a guided and repetitive self-monitoring, feedback, and goal-setting process, the
pedometer is able to provide up-to-the-minute information which can be used to adjust these behavioural choices to achieve physical activity objectives (p. 309).

Hypothesis 4. It was predicted that the experimental group would attain higher indices of scholastic achievement including higher GPAs and fewer days absent and tardy compared to the control group. To test this hypothesis, a repeated-measures analysis of variance (ANOVA) was conducted on GPA and Attendance and an analysis of covariance (ANCOVA) was conducted on Tardiness. Additional analyses were conducted using a paired sample t-test, with alpha set to .05, comparing pre-test to intervention, intervention to post-test, and pre-to post-test for all scholastic variables. Results of the analyses yielded only one significant interaction, which was for Tardiness. This result supported hypothesis 2.

Previous studies have noted that higher BMI rates and higher weights among school-aged children are associated with more days absent from school (Geier et al., 2007; Shore et al., 2008), yet there is a void in the literature linking physical activity to school attendance or tardiness. A review of two notable school-based studies with physical activity promotion components rendered no
available data on scholastic variables in general, and more specifically no data collection on attendance and tardiness (Caballero et al., 2003; Gortmaker, Peterson et al., 1999).

A comprehensive literature review by Taras (2005) sought to identify studies that linked physical activity to academic outcomes. Taras identified 14 articles that were published since 1984 in peer reviewed journals, utilized school-aged children, and included at least one scholastic outcome. A closer inspection of Taras’ review of literature revealed that only five (Caterino & Polak, 1999; MacMahon & Gross, 1987; Raviv, 1990; Sallis et al., 1999; Shephard, 1996) of the articles described studies that used a controlled experimental design where some regimen of physical activity was implemented and an academic outcome was measured in the control and experimental group.

Subsequent to the Taras article, Coe, Pivaknik, Womak, Reeves, and Malina (2006) published a study with an experimental design and measured academic outcomes. None of the previously cited six studies above measured attendance or tardiness as an academic outcome. Therefore, possible explanations of the significant interaction for Tardiness in the current study are both relatively novel and speculative.
A closer inspection of the interaction for Tardiness suggests that there was some unique contribution of the experimental intervention that caused the number of days to significantly decrease over the time of the study. Conversely, something about the absence of the intervention caused the days tardy to trend upwards for the control group. One possible explanation to account for the significant interaction for Tardiness is that the goal setting and prompts to attain 10,000 steps used with the experimental group caused them to feel more accountable to be in school during the intervention. This accountability could have “transferred” to after the intervention and explain the maintenance of the improved rate of tardiness at post-test. Students in the experimental group could have experienced a sense of accountability to be in school to log their steps, whereas the control group did not.

A second plausible explanation for this particular interaction could be that some of the topics taught in PE to the experimental group were internalized and applied to finding solutions to be on time for school. For example, the concepts of problem solving and overcoming barriers to be physically active theoretically could be applied by students in the experimental group to finding solutions to be on time to school. Perhaps a student learned that she
needed to manage her time more effectively to have time each day to exercise or participate in a team sport. Her "learned" time management skills potentially could have also been applied to managing her morning routine and she was able to arrive at school on time.

It is plausible that the significant main effect for Time on GPA and Attendance can be attributed to increased physical activity detected for both groups. Taras (2005) maintained that there is evidence of a significant, but weak association between better academic performance and activity level. One theory to account for increased academic performance as a function of increased physical activity is that physical activity improves concentration on academic tasks (Caterino & Polak, 1999).

Despite the significant, but weak association, there needs to be some caution applied to generalizing the results of these studies to the current study. None of the studies reviewed in Taras’ (2005) paper, nor the Coe et al. (2006) study used pedometers to measure physical activity that was subsequently associated with better academic outcomes.

In studies that found some evidence of an association between physical activity and academic measures, other means beside a pedometer were used to measure physical
activity. Caterino and Polak (1999) used the presence of physical activity (stretching and aerobic walking) immediately prior to administering the Woodcock-Johnson Test of Concentration. Fourth graders in this study demonstrated significantly better concentration when they had physical activity immediately prior to taking the test of concentration (Caterino & Polak). Dexter (1999) found some positive, but weak correlations between sport performance and academic ability. Sport performance was defined as teacher’s judgment of the execution of sport-specific skills and academic ability was defined as grade attained on the General Certificate of Secondary Education (GCSE), an examination taken by students in England, Wales, and Northern Ireland at 16 years of age (Dexter). Clearly, Dexter measured a factor related to physical activity, but not one that specifically measured it, nor was an experimental design utilized.

Field, Diego, and Sanders (2001) also purported to have found evidence that supports that relationship between physical activity and grades. They measured physical activity and grades using a self-reported Likert-type questionnaire. Students in the high-exercise group had significantly higher GPAs relative to their less active peers (Field et al.). The results of their study are
difficult generalize to the current study because different operational definitions were used. Furthermore, the study appears to contain several methodological weaknesses, including relying on a self-report measure to assess GPA, and using a highly simplistic tool to measure physical activity that was not validated.

Since there was no significant main effect for Group or significant interaction for GPA or Attendance, it is not possible to speculate which condition had a greater impact on GPA or Attendance. Further, it is possible that the improved GPA and Attendance are attributable to other factors not exclusive to the study, such as acclimation to the school environment or the application of study skills taught to all students in sixth grade. Without a comparison group composed of students who did not participate in the study, and the fact that both conditions significantly improved their physical activity over time, it remains too difficult to confidently conclude that the improvements were caused by the intervention or a by-product of increased physical activity.

It should also be specified that both the attendance and tardiness rates for both groups started out at baseline at considerably low rates. At baseline, the control and the experimental groups averaged 1.57 days and 1.72 days
absent from school respectively. At baseline, the experimental and control groups averaged .43 days and .90 days tardy to school respectively. While statistically significant, the decline in Tardiness for the experimental group from pre- to post-test of about .5 day, needs to be further evaluated for educational and practical relevance. Likewise, the statistically significant increase in Tardiness for the control group from pre-test to intervention also needs to be further commented on.

Based on the author’s professional experience, the two aforementioned changes in Tardiness are of almost imperceptible educational and practical relevance in this particular public school setting. The questions raised in the upcoming paragraphs about the educational importance of the significant findings should be applied to all of between marking period significant changes as well.

There are two main reasons why the author maintained a tepid view of the significant findings for scholastic variables. First, as mentioned above, all of the baseline measures for all the scholastic variables for both groups portray profiles of scholastic success. A ceiling effect on the academic measures was a factor in the nonsignificant changes in academic measures. For example, taking the worse of the two baseline scores for Attendance (1.72
days), it is clear that less than two days absent for a marking period leaves little, if any, room for improvement. Extending this estimate out to the course of the entire year would yield less than eight days absent. The generally accepted marker for or "red flag" for problematic school attendance is an absentee rate of 10% or greater. For attendance to be considered a concern for a particular child extended over the course of the school year, she would need to be absent approximately 16 days from school or four per marking period.

The fact that students in the experimental group significantly decreased their tardiness by almost .5 day per marking period is not necessarily impressive for this particular school. The corresponding percent changed for this trend was 53% (.90 days to .48 days) and is of particular interest. If the percent change for days tardy can be replicated by using a physical activity intervention, that intervention would increase its utility of producing an educationally meaningful result. As suggested by Dexter (1999), in order for the efficacy of a physical activity intervention like H.Y.P.P.E. to produce academic improvements, a school population with less than average academic performance should be selected.
Hypothesis 5. It was predicted that the experimental group would significantly improve on measures of physical fitness relative to the control group. Changes in physical fitness were assessed using The Presidential Physical Fitness Tests. To test this hypothesis, a repeated-measures analysis of variance (ANOVA) was completed for all physical fitness tests. There were no significant differences between the groups at pre-test on any physical fitness test and, thus, an ANOVA was an acceptable form of analysis. The main point of interest in conducting this analysis was to determine the presence of significant interactions. The secondary point of interest was to detect significant main effects for Time and Group. Results of the ANOVAs revealed a significant main effect for Group only for Sit and Reach. A significant main effect for Time was detected on Pull Up and Shuttle Run. There were no significant interactions for any of the Physical Fitness Tests. To further test the hypothesis, paired sample t-tests were completed comparing the pre- to post-test for national percentile scores for both groups.

Most importantly, the non-significant interactions on all of the physical fitness tests do not support hypothesis 5. There was a significant main effect for Time for Pull Up, but a review of Table 24 showed that despite an
increased percentile score, the t-test did not detect a significant improvement (higher percentile score) for the experimental group. Further, the significant improvement in percentile score for the control group on Pull Up is contrary to hypothesis 5.

Another main effect for Time was detected for Shuttle Run. A closer examination of Table 24 revealed that the results of the t-test indicated significantly worsened performance on Shuttle Run, thus not providing any support for hypothesis 5.

The main effect for Group on Sit and Reach provided inconclusive support for the hypothesis. Had a significant interaction been found, more conclusive support for the hypothesis could have been obtained. The results of the t-test noted a significant improvement for the experimental group on Sit and Reach and no change at all for the control group.

It was suggested that the significant main effect for Time on Step Count was attributable to the intervention. The directional changes between pre- and post-test for the experimental group on the fitness tests that had significant main effects for Time were not the same, meaning some fitness scores improved and other declined. Performance on Shuttle Run significantly declined and the
performance on Pull Up improved, but not significantly. Therefore, the intervention cannot be cited as a possible cause of the main effects found for the physical fitness tests.

Any explanation of inconclusive evidence for the support of hypothesis 5 should be considered only after noting that baseline scores for all of the fitness tests for both groups were already above the national average. In some cases, at baseline the scores were considerably higher than the national average. For example, the percentile score for the control group at baseline for Sit and Reach was at nearly the 76th percentile. Six other baseline scores were at or above the 60th percentile. Similar to GPA, the scores for fitness were already quite good. Therefore, a ceiling effect limited the potential for improvement of fitness scores for this particular study population. It is asserted for an already highly fit study population to improve their fitness, the intervention would have to be exceptionally strong.

As was the case for other dependent measures in this study, it is proposed that the intervention was not long enough, nor strong enough to produce significant changes in physical fitness. This point is supported by the fact that, to the author’s knowledge, there are no known short-
term studies that found improved fitness to be mediated by increased physical activity. More specifically, the studies cited in Luban, Morgan, & Tudor-Locke’s (2009) review of studies using pedometers to promote physical activity did not even measure changes in fitness. Thus, it is asserted that while physical activity can be increased in the short-term, changes in physical fitness are harder to produce, or more difficult to detect, in populations with high physical fitness at the onset of an intervention.

Hypothesis 6. The author predicted that the experimental group would significantly improve their measures of self-efficacy to be physically active relative to the control group. Changes in self-efficacy were assessed using an eight-item questionnaire developed and originally tested by Motl et al. (2000). This hypothesis was tested by completing a repeated-measures analysis of variance (ANOVA). Results of the ANOVA indicated that there were no significant main effects or interaction effect for Efficacy.

The instrument used to measure changes in self-efficacy effectively measures this particular construct (Dishman et al., 2002). It was subsequently used by Dishman et al. (2004) in the Lifestyle Education for Activity Program (LEAP) Study to measure the impact that
self-efficacy had on physical activity. Dishman et al. (2004) concluded that self-efficacy partially mediated increased physical activity in over 2,000 black and white adolescent girls.

Dishman et al. (2004) proposed that their work was the first study to their knowledge that suggested that increased physical activity was partially caused by increased self-efficacy. This is an important finding, but it is difficult to compare their findings to H.Y.P.P.E. because there are no normative data or mean scores cited in Dishman et al.’s (2004) study. Further, LEAP differed from H.Y.P.P.E. in that it was a two year study designed to change instruction and the school environment. The intervention included changes to physical education, school environment, health education, school health services, faculty or staff health promotion, and parent and community involvement.

Interestingly, Zizzi et al. (2006) used the self-efficacy scale at pre- and post-test developed by Marcus, Selby, Niaura, and Rossi (1992). There were no significant differences noted in self-efficacy in the study. In fact, self-efficacy scores declined slightly, reiterating the difficulty in changing self-efficacy in the short-term.
The author concludes that the H.Y.P.P.E. intervention did not produce any significant changes in self-efficacy between the treatment conditions because the intervention was relatively short and the curriculum used in PE with the experimental group was not strong enough to change students' beliefs that they had the ability to be physically active or not. It would have been preferable for the data to support hypothesis 6, but it is interesting that it did not because it demonstrated that short-term changes in physical activity can be produced independent of measureable changes in self-efficacy.

One last point worth noting is that not only was there no significant difference between the experimental and control conditions for self-efficacy, there was no statistical difference in scores at pre- and post-test for either group. In addition, because there are no normative data available for this instrument, it is not known whether the baseline efficacy of either group was relatively high or low compared to children of a similar demographic.

Hypothesis 7. The author predicted that the experimental group would significantly improve their attitude toward physical activity relative to the control group. The change in attitude was measured using an instrument that was believed to measure changes in this
construct (Dishman et al., 2002). To test this hypothesis, a repeated-measures analysis of variance (ANOVA) was computed for Attitude. Results of the ANOVA revealed no significant main effects or interaction. In addition, there was no significant change in pre- to post-test in Attitude for either group.

As speculated in the discussion of hypothesis 6, the intervention used in the current study was not long enough or strong enough to produce changes in attitude. Saunders, Motl, Dowda, Dishman, and Pate (2004) used a variation of the instrument tested in Dishman et al. (2002). A copy of the instrument was requested from the author of the instrument (R. K. Dishman, personal communication, April 14, 2008). The version received via personal communication appears somewhat different from the version reported in the Saunders et al. study. The stem used in both versions was the same. The stem on both items was "If I were to be physically active on my free time on most days it would help me..." An example of how the versions varied is that in H.Y.P.P.E., the stem was followed by "it would help me make new friends" compared to the Saunders et al. version of the stem plus "it would help me spend more time with my friends."
It is unknown by the author whether there is consistency between the two versions. Therefore, comparing the total mean scores should be done with some reservation. The total mean score on the Attitude measure reported by Saunders et al. (2004) was 17.9 compared at baseline to 32.1 for the control group and 30.9 for the experimental group. The notably higher scores on the Attitude measure in H.Y.P.P.E. is another feasible explanation of why there were no significant changes at all for this dependent measure. If the Attitude scores were already exceptionally high for this population, it is reasonable to conclude there would be little improvement in attitude even if the intervention was longer or more efficacious.

General Discussion

The main purpose of this study was to determine the effectiveness of a school-based intervention to increase physical activity. It was also an aim of the study to determine the relative effectiveness of the experimental intervention to increase physical activity compared to the control group. The experimental intervention consisted of sixth grade students using a pedometer, recording their daily steps using a website, prompts to attain 10,000 steps per day, prompts to attain 3200 steps during PE class, and an enhanced PE curriculum including topics like overcoming
barriers to being physically active and using self-talk. The control group only used pedometers and recorded their steps each day.

The data analysis revealed that both groups significantly improved their step-counts during the course of the study, but there was essentially no real difference in the effectiveness of either intervention. The experimental group outperformed the control group by week seven, which was the last week of the intervention, but by week 11, which was the four-week follow-up period, the control group had surpassed the experimental group in terms of physical activity. Although there was not a significant difference in step-counts at week seven or 11, an important conclusion from the study can be made. The use of the experimental intervention proved more effective at producing higher step-counts than self-monitoring alone in the short-term, but this difference disappeared later at follow-up.

It was not originally planned or predicted that the control group would outperform the experimental group by week 11. This finding is important because it fills a void in the literature about the responsiveness of youth to pedometer use (Lubans, Morgan, & Tudor-Locke, 2009). The fact that the control group increased their step-count by
2,231 steps per day at week 11 is highly encouraging. It was disappointing that the experimental group did not maintain their step-count gains from week seven to week 11, but the fact that they increased their step-counts by 2,161 steps per day at week seven also shows some merit in the ability of the experimental intervention to increase physical activity.

Self-monitoring was considered to be the primary factor that produced significant gains in physical activity. Both groups benefited from two forms of self-monitoring, which were pedometer use and logging of step-counts. The significant step-count increases were consistent with the studies presented in the Review of Literature in the section on Pedometers and Self-Monitoring. The study design of H.Y.P.P.E. did not allow for a comparative analysis to determine the relative impact of each form of self-monitoring. It is speculated that students benefited from both forms of self-monitoring. It would have been preferable for the study design to have controlled for these confounding variables.

Another unexpected, but highly encouraging finding of this study were the compliance and attrition data. Only three students dropped out of the study. The total compliance rate for the study was 77.3%. These findings
are particularly important because, to the author’s knowledge, the H.Y.P.P.E. study is the only school-based pedometer study conducted with middle school students (not designated low active or overweight) in which pedometers were used for an extended time frame. Eight weeks is a relatively short time in terms of demonstrating long-term efficacy of an intervention, but it is a considerably long time for students to use pedometers for the duration of the study compared to other studies.

It was demonstrated that high school students had a low attrition rate for using pedometers for three weeks (Zizzi et al., 2006). Other studies with school-aged children had interventions to increase physical activity as long or longer than H.Y.P.P.E., but they employed sealed pedometers to measure physical activity for considerably fewer weeks, and used either low-active or overweight participants (Goldfield et al., 2006; Rodearmel et al., 2007; Schofield et al., 2005; Tsiros et al., 2008). Other studies did not employ low-active or overweight participants, but the number of time sealed pedometers were used was considerably less than in H.Y.P.P.E. (Butcher et al., 2007; Oliver et al., 2006; Southard & Southard, 2006).

Favorable participant feedback about H.Y.P.P.E. provided further evidence for the utility of using a
similar program in other middle schools. Students enjoyed using pedometers and receiving a t-shirt for their participation. More than 75% of the total sample believed that H.Y.P.P.E made them more aware of how much physical activity they got during the intervention and 60% of the sample believed H.Y.P.P.E. helped them increase their physical activity during the intervention. Sixty-eight percent of the participants either agreed or strongly agreed that they enjoyed participating in H.Y.P.P.E. Only 6% of the control group and 24% of the experimental group either disagreed or strongly disagreed that they enjoyed wearing their pedometer. A potential self-selection bias could have contributed to the favorable participant feedback. Nonetheless, the feedback was encouraging, especially for a highly savvy, enlightened, and stimulated middle school population.

A secondary aim of the study was to determine whether the other dependent measures, including grades, physical fitness, self-efficacy, and attitude about physical activity, significantly increased relative to the control group. With the exception of Tardiness, there were little statistical data to support a significant interaction of the experimental condition and time in this study. Further, there was little evidence to lead the author to
believe the experimental intervention improved performance on any of the dependent measures.

It was hoped that there would have been some significant changes noted in the dependent measures in addition to step-count. It was anticipated that changes in attitude and self-efficacy would be the easiest to produce. Changes in any of the dependent measures could have potentially pulled in a wider array of stakeholders to support physical activity promotion in middle schools. The interest of parents and school officials would have been peaked considerably about H.Y.P.P.E. if grades or physical fitness tests were conclusively improved by H.Y.P.P.E. Clearly, changing grades, fitness levels, and attitudes is a challenging task through a physical activity intervention.

There is an additional point worth noting regarding not finding significant changes in attitude or self-efficacy. While this would have been preferred, the non-significant result points to the strength of self-monitoring as a stand-alone tool for increasing physical activity. Perhaps this finding enables us to simplify our attempts to change health-related behavior. We might be able to discredit the notion that we need to change
attitudes and beliefs in order to change behavior at least in the short-term.

The last aim of the study was to determine whether there were any associations between students who increased their physical activity with changes in other dependent measures. In essence, the second aim of the study was to try to show causality between the increased physical activity and increased performance on the dependent measures. The third aim attempted to establish associations between the dependent measures. Table 31 appears in Appendix N and suggests that there were some weak associations between increased physical activity and other dependent measures. Pre-test GPA was the only academic measure that showed a weak significant correlation with increased physical activity. Three out of the five fitness tests at pre-test were associated with increased physical activity. Weak significant correlations between pre-test Curl Up, pre-test Shuttle Run, and pre-test Mile and increased physical activity were noted.

Implications for Researchers

This study was the first of its kind to achieve significant step-count increases with a general middle school population during a relatively long period of self-monitoring through pedometer use. Impressive step-count
gains, a low attrition rate, and high compliance rate were notable, but it is unknown whether similar findings could be achieved over a longer time period. It is suggested that future research answer this question. Similar findings would be highly meaningful if they could be repeated for two marking periods or an entire school year.

The setting of a similar study should be carefully considered and selected if the findings are to have greater generalizability to mainstream American schools. The school in which H.Y.P.P.E. was implemented was in a very unique school district. The school district has several blue ribbon schools including the particular setting for H.Y.P.P.E., has less than 5% of its students enrolled in the federal free and reduced lunch program, and consistently ranks among the highest of all the school districts in PA for SAT and other standardized test scores. It is suggested that this study be replicated to some degree in a less affluent school with students that have less access to healthy nutritional choices, higher rates of overweight, and less school achievement. Typically, these school environments enroll students that get considerably less physical activity than students enrolled in elite public schools.
One component of H.Y.P.P.E. that was not successful was the optional use of a local fitness facility by participants. This was offered as an incentive to increase participation in the study. It is believed students did not use this option because 62% of the participants reported that they were doing something else when the classes were offered. It would be interesting to see if students in a school where there was less opportunity in general for extra-curricular activities would take more advantage of free group fitness classes. It is reasonable to conclude they would do so given that 66% of the control group and 56% of the experimental group agreed or strongly agreed that they enjoyed the fitness field day which included several group fitness classes offered by instructors from the local fitness club. Another suggestion would be to offer the group fitness classes after school on school property, or within walking distance if replicated in a more urban school setting.

H.Y.P.P.E. was not shown to increase grades. However, the author still believes research needs to be conducted that shows the academic benefit of increasing physical activity among adolescents. This could be achieved potentially in two ways. First, as experience leads the author to believe, improving grades even with a more direct
intervention is difficult. Grades are the product of students’ long-standing behavioral choices and patterns. Changes in physical activity might not produce changes easily detected from marking period to marking period. However, collecting longitudinal data on changes in physical activity patterns may yield detectable changes in grades.

Another suggestion to show the impact of increased physical activity on academic performance would be to collect data on test scores, class assignments, or some other measure preceding a rigorous PE class and compare to the same measure several hours later. This study design was already completed with primary aged students. Fourth graders did significantly better on a measure of concentration if they participated in physical activity immediately before the test of concentration (Caterino & Polak, 1999).

Implications for Practitioners

The pedometer use in both conditions shows promise for increasing physical activity using relatively easily reproducible procedures for other middle schools. The Log It website can be used in and out of school at no cost to students or schools. It provides a user-friendly website oriented to older primary school children or younger
adolescents to log their daily step-counts. Data on this website can be easily accessed and tabulated by PE teachers or other school staff. In fact, student data can be exported in a data file for easy analysis.

The cost of the pedometers can be somewhat prohibitive to using them with all students. Depending on how many students attend a particular school or district, pedometers could be shared for several weeks. The author was very fortunate to have the school district completely fund the pedometers for this study. Given the difficult budgetary constraints on most school districts, practitioners are encouraged to apply for grants to fund the purchase of pedometers. Additionally, schools might want to consider having students pay for lost or damaged pedometers in the same way they do for lost or damaged text books. This was not considered appropriate in the current study because participants cannot be charged to participate in research.

It is suggested that practitioners consider using some of the curricular components in H.Y.P.P.E. especially if they work in schools where health is not taught. Oddly, students in sixth grade in the H.Y.P.P.E. school do not have any health curriculum at all. Even though the PE curriculum did not produce any significant step-count increases relative to the control group, the concepts of
goal-setting, overcoming barriers, and using self-talk are important skills for adolescents to learn. It is important for practitioners using such a curriculum to have a high degree of buy-in from those implementing it in a school or other setting.
CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS FOR FUTURE RESEARCH

Summary

The main purpose of this study was to determine the effectiveness of a school-based program to increase the physical activity of 6th grade students. A secondary aim of the study was to determine whether there were significant increases in other dependent measures as a result of the H.Y.P.P.E. intervention. The other dependent measures included grades, attendance, tardiness, physical fitness scores, and self efficacy and attitude toward physical activity. Another secondary aim of the study was to determine whether there was an association between changes in the dependent measures and students who did or did not increase their physical activity.

A total of 113 students in a large suburban public middle school participated in the 11 week study. A quasi-experimental design was used. Physical education classes served as the unit of randomization. There were six physical education classes assigned to the control condition and six physical education classes assigned to
the experimental condition. Students in the control group were asked to wear unsealed pedometers throughout the day in school and at home for the duration of the study and to record their daily step-counts in school on a web site. Students in the experimental group also wore unsealed pedometers throughout the day for the duration of the study and logged their daily step-counts in school, but additionally received a 10,000 step per day goal, were asked to attain a 3200 step-count goal during PE class, and an enhanced PE curriculum that included curricular topics designed to promote physical activity and pedometer-based activities.

The curricular topics were adapted from a manual that was used in an intervention that significantly increased physical activity (Dishman et al., 2004). A summary of the lesson topics used with the experimental group is presented in chapter three on pages 84 and 85. A brief sample of the topics designed to increase physical activity included goal-setting strategies, replacing sedentary behavior, and using self-talk. The control group received the standard PE curriculum which did not include the curricular topics, or enhanced pedometer-based activities. The specific lesson plans for both groups are presented in Appendix L and Appendix M.
Pre- and post-test data were gathered for all dependent measures including average daily step-counts by week, GPA, attendance, tardiness, attitude and self-efficacy about physical activity, and Presidential Physical Fitness Tests. The data analysis was completed using analyses of variance (ANOVAs), analysis of covariance (ANCOVA), paired sample t-tests, and independent sample t-tests. Results revealed significant gains in physical activity for both treatment conditions. The intervention did not produce significant changes in attitude or self-efficacy. There were some significant improvements in physical fitness and the scholastic measures, but these changes were not attributed to the intervention.

This study made several valuable contributions to the existing literature on physical activity promotion in schools. Most notably, a step-count increase of over 2000 steps for the experimental group was achieved by the conclusion of the seven week intervention and for the control group by week 11. These step-count gains are favorable to some other pedometer-based school interventions.

A unique component of this study was that middle school students demonstrated they were able to responsibly use pedometers for a full academic marking period. This
point was reiterated by the low attrition rate, high compliance rate, and favorable student self-reported satisfaction with the program. It was a relative strength of this study that there were no external rewards or reinforcement used to attain the high degree of compliance and low attrition rate. Incentives were offered to participate in the study, but not for compliance or step-count increases. The incentives were a H.Y.P.P.E. t-shirt and free access to a local fitness facility. It is believed that the feedback that resulted from daily self-monitoring was the motivation to keep students engaged in the study, not the nominal incentive of the t-shirt, and clearly not the free access to the local health club.

It is also believed that the data presented in Table 30 are unique to the field of pedometry. The data illustrated that after several weeks of pedometer use, students accurately self-recalled their step-counts from several weeks prior. To the author’s knowledge, this was the first attempt to have students self-recall their step-counts in a pedometer-based study. The data presented in Table 30 are meaningful because they reiterate the effectiveness of self-monitoring to moderate increased physical activity. As previously asserted, it is not believed that students can increase physical activity
without first gaining an accurate assessment of their physical activity. It is not likely that students that did not participate in this study would have been able recall their step-counts as accurately as did the students who did participate in H.Y.P.P.E. It was impressive for students to accurately recall their physical activity after several weeks of not using a pedometer. It can be concluded that the negligible difference between recalled and recorded step-counts illustrated the meaningful impact of the study on students' ability to accurately assess and monitor their own physical activity.

A final point is worth noting regarding the value of this study. It was shown that with the exception of the moderately prohibitive cost of the pedometers, this intervention can be easily replicated in other middle schools. This study did not utilize additional staff nor require a large amount of human or monetary resources to produce similar step-count increases as other notable projects with extensive funding. The principal researcher in this study was employed in the middle school as a school counselor. The administration of this project could easily be absorbed by the collective efforts of a PE or health staff. A classroom teacher that can grant students everyday computer access to the free web site for literally
1-2 minutes each day is all that would be required to replicate this program.

Overall, this study revealed that, in the short-term, the intervention used with the experimental group was more effective at producing meaningful, but not statistically different step-count increases than pedometer use and self-monitoring alone. However, at four-week follow-up the step-count advantage for the experimental group relative to the control group disappeared. It is believed that daily self-monitoring used with both groups was the key factor that contributed to notable gains in physical activity. It can be concluded that it is possible to significantly improve physical activity in the short-term without changing an adolescent’s self-efficacy or attitude by using pedometers and self-monitoring in a middle school setting.

Conclusions

The following conclusions were made according to the findings of the current study. Each conclusion was drawn from the respective hypotheses.

1. The combination of daily pedometer use, self-monitoring, a 10,000 step-count goal, a 3200 step-count goal during PE class, and an enhanced PE curriculum produced a higher, but not a statistically significantly higher step-count in the short-term (seven weeks) than
pedometer use and self-monitoring alone. For an extended
time period (11 weeks), pedometer use and self-monitoring
proved to be more efficacious, but not statistically so
than the multi-faceted experimental intervention.

2. The experimental intervention that consisted of
daily pedometer use, self-monitoring, a 10,000 step-count
goal, a 3200 step-count goal during PE class, and an
enhanced PE curriculum produced a significantly higher
step-count from baseline to the conclusion of the study.

3. The control group’s intervention, which consisted
of daily pedometer use and self-monitoring, produced
significant step-count gains from baseline to the
conclusion of the study.

4. There were some significant improvements on GPA,
Attendance, and Tardiness. Additionally, there were
significant improvements in physical activity in both
groups. Therefore, it could not be safely concluded that
the improvements in the scholastic dependent measures were
a result of increased physical activity.

5. There were both significant increased and
significant worsened performance detected on the physical
fitness tests. These findings, again coupled with the fact
that both groups significantly increased their physical
activity, caused the author to not conclude that the
increased physical activity caused any of the improvements on the fitness test measures.

6. There were no significant findings whatsoever for Self-efficacy. There were no pre- to post-test changes for this measure, nor any between group differences detected. It was concluded that physical activity can be significantly improved without also changing self-efficacy about being physically active in the short-term.

7. There were no significant findings whatsoever for Attitude. There were no pre- to post-test changes for this measure, nor any between group differences detected. It was concluded that physical activity can be significantly improved without also changing attitudes about physical activity in the short-term.

Recommendations for Future Research

The following recommendations for future research are suggested by the limitations, results, and conclusions from the current study:

1. It would be helpful to replicate these findings with a more ethnically and socio-economically diverse sample population. If similar findings were attained with a more diverse study sample, the findings would possess wider applicability.
2. The notion of competition has yet to be explored as an intervention component in a pedometer-based study with adolescents. Academic teams or schools could be matched against each other in competition for attaining the highest step-counts or step-count increase. Diligence would be needed to ensure accurate step-count recording in this type of study. Nonetheless, the notion of using competition to increase physical activity presents several interesting avenues for exploration.

3. There is significant, but weak evidence regarding the connection between increased physical activity and gains on scholastic measures (Taras, 2005). Stronger evidence showing the cause and effect of physical activity on scholastic measures is critical to assert the importance of physical activity programming in schools. It is suggested that long-term data on physical activity rates and attendance or grades be collected. Perhaps, changes in scholastic measures would be easier to detect over longer time periods.

4. It is also suggested that the benefits of physical activity on immediate learning tasks be completed with adolescents. It has already been shown that 4th graders had better performance on a test of concentration immediately after a physical activity period (Caterino &
Polak, 1999). A similar study should be replicated with older students.

5. Another suggestion to establish the direct benefit of physical activity on scholastic measures would be to conduct a secondary analysis of curriculum-based assessments or standardized test scores. Results of the academic assessment could be compared based on when the students had physical education during the school day in relation to when they were administered the academic assessment.

6. Students in H.Y.P.P.E. did not regularly access the local fitness facility that was offered to them with participation in the study. It is suggested this type of community partnership be explored in a community with less access to opportunities for physical activity. It would be interesting to determine if physical activity increased for students that took advantage of such a resource.

7. It was not expected that the control group in H.Y.P.P.E. would increase their step-counts as significantly as did the experimental group. This made conclusions about gains on other scholastic measures difficult to make because both groups showed significant improvements in physical activity. It is recommended that a third group be added and not use pedometers. They would
provide a comparison group for the other dependent measures with the exception of step-count.

8. It is believed that an additional analysis of the current step-count pedometer data to determine the intraclass correlations (ICC) would be highly valuable. The ICC is a measurement that accounts for the day-to-day fluctuation of physical activity that ultimately results in variable pedometer data for a given participant over the course of a study. Tudor-Locke et al. (2009) published a recent paper that included a review of studies that reported ICC data from collection periods ranging from two to eight days. The range of ICCs was found to be .59 (2 days) to .87 (eight days) (Tudor-Locke et al., 2009). The ICC data from H.Y.P.P.E. would significantly add to the existing body of literature because there is step-count data available for up to eight weeks. To the author’s knowledge, if this data analysis was completed, it would provide the greatest data collection period of ICC data to date.

9. Some pedometers allow step-count data to be recorded remotely without the need for students to log their own steps. Using this technology would provide a solution for the confounding variables of pedometer use and logging of step-counts that occurred in H.Y.P.P.E.
References


Pennsylvania Code 4.22. Middle level education.


APPENDIX A
Attitude Questionnaire (Motl et al., 2000)

Attitude Questionnaire

If I were to be physically active during my free time on most days...

1. It would help me cope with stress.
2. It would be fun.
3. It would help me make new friends.
4. It would get or keep me in shape.
5. It would make me more attractive.
6. It would give me more energy.
7. It would make me hot and sweaty.
8. It would make me better in sports, dance, or other activities.
Appendix B
Self-Efficacy Questionnaire (Motl et al., 2000)

Self-Efficacy Questionnaire

1. I can be physically active during my free time on most days.

2. I can ask my parent or other adult to do physically active things with me.

3. I can be physically active during my free time on most days even if I could watch TV or play video games instead.

4. I can be physically active during my free time on most days even if it is very hot or cold outside.

5. I can ask my best friend to be physically active with me during my free time on most days.

6. I can be physically active during my free time on most days even if I have to stay home.

7. I have the coordination I need to be physically active during my free time on most days.

8. I can be physically active during my free time on most days no matter how busy my day is.
APPENDIX C
Log It web site

View my chart for the:
- Last 7 days
- Last 30 days
- *Last 12 months
- View All Days

*Note: Will display the average steps per month

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<td>8000</td>
</tr>
<tr>
<td>Mon 5/26/2008</td>
<td>6000</td>
</tr>
<tr>
<td>Sat 5/24/2008</td>
<td>3509</td>
</tr>
</tbody>
</table>

Show my chart in:  
- Steps
- Miles
- Kilometers
APPENDIX D
Specifications for New Lifestyle’s SW-401

The SW-401 pedometer — a NEW-LIFESTYLES exclusive — tracks steps and multiplies them by your stride length to calculate the number of miles you traveled. With the touch of one button, you can alternate between totals for steps and miles. This model accepts stride lengths in increments of .25 feet. It’s about 2” x 1 1/2” x 3/4” and weighs less than 3/4 ounce. The SW-401 Pedometer is available in Black or Yellow.

Its internal sensor mechanism uses a coiled spring-suspended lever arm, and therefore it counts best on those who are not overweight or obese and at speeds greater than 2.5 mph. If you are overweight or if you walk at speeds slower than 2.5 mph, then opt for one of the NL-series piezoelectric pedometers (also known as accelerometers).
APPENDIX E
Certificate of Participation
# APPENDIX F
Student Feedback Questionnaire

## 1. H.Y.P.P.E. Student Survey

Please answer all of these questions honestly. Your name will not appear anywhere on your survey, so all of your answers will be anonymous.

**1. Please select your gender.**

- [ ] Female
- [ ] Male

**2. My computer teacher is:**

- [ ] Ms. Aitken
- [ ] Mrs. Makin
- [ ] Mr. Iron

**3. My Physical Education Teacher is:**

- [ ] Mrs. Burke
- [ ] Mrs. Denko
- [ ] Ms. O’Brien
- [ ] Mr. Stinson

**4. Participating in H.Y.P.P.E. made me more aware of how much physical activity I was getting.**

<table>
<thead>
<tr>
<th>During the initiative</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFTER the initiative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**5. Participating in H.Y.P.P.E. increased my physical activity.**

<table>
<thead>
<tr>
<th>During the initiative</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFTER the initiative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**6. The following thing(s) made me more aware of how much physical activity I was getting. (Select all that apply)**

- [ ] Wearing a pedometer
- [ ] Using the Log It website to record my progress
- [ ] Information I learned in Physical education class
- [ ] I was not more aware of how much physical activity I was getting

**During the initiative**

| | Wearing a pedometer | Using the Log It website to record my progress | Information I learned in Physical education class | I was not more aware of how much physical activity I was getting |
|-----------------------|---------------------|-----------------------------------------------|--------------------------------------------------|
| |                     |                    |                                                |                                                  |

**After the Initiative**

| | Wearing a pedometer | Using the Log It website to record my progress | Information I learned in Physical education class | I was not more aware of how much physical activity I was getting |
|-----------------------|---------------------|-----------------------------------------------|--------------------------------------------------|
| |                     |                    |                                                |                                                  |

**Other (please specify)**
7. During H.Y.P.P.E. I got approximately
   ( ) 1,000-2,000 steps per day
   ( ) 3,000-4,999 steps per day
   ( ) 5,000-6,999 steps per day
   ( ) 7,000-8,999 steps per day
   ( ) 9,000-10,999 steps per day
   ( ) 11,000-12,999 steps per day
   ( ) 13,000-14,999 steps per day
   ( ) 15,000 or more steps per day

8. Did you participate in any of the fitness classes at the Aquatic Fitness Center?
   ( ) Yes
   ( ) No

9. If you participated in classes at the Aquatic and Fitness Center, which class(es) did you participate in?

10. I did not participate in the fitness classes at the Aquatic Fitness Center for the following reason(s): (select all that apply)
    ( ) I was not interested in the classes
    ( ) I did not have a ride to the classes
    ( ) I was doing something else when the classes were offered
    ( ) I did not know about the classes

    ( ) Strongly Agree
    ( ) Agree
    ( ) Neutral
    ( ) Disagree
    ( ) Strongly Disagree
12. Specifically, I enjoyed

<table>
<thead>
<tr>
<th>Wearing my pedometer</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using the Log It website</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The fitness right way</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The information I learned in Physical Education class</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Getting my H.Y.P.P.E. t-shirt</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

13. Please comment on what you enjoyed about H.Y.P.P.E.

14. Please comment on what you did not enjoy about H.Y.P.P.E.

15. Please comment on what would have made H.Y.P.P.E. more enjoyable.
Lower Merion School District
301 East Montgomery Avenue  •  Ardmore, PA 19003-3399
Phone: 610-645-1920  •  Fax: 610-649-6173  •  www.lmsd.org

OFFICE OF CURRICULUM, INSTRUCTION AND ASSESSMENT

February 26, 2008

Stuart Shore
Bala Cynwyd Middle School
510 Bryn Mawr Avenue
Bala Cynwyd, PA 19004

Dear Stuart,

Dr. Patricia Haupt and I have reviewed your application and research proposal and have approved your project. Please work closely with Dr. Haupt in following the procedures involved with gaining parental, student, teacher and administrators’ permission to participate.

Dr. Haupt and I look forward to reading the results of your research project. Increasing student motivation for physical activity is a valuable and interesting topic to explore. We wish you the best with your endeavor.

Sincerely,

Steven Barbato
Director of Curriculum, Instruction and Assessment

c: Dr. Patricia Haupt
APPENDIX H
Introduction of Study Parent / Guardian Letter

College of Health Professions
TEMPLE UNIVERSITY

Department of Kinesiology
Pearson Hall (646-00)
Philadelphia, Pennsylvania 19122

November 6, 2008

Dear Parent/Guardian(s),

I am very pleased to invite your child to participate in the H.Y.P.E. Initiative: Helping Youth Pursue Physical Activity and Exercise at Bala Cynwyd Middle School. The main purpose of the initiative is to promote a healthy amount of daily physical activity for sixth grade students. As you may already know, the Centers for Disease Control and Prevention suggests that children and adolescents engage in at least 60 minutes of physical activity, preferably on most days of the week. Unfortunately, more than half of all students in the United States aged 9-13 years of age do not engage in any organized physical activity during their non-school hours and about 23% of the same age group do not participate in any leisure time physical activity. The amount of time children spend in physical activity drastically decreases from age 9 to age 15.

The benefits of physical activity have been widely publicized and include maintaining a healthy weight, building muscular strength, reducing anxiety and stress, and building self-esteem. In my study that was recently published in the journal *Obesity* in July 2008, I reported that students of a healthy weight had higher grade point averages, stronger scores on a standardized reading assessment, better attendance, fewer detentions, and more participation on school athletic teams.

This initiative is a collaboration between me, a PhD candidate at Temple University in the College of Health Profession’s Department of Kinesiology, the Physical Education Department at Bala Cynwyd Middle School, and the Aquatic and Fitness Center (AFC) in Bala Cynwyd. Your child will be encouraged to engage in simple lifestyle activities like walking, doing yard work, or taking the stairs during the initiative. Specifically, during the initiative students will track their physical activity by using a pedometer for about 7 weeks. Your child will receive a New LifeStyle’s SW-401 DIGI-walker pedometer at no cost to use during the initiative which will take place during the third marking period. Students will be recording their daily step count each day in computer education class. Some physical education classes will also take part in a physical education curriculum designed to promote lifestyle physical activity. To help promote this initiative, AFC will offer the use of their facility to students and one parent or guardian at no cost during the initiative. This includes classes that are age appropriate for your child. AFC will also offer ten three-month memberships to families of students who successfully complete the initiative and are selected by a lottery drawing. AFC will also partner with our PF staff to offer a fitness field day experience on January 26, 2009 at BCMS as part of the PF curriculum to help launch the initiative.

As part of the requirements for my dissertation at Temple, I will be collecting and statistically analyzing some data for the sixth grade students taking part in the study. The data will include grades, attendance, results of the Presidential Fitness Assessments, daily step counts, some brief questionnaire responses about your child’s attitude and self-efficacy about physical
activity, and their opinion about the initiative. All data will be reported as aggregate group data and will be kept anonymous. Your child's name will not appear anywhere in the study. This research study is completely independent of my role as your child’s school counselor. My role as your child’s school counselor will not be positively or negatively impacted by your child participating in or not the study. Your child will not experience any unnecessary risks beyond what they would incur from walking at a normal pace or performing other everyday activities. There will be no deception used during the study. Students will not be penalized in any way, but they may receive extra credit for simply having their pedometer each day and recording their step count in computer education class.

The study has been approved by Temple University’s Institutional Review Board. I will serve as the Student Researcher and my advisor, Michael Sachs, PhD, Temple University will be the Primary Researcher. He can be reached at temple at msachs@temple.edu. The initiative has the full support of Dr. Patricia Haupt, principal at Bala Cynwyd Middle School, Mr. Steve Barbato, Director of Curriculum, Instruction and Assessment, and the BCMS Home and School Association. There will be an informational meeting held at Bala Cynwyd Middle School on November 19, 2008 at 7:00 P.M. in the library to answer your questions about the initiative. There will be another written notification in January to provide you with information on how to help your child stay actively engaged in the initiative.

Student and parental participation in this study are completely voluntary. Your written consent is necessary for your child to wear a pedometer outside of physical education class and for the above mentioned data to be collected and included in the study. Your child’s written assent is also required for his/her participation. Both forms are enclosed and should be returned to me at BCMS. Thank you in advance for your support of this endeavor. I can be reached at (610) 645-1489 or by e-mail at shore@temple.edu should you have questions.

Sincerely,

Stuart Shore, M.S.
Licensed Professional Counselor

---

Informational 6th Grade Parent Meeting November 19, 2008

Please join Stuart Shore, PhD Candidate, Temple University To learn more about the HY.P.P.E Initiative and other current topics related to adolescent physical activity

BCMS Library
7:00 P.M.

Please e-mail shore@temple.edu if you are planning to attend
APPENDIX I
Parental Consent Form

College of Health Professions
TEMPLE UNIVERSITY

Consent Form

Title: The H.Y.P.P.E. Initiative: Helping Youth Pursue Physical Activity and Exercise

Researchers:
Principal Researcher: Michael Sachs, PhD, Temple University, College of Health Professions, Kinesiology, 215-204-8/18, msaachs@temple.edu
Student Researcher: Stuart Shore, PhD Candidate, Temple University, College of Health Professions, Kinesiology, 610-645-1488, shore@temple.edu

Purpose of the Research:
The main purpose of this study is to determine the effectiveness of an initiative to increase physical activity consisting of a 10 lesson school-based curriculum combined with self-monitoring among sixth grade students. A secondary aim of the study is to determine whether students in the experimental group increase their grades, physical fitness, self-efficacy, and attitude about physical activity relative to the control group. The third aim is to determine whether there are changes in grades, measures of physical fitness, self-efficacy, and attitude about physical activity by those students who do and do not increase their physical activity. Sixth grade students are being asked to participate in this study because this age group is a critical time period for developing life-long healthy behavior. Current research suggests that there is a considerable drop off in the amount of time elementary aged students spend engaged in physical activity compared to high school aged students.

Selection of Subjects:
All students in sixth grade at Kasa Cynwyd Middle School (BCMS) during the 2008-09 school year will be invited to participate in the study. No student will be excluded from participating for any known reason.

General Experimental Procedures:
All sixth grade students participate in physical education (PE) class at BCMS. Students in every grade wear a pedometer in all PE classes to record their step counts in class as part of the approved PE curriculum. During the third marking period from January 28, 2009 through March 20, 2009, six PE classes (the experimental group) will take part in 10 PE lessons designed to promote physical activity in and out of school. The general format of these lessons will consist of the following components: 1) a pedometer-based activity, 2) physical activity promotion information taught via kinesthetic learning, 3) a step count goal of 3200 steps per class, and 4) classroom prompts in PE to attain a 10,000 step per day goal. There will be no penalty for students who do not meet either goal.

TEMPLE UNIVERSITY
IRB (COMMITTEE B) APPROVAL

AUG 20 2006
VALID FOR NO MORE THAN ONE YEAR
During the same time frame (January 28, 2009 through March 20, 2009) in the third marking period, six PE classes (the control group) will take part in 10 traditional PE lessons. These lessons will consist of standard PE activities like basketball or volleyball. Students in these classes will receive a step count goal of 2400 steps per class. This is the standard step count goal used in PE classes at BCMS.

The lessons to be used in the experimental and control groups have both been approved by the Lower Merion School District and both meet Pennsylvania state standards. There are four PE teachers at BCMS that teach sixth grade. Two teachers will be assigned to teach the experimental groups and two teachers will be assigned to teach the control groups. Students will not be told which type of lessons they are being taught.

Parental consent and student assent is required to participate in the initiative outside of the school curriculum. Students in the control and experimental groups who participate in the initiative outside of the school curriculum will receive a New Lifestyles’s SW-401 DIGI-walker pedometer to use during the intervention and follow up period. A pedometer is a portable device worn on the belt or clipped to the waistband that records the number of steps an individual takes. The intervention period for wearing the pedometers coincides with the same dates (January 28, 2009 through March 20, 2009) as when the experimental and control PE lessons are implemented in school. Students will be encouraged to wear their pedometers at all times except when bathing, swimming, and sleeping. Students in the control and experimental groups will record their daily step counts in computer education classes during the intervention and follow up period. Students will record their daily pedometer step count from the previous 24 hours using the Log It website which can be viewed at http://www.pedlogit.org/logit.asp. This website is a collaboration between PE Central, a health promotion website for physical educators, parents, and students and New Lifestyles, a manufacturer of pedometers and other fitness products. Students will have the option of recording their step counts on non-school days or school absences at home or in computer class on the next school day. All sixth grade students have computer education classes during the school day all year. Students will be instructed to re-set their pedometers each day after recording their step count.

Students who do not have consent to use a pedometer outside of PE class for the study will still be able to participate in the PE class they are scheduled in because all students in PE classes at Bala Cynwyd Middle School use pedometers in class.

Pedometers will be collected the week of March 16, 2009 and redistributed to students who have consent to wear them during the follow up period from April 28-April 27, 2009. Students will use the procedure for recording their daily step count in computer education class during the 1 week follow up period that they used during the intervention period. Follow up data on step counts are necessary to determine if increases in physical activity are noted beyond the initial initiative.

Students that have consent to participate in the study beyond the school curriculum will also have access to age-appropriate fitness classes at the Aquatic and Fitness Center (AFC) in Bala Cynwyd, PA. AFC will allow sixth grade students to attend age-appropriate group fitness classes at no cost during the intervention period. One parent or guardian may use the AFC facility at no cost as well only during days when their child is participating in one of the fitness classes. All club rules regarding guest use of the AFC will apply.
club will apply to students and parents using the facility. Parents and students will need to sign a waiver of participation to use the facilities at AFC which will be held on file at AFC.

AFC will also offer ten three-month trial memberships free to students who complete their physical activity logs, return their pedometers in good working order, and are drawn randomly by lottery at the conclusion of the initiative. One parent or guardian may use the AFC facility at no cost only during times when their child is participating in one of the fitness classes. Students will be able to attend age-appropriate group fitness classes at no cost during the trial membership.

To help launch the initiative, our PE department will collaborate with personal trainers from AFC to provide a fitness field day experience for all 6th graders. Students will rotate through various age-appropriate fitness stations. Students who do not have consent to participate in the study will still be permitted to participate in this event. This field day is considered part of the PE curriculum at BCMS.

The effectiveness of the intervention will be determined by comparing pre and post-test student data. Data collection will include grades, attendance, Presidential Physical Fitness Test Scores, and brief questionnaires that rate students’ attitude and self-efficacy about physical activity. The Presidential Fitness Tests are given twice a year at Bala Cynwyd independent of this study. The questionnaires each contain eight items and have been validated in previous studies. Students may also be asked to supply anonymous responses about what they did and did not like about the study.

Risks:

There are no long range risks to the subjects. There is no discomfort, inconvenience, or physical danger to subjects beyond what they would normally incur from walking or participating in physical education class. It should be noted that interventions designed to increase physical activity among adolescents have not been found to produce body image dissatisfaction or decreased self-esteem even for overweight or at risk for overweight participants.

Benefits:

The immediate benefit for participation in the study is that students will be able to self-monitor their physical activity using a school issued pedometer during the initiative. It has been well documented that pedometers provide a cost-effective objective measure of physical activity among youth. The health benefits of physical activity have been well established and include a healthier Body Mass Index, decreased stress, improved concentration, and fewer physical health problems including diabetes, sleep apnea, liver disease, and heart disease.

Confidentiality:

All data will be kept on a secure school district issued computer. Only the researcher has the confidential passwords to access the data. There will be no names or other identifying data reported anywhere in the findings of this study. The results of this study may be published, but no identifying data will be disclosed. Only aggregate data will be reported. Parents/guardians may request a summary of their child’s data and/or a summary of the study at the conclusion of the study.
Disclaimer/Withdraw:

All parents/guardians are free to determine whether or not their child will participate in using a pedometer outside of school. Students must also complete an assent form indicating their agreement to participate. Students and their parents/guardian may withdraw their participation at any time during the study. No students will be coerced into participating or not withdrawing from the study. Non-participation in the study will not have a negative impact on your child and any member of the BCMS staff.

Every effort will be made to keep students engaged in the study. However, if after reasonable attempts are made, a student may be asked to withdraw from the study if their participation becomes a distraction to their own learning or the learning of others in the school setting.

Subject Rights:

I understand that if I wish further information regarding my rights as a research subject, I may contact Richard Thom, Program Manager & Coordinator at Office of the Vice President for Research of Temple University by phoning (215) 707-8757.

Questions:

Students and parents/guardians are encouraged to ask questions about the study. Parents/guardians can reach Mr. Shore at 610 645 1488 or shore@temple.edu or Michael Sebra at 215-204-8718.
Consent Form

The H.Y.P.E Initiative: Helping Youth Pursue Physical Activity and Exercise

Principal Researcher: Michael Sadik, PhD, Temple University, College of Health Professions, Kinesiology, 215-204-8718, msadik@temple.edu

Student Researcher: Stuart Shore, PhD Candidate, Temple University, College of Health Professions, Kinesiology, 610-645-1488, shore@temple.edu

I have read the attached consent form and I voluntarily consent my child's participation in the study. I give consent for him/her to wear a pedometer at the designated intervention and follow up periods and for the above mentioned data to be collected and used in the study. I understand my child is expected to return his/her pedometer in good working order at the conclusion of the study.

Student’s name

Parent/Guardian’s name

Parent/Guardian’s signature

Date

Please return this consent form to Mr. Stuart Shore in the enclosed envelope.

TEMPLE UNIVERSITY
IRB (COMMITTEE B) APPROVAL
AUG 20 2008
VALID FOR NO MORE THAN ONE YEAR
APPENDIX J
Student Assent Form

College of Health Professions
TEMPLE UNIVERSITY

Department of Kinesiology
Pearson Hall (R46 00)
Philadelphia, Pennsylvania 19122

phone 215-204-8707
fax 215-204-4414

Student Assent Form
The H.Y.P.P.E Initiative: Helping Youth Pursue Physical Activity and Exercise

Principal Researcher: Michael Sachs, PhD, Temple University, College of Health Professions, Kinesiology, 215-204-8718, msachs@temple.edu

Student Researcher: Stuart Shore, PhD Candidate, Temple University, College of Health Professions, Kinesiology, 610-645-1488, shorec@temple.edu

I voluntarily agree to participate in this research study.

I understand that I will wear the school issued pedometer to the best of my ability from January 28 through March 20, 2009 and April 20-27, 2009 at all times except when bathing, sleeping, or swimming. I understand that I will record my daily step count each day in computer class or at home on the weekends if I am absent from school.

I understand that I must return the pedometer in good working order at the conclusion of the study.

I understand that my name or any other means of personal identification will not appear in the study.

I understand that I can withdraw my participation from this study at any time. There will be no negative consequences for withdrawing from the study between me and any teacher, counselor, or administrator at BCMS.

__________________________________________
Student's name

__________________________________________
Student's signature

Date

Please return this form to Mr. Shore at BCMS.
## APPENDIX L

### H.Y.P.P.E. Experimental PE Lessons

<table>
<thead>
<tr>
<th>PE UNIT:</th>
<th>Pedometers</th>
</tr>
</thead>
<tbody>
<tr>
<td>LESSON 1:</td>
<td>Orientation to pedometer &amp; H.Y.P.P.E.</td>
</tr>
<tr>
<td>PDE Standard:</td>
<td>10.4.9 A: Analyze &amp; engage in develop appropriate activity with goals.</td>
</tr>
<tr>
<td>National Standard:</td>
<td>3: Participates regularly in Physical Activity</td>
</tr>
<tr>
<td>OBJECTIVES:</td>
<td>SW demonstrate proper use of pedometers. SW will be reintroduced to the purpose of H.Y.P.P.E.</td>
</tr>
<tr>
<td>DIRECTIONS:</td>
<td>• T welcomes S into the gym and the students begin to jog around the perimeter.</td>
</tr>
<tr>
<td></td>
<td>• S then sit in squads and T takes role.</td>
</tr>
<tr>
<td></td>
<td>• T then directs the students’ attention to the power point for pedometer instruction. See attached.</td>
</tr>
<tr>
<td></td>
<td>• T then hands out pedometers and assists S set stride length for the pedometer (See pedometer manual).</td>
</tr>
<tr>
<td></td>
<td>• T directs S to move around the gym to gain steps and try pedometers.</td>
</tr>
<tr>
<td></td>
<td>• If time allows, T has S attempt different activities to see if they can gain more steps.</td>
</tr>
<tr>
<td></td>
<td>• T then calls S back to record scores.</td>
</tr>
<tr>
<td></td>
<td>• T then dismisses class.</td>
</tr>
<tr>
<td>Assessment:</td>
<td>Effective use of pedometers.</td>
</tr>
<tr>
<td>Closing:</td>
<td>Students told to walk normally not to try to attain more physical activity than they would normally do on any given day.</td>
</tr>
<tr>
<td><strong>PE UNIT:</strong></td>
<td>Pedometers</td>
</tr>
<tr>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td><strong>LESSON 2:</strong></td>
<td>Using Stations to Practice Self-Monitoring</td>
</tr>
<tr>
<td><strong>PDE Standard:</strong></td>
<td>10.4.9 A: Analyze &amp; engage in develop appropriate activity with goals.</td>
</tr>
<tr>
<td><strong>National Standard:</strong></td>
<td>3: Participates regularly in Physical Activity</td>
</tr>
<tr>
<td><strong>OBJECTIVES:</strong></td>
<td>SW demonstrates proper use of pedometers. SW practice self-monitoring. SW will be reintroduced to 10,000 daily step-count goal. SW will be reintroduced to the 3200 PE step-count goal.</td>
</tr>
</tbody>
</table>

| **DIRECTIONS:** | T welcomes Class  
S record their starting step-counts.  
T starts warm up 2-4 minutes.  
T then takes role.  
T reviews basic pedometer functions  
T introduces concept of self monitoring and how it can help increase physical activity  
S will use stations to practice self-monitoring.  
Station 1. Sit ups  
Station 2. Slanty rope  
Station 3. Agility run  
Station 4. Jump rope  
Station 5. Step up  
Station 6. Basket Ball  
Station 7. Perimeter walk  
T hands out pencil and recording paper.  
S will move through the stations and determine which station gives them the highest step-counts.  
S record their starting and ending step-counts at the beginning and end of stations.  
T gives S a number and they report to their stations.  
T lets S participate in stations 2- min at a time.  
At the end of class T call S back to area where class charts are.  
T tells S to add up all steps. And |
| **Time:** 40 min  
**Space:** Large Gym  
**Equipment:** Pedometers Projector Power Point Basket balls Hula hoops Cones Mats Poly spots Music Player |
demonstrates how to record on the chart.

| Assessment:          | Number of steps: 3000 – 3200  
|                     | Effective use of pedometers. |
| Closing:            | Which activities gave you the most steps?  
|                     | Which activity gave you the least amount of steps?  
|                     | How pedometers and step log help monitor your physical activity?  
|                     | T remind S about 10,000 daily step-count goal and logging steps in computer class every day. |
## STEP LOG

<table>
<thead>
<tr>
<th>STATION 1:</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Start count:</td>
<td></td>
<td>End count:</td>
</tr>
<tr>
<td>Total:_____</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATION 2:</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Start count:</td>
<td></td>
<td>End count:</td>
</tr>
<tr>
<td>Total:_____</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATION 3:</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Start count:</td>
<td></td>
<td>End count:</td>
</tr>
<tr>
<td>Total:_____</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATION 4:</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Start count:</td>
<td></td>
<td>End count:</td>
</tr>
<tr>
<td>Total:_____</td>
<td></td>
<td></td>
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<table>
<thead>
<tr>
<th>STATION 5:</th>
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</thead>
<tbody>
<tr>
<td>Start count:</td>
<td></td>
<td>End count:</td>
</tr>
<tr>
<td>Total:_____</td>
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</tbody>
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<table>
<thead>
<tr>
<th>STATION 6:</th>
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<tbody>
<tr>
<td>Start count:</td>
<td></td>
<td>End count:</td>
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<tr>
<td>Total:_____</td>
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<table>
<thead>
<tr>
<th>STATION 7:</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Start count:</td>
<td></td>
<td>End count:</td>
</tr>
<tr>
<td>Total:_____</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PE UNIT:</td>
<td>Pedometers</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>---------------------</td>
<td></td>
</tr>
<tr>
<td>LESSON 3:</td>
<td>Health &amp; Social Benefits of Physical Activity</td>
<td></td>
</tr>
</tbody>
</table>

| PDE Standard:    | 10.4.9 A: Analyze & engage in developing appropriate activity with goals. |
| National Standard: | 3: Participates regularly in Physical Activity |

| OBJECTIVES:      | SW demonstrate proper use of pedometers.  
|                  | SW state 3 positive health 2 social benefits of physical activity.  
|                  | SW work collaboratively to identify benefits.  
|                  | 3200 PE step-count goal. |

| DIRECTIONS:      | • T welcomes class – S record beginning step-count  
|                  | • T starts warm up 2 – 4 minutes.  
|                  | • T takes role  
|                  | • T reviews information from last class.  
|                  | • T introduces new lesson.  
|                  | • T explains:  
|                  | • Today we are going to be talking about the health and social benefits of physical activity. There are posters around the room that list different benefits. When we start you are going to be asked to run around to the different posters and remember as many benefits as possible. After 2 min. I am going to call you back and we will see how many benefits you can recall.  
|                  | • T plays music as the S review the posters  
|                  | • T then calls S back and asks the question “what are the benefits of physical activity?”  
|                  | • Students raise their hand to answer. After a brief discussion the students are given one more chance to get as many benefits as possible.  
|                  | • Once they review the posters again, they will share their knowledge with someone else in the class! |
Next, S will play a game that will allow them to focus on benefits as well as have fun.

This game is called the Benefit Circle. When the music stats S move in the manner of the teacher’s choice around the different benefits. (Hopping, skipping, walking, jogging, running) ** Please see below for description and gym set up. The S keep moving around until the music stops. Once the music stops then the S will have three seconds to get to a hoop with one of the benefits listed in it. The T then rolls a dice with the benefits listed on each side. Whatever benefit is facing up that is the winning hoop. T plays a few rounds and prizes are awarded for the winners.

T moves to the debriefing circle and reviews one more time about the benefits of being physically active.

S record their class step total

| Assessment: | S write down 3 benefits of being physically active. |
| Number of Steps 3000-3200 |

| Closing: | Everyone should know and understand the benefits of physical activity. Tonight go home and tell an adult at home the benefits that you think are most important. T calls on a few S to list the benefits that they are going to use. DAILY STEP COUNT GOAL 10,000 |
Benefits of Physical Activity

From The Centers for Disease Control and Prevention

- Reduces the risk of developing coronary heart disease (CHD)
- Reduces the risk of stroke
- Reduces the risk of having a second heart attack in people who have already had one heart attack
- Lowers both total blood cholesterol and triglycerides and increases high-density lipoproteins (HDL or the "good" cholesterol)
- Lowers the risk of developing high blood pressure
- Helps reduce blood pressure in people who already have hypertension
- Lowers the risk of developing non-insulin-dependent (type 2) diabetes mellitus
- Helps people achieve and maintain a healthy body weight
- Reduces feelings of depression and anxiety
- Promotes psychological well-being and reduces feelings of stress
- Helps build and maintain healthy bones, muscles, and joints

Everyone can benefit from physical activity:

Older adults: No one is too old to enjoy the benefits of regular physical activity. Evidence indicates that muscle-strengthening exercises can reduce the risk of falling and fracturing bones and can improve the ability to live independently.

Parents and children: Parents can help their children maintain a physically active lifestyle by providing encouragement and opportunities for physical activity. Families can plan outings and events that allow and encourage everyone in the family to be active.

Teenagers: Regular physical activity improves strength, builds lean muscle, and decreases body fat.

People trying to manage their weight: Regular physical activity burns calories while preserving lean muscle mass. Regular physical activity is a key component of any weight-loss or weight-management effort.

People with high blood pressure: Regular physical activity helps lower blood pressure.

People with physical disabilities, including arthritis: Regular physical activity can help people with chronic, disabling conditions improve their stamina and muscle strength. It also can improve psychological well-being and quality of life by increasing the ability to perform the activities of daily life.

Everyone under stress, including persons experiencing anxiety or depression: Regular physical activity improves one's mood, helps relieve depression, and increases feelings of well-being.
PE UNIT: Pedometers

Gym set-up for Benefit Circle

Circles are for game

Squares are for poster activity
<table>
<thead>
<tr>
<th>LESSON 4: FITT (frequency, intensity, time, type)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PDE Standard:</strong> 10.4.9 A: Analyze &amp; engage in develop appropriate activity with goals.</td>
<td></td>
</tr>
<tr>
<td><strong>PE UNIT: National Standard:</strong> Pedometers 3: Participates regularly in Physical Activity</td>
<td></td>
</tr>
<tr>
<td><strong>OBJECTIVES:</strong> SW demonstrates proper use of pedometers. SW learn the 4 components of FITT. 3200 PE step-count goal.</td>
<td></td>
</tr>
<tr>
<td><strong>DIRECTIONS:</strong> Time: 40 min Space: Large Gym Equipment: Pedometers Projector Power Point</td>
<td></td>
</tr>
</tbody>
</table>
| • T welcomes class - S record beginning step-counts  
• T starts warm up 2-4 minute jog  
• T then takes role  
• T reviews previous lesson  
• T introduces current lesson.  
• T explains FITT to S. These concepts are important to keep in mind when being physically active.  
  
  F. Frequency  
  I. Intensity  
  T. Time  
  T. Type  
  
  • T explains personal training activity.  
  • T then assigns partners to train.  
  T tells S that they will train each other using the FITT recipe to get as many steps as possible.  
  • T calls S back into wrap up and review FITT  
  • S record their end of class totals |  |
| **Assessment:** State FITT principles Number of steps 3000-3200 |  |
| **Closing:** What activities gave you the most steps? T reminds students about 10,000 step goal and daily recording |  |
# LESSON 5: Barriers to Physical Activity

<table>
<thead>
<tr>
<th>PDE Standard:</th>
<th>10.4.9 A: Analyze &amp; engage in develop appropriate activity with goals.</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Standard:</td>
<td>3: Participates regularly in Physical Activity</td>
</tr>
</tbody>
</table>

## OBJECTIVES:
- SW demonstrate proper use of pedometers.
- SW state 3 barriers of physical activity.
- SW consider different ways to overcome barriers.

3200 PE step-count goal.

## DIRECTIONS:

- **Time:** 40 min  
  **Space:** Large Gym  
  **Equipment:** Pedometers Projector Power Point

- T welcomes class - S record beginning step-count  
- T starts warm up 2-4 minutes  
- T then takes role  
- T reviews previous lesson  
- T introduces current lesson.  
- T explains barriers of physical activity to S.  
  - Lack of Time  
  - Family Commitments  
  - Energy  
  - Medical conditions  
  - Injury  
- T then introduces Mat Ball activity  
- T observes while S are playing and asks them if they have noticed any barriers that have kept them from staying in motion.  
- T then calls S in and debriefs.

## Assessment:
- S able to identify strategies for overcoming barriers  
  - Steps 3000-3200

## Closing:
- When did you get the most steps? What Barriers did you face in this game? How did you overcome some of these Barriers?

**DAILY STEP COUNT GOAL 10,000**
<table>
<thead>
<tr>
<th>PE UNIT:</th>
<th>Pedometers</th>
</tr>
</thead>
<tbody>
<tr>
<td>LESSON 6:</td>
<td>Goal setting</td>
</tr>
<tr>
<td><strong>PDE Standard:</strong></td>
<td>10.4.9 A: Analyze &amp; engage in develop appropriate activity with goals.</td>
</tr>
<tr>
<td><strong>National Standard:</strong></td>
<td>3: Participates regularly in Physical Activity</td>
</tr>
<tr>
<td>OBJECTIVES:</td>
<td>SW demonstrates proper use of pedometers. SW evaluate the benefits of goal setting. SW state personal goal for steps. 3200 PE step-count goal.</td>
</tr>
</tbody>
</table>
| DIRECTIONS:      | • T welcomes Class – S record beginning step-counts  
| Time: 40 min     | • T starts warm up 2-4 minutes  
| Space: Large Gym | • T then takes role  
| Equipment:       | • T reviews previous lesson  
| Pedometers       | • T introduces current lesson  
| Projector        | • T tells S that they will set step goals for different activities. S will rotate clockwise through each activity set up around the gym. S will asses each activity and then write down a step goal they can attain in 2 minutes (The students will be using their pedometers so have them write their starting number and then their ending number, when you bring them in you can have them do the math! (across the curriculum)  
| Power Point      | • T explains stations to S.  
| Basket balls     | Station 1. Sit ups  
| Hula hoops       | Station 2. Slanty rope  
| Cones            | Station 3. Agility run  
| Mats             | Station 4. Jump rope  
| Poly spots       | Station 5. Step up  
| Music Player     | Station 6. Basket Ball  
|                  | Station 7. Perimeter walk  
|                  | • T hands out pencil and recording paper.  
|                  | • T gives S a number and they report to their stations.  
|                  | • T lets S participate in stations 2-min at a time. |
- At the end of class T call S back to area where class charts are.
- T tells S to add up all steps. And demonstrates how to record on the chart.
- S are called in and then asked to do the math to see if they made their goal.
- T then moves to the debriefing.

| Assessment          | Step goals MET vs. NOT MET  
|---------------------|-------------------------------
|                     | Steps 3000-3200               |

| Closing             | Which activities gave you the most steps? Which activity gave you the least amount of steps? Where you able to set an appropriate goal and make that goal. T reminds S about 10,000 daily step-count goal. |
STEP LOG

STATION 1:
Goal: Start count: End count:
Total:_____

STATION 2:
Goal: Start count: End count:
Total:_____

STATION 3:
Goal: Start count: End count:
Total:_____

STATION 4:
Goal: Start count: End count:
Total:_____

STATION 5:
Goal: Start count: End count:
Total:_____

STATION 6:
Goal: Start count: End count:
Total:_____

STATION 7:
Goal: Start count: End count:
Total:_____
<table>
<thead>
<tr>
<th><strong>PE UNIT:</strong></th>
<th>Pedometers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LESSON 7:</strong></td>
<td>Problem solving</td>
</tr>
<tr>
<td><strong>PDE Standard:</strong></td>
<td>10.4.9 A: Analyze &amp; engage in developing appropriate activity with goals.</td>
</tr>
<tr>
<td><strong>National Standard:</strong></td>
<td>3: Participates regularly in Physical Activity</td>
</tr>
<tr>
<td><strong>OBJECTIVES:</strong></td>
<td>SW demonstrates proper use of pedometers. SW relate in-class problem solving strategies to out-of-class situations. 3200 PE step-count goal.</td>
</tr>
</tbody>
</table>
| **DIRECTIONS:** | Time: 40 min  
Space: Large Gym  
Equipment:  
• T welcomes class - S record step-counts  
• T starts warm up 2-4 minutes  
• T then takes role  
• T reviews previous lesson  
• T introduces current lesson  
• S will experience 3 different situations that will provide a problem to be solved. Types of problems:  
• Lack of time  
• Lack of equipment  
• Lack of space  
• The challenges that you will cycle through will be done in a group and you must work together to solve the problems and still get the amount of required steps for each activity.  
• Activity 1  
• Cross the mote = 200 steps  
• S are placed at one end of the area and given a certain amount of equipment S are then told that they must get everyone across the mote only using the equipment given without anybody touching the mote and still getting all members of the group to the required 300 steps. |
<table>
<thead>
<tr>
<th><strong>Activity 2</strong></th>
<th><strong>Activity 3</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Trampoline jump = 700 steps</em></td>
<td><em>½ mile run = 1000 steps</em></td>
</tr>
<tr>
<td><em>All students in the group are placed around 3 trampolines</em></td>
<td><em>The group is placed in a small square designated by cones. The S must work together to get everyone to run a ½ mile in the time provided.</em></td>
</tr>
<tr>
<td><em>On the word go all the students must work together to get every person their 700 steps using the trampolines. Only one person can be on a trampoline at a time but all students must have the same time on the trampolines before the session is over.</em></td>
<td><em>T then calls the S back in to debrief see what problems they faced.</em></td>
</tr>
<tr>
<td><em>S record end of class step-counts</em></td>
<td></td>
</tr>
</tbody>
</table>

**Assessment:** Describe three different ways that you problem solved today
Steps 3000-3200

**Closing:** How did you problem solve? Can you use these strategies outside of school to be more physically active? In what ways did you work with your group members? What did effective and ineffective communication sound like? We are going to talk about next time, social support and communication styles.

**DAILY STEP COUNT GOAL 10,000**
<table>
<thead>
<tr>
<th>PE UNIT:</th>
<th>Pedometers</th>
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</thead>
<tbody>
<tr>
<td>LESSON 8:</td>
<td>Communication (Self-talk) styles that promote</td>
</tr>
<tr>
<td></td>
<td>physical activity</td>
</tr>
<tr>
<td>PDE Standard:</td>
<td>10.4.9 A: Analyze &amp; engage in develop</td>
</tr>
<tr>
<td></td>
<td>appropriate activity with goals.</td>
</tr>
<tr>
<td>National Standard:</td>
<td>3: Participates regularly in Physical Activity</td>
</tr>
<tr>
<td>OBJECTIVES:</td>
<td>SW demonstrates proper use of pedometers.</td>
</tr>
<tr>
<td></td>
<td>SW learn the different communication styles.</td>
</tr>
<tr>
<td></td>
<td>SW will identify which styles promote PA.</td>
</tr>
<tr>
<td></td>
<td>3200 PE step-count goal.</td>
</tr>
<tr>
<td>DIRECTIONS:</td>
<td>• T welcomes class</td>
</tr>
<tr>
<td></td>
<td>• T starts warm up 2-4 minutes</td>
</tr>
<tr>
<td></td>
<td>• T reviews previous lesson.</td>
</tr>
<tr>
<td></td>
<td>• T introduces types of current lesson.</td>
</tr>
<tr>
<td></td>
<td>• S will determine which types help someone</td>
</tr>
<tr>
<td></td>
<td>be more physically active and hinder them</td>
</tr>
<tr>
<td></td>
<td>from being physically active.</td>
</tr>
<tr>
<td></td>
<td>• T then reviews the different types of</td>
</tr>
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<td></td>
<td>communication with self and other</td>
</tr>
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<td></td>
<td>• S will catch themselves using negative</td>
</tr>
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<td></td>
<td>talk.</td>
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<td></td>
<td>• S will play a game of 4-way soccer. In</td>
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<td></td>
<td>this game we are going to be looking for all</td>
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<td>three types of communication. But we will focus</td>
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<td></td>
<td>on Assertive communication.</td>
</tr>
<tr>
<td></td>
<td>• Praising others and yourself to keep</td>
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<tr>
<td></td>
<td>everyone motivated to be physically</td>
</tr>
<tr>
<td></td>
<td>active!</td>
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<td></td>
<td>• T then breaks S up into teams and then</td>
</tr>
<tr>
<td></td>
<td>begins game.</td>
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<tr>
<td></td>
<td>• T moves around and gives feedback for</td>
</tr>
<tr>
<td></td>
<td>assertive positive communication!</td>
</tr>
<tr>
<td>Assessment:</td>
<td>What are the three types of communication?</td>
</tr>
<tr>
<td></td>
<td>Steps 3000-3200</td>
</tr>
<tr>
<td>PE UNIT:</td>
<td>Pedometers</td>
</tr>
<tr>
<td>LESSON 9:</td>
<td>Replacing Sedentary Activities</td>
</tr>
<tr>
<td><strong>State Standard:</strong></td>
<td>10.4.9 A: Analyze &amp; engage in developing appropriate activity with goals.</td>
</tr>
<tr>
<td><strong>National Standard:</strong></td>
<td>3: Participates regularly in Physical Activity</td>
</tr>
<tr>
<td><strong>OBJECTIVES:</strong></td>
<td>SW demonstrates proper use of pedometers. SW state 3 sedentary activities and a strategy to make them active. SW evaluate different activities and how they can lead to a sedentary lifestyle. 3200 PE step-count goal.</td>
</tr>
</tbody>
</table>
| **DIRECTIONS:** | Time: 40 min  
Space: Large Gym  
Equipment: Pedometers, Projector, Power Point, Basket balls, Hula hoops, Cones, Mats, Poly spots, Music Player  
- T welcomes class - S record step-counts  
- T starts warm up 2-4 minutes  
- T reviews previous lesson  
- T introduces new lesson. S will be challenged to make sedentary activities more active. S will go through stations and identify how to make activities less sedentary. For example, when S watches TV, they can do push up and crunches during commercials. While S are going through the stations, S think of any other ways to make sedentary activities more active.  
- T explains stations to S.  
  Station 1. Video Games  
  Station 2. TV watching  
  Station 3. Computer use  
  Station 4. Snacking  
  Station 5. Elevator  
- T then assigns S to stations  
- Each station will last approx 5 min. then rotate to the next station. After the S have participated in the stations T calls them back for closing. |
| **Assessment:** | How did you make sedentary activities more active? Steps 3000-3200 |
| **Closing** | What is causing activities to be more sedentary today than in the past?  
DAILY STEP COUNT GOAL 10,000 |
<table>
<thead>
<tr>
<th><strong>PE UNIT:</strong></th>
<th>Pedometers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LESSON:10</strong></td>
<td>Creating a Public Service Announcement</td>
</tr>
<tr>
<td><strong>State Standard:</strong></td>
<td>10.4.9 A: Analyze &amp; engage in develop appropriate activity with goals.</td>
</tr>
<tr>
<td><strong>National Standard:</strong></td>
<td>3: Participates regularly in Physical Activity</td>
</tr>
<tr>
<td><strong>OBJECTIVES:</strong></td>
<td>SW demonstrates proper use of pedometers. SW will create a public service announcement for becoming more physically active.</td>
</tr>
<tr>
<td><strong>DIRECTIONS:</strong></td>
<td></td>
</tr>
<tr>
<td>Time: 40 min</td>
<td>• T welcomes class – S record beginning step-count</td>
</tr>
<tr>
<td>Space: Large Gym</td>
<td>• T starts warm up 2-4 minutes</td>
</tr>
<tr>
<td>Equipment: Pedometers Projector Power Point Basket balls Hula hoops Cones Mats Poly spots Music Player</td>
<td>• T tells the class that we have been working for the last few lessons up to this point of being physically active.</td>
</tr>
<tr>
<td></td>
<td>• T asks the S to raise their hand and mention some of the facts, concepts that they have learned.</td>
</tr>
<tr>
<td></td>
<td>• T tells the S that today is going to be your day to become an advocate for Physical Activity.</td>
</tr>
<tr>
<td></td>
<td>• T explains advocate: a person who publicly supports or recommends a particular cause</td>
</tr>
<tr>
<td></td>
<td>• T tells S that they will be creating a 30 sec. Public service announcement for Physical Activity and motivate people to become physically active.</td>
</tr>
<tr>
<td></td>
<td>• T tells S that they will have some time to work with their group and they must come up with a positive and creative PSA.</td>
</tr>
</tbody>
</table>
• T gives S their groups and gives them 10 min to work through the storyboard of the PSA.
• If time allows S can work in training partners while waiting for the other S to finish.
• Once all S have been taped the T calls the S back over for review.

**Assessment:**

Public Service Announcement

**Closing:**

How did you enjoy the unit on pedometers? Are you more physically active now then before the unit begun? What will you remember from this unit?

*Daily Goal -10,000 steps*
## APPENDIX M
### H.Y.P.P.E. Control PE Lessons

**Lessons 1 & 2**

<table>
<thead>
<tr>
<th>Lesson Key</th>
<th>S=students / T=teacher/ SWBAT = students will be able to...</th>
</tr>
</thead>
</table>

### UNIT:
Fitness through games / Heart rate tracking

### Lesson/Activity:
Choosing to be active

### STANDARDS:
- **National:**
  - 10.9.4 C  Healthy Fitness Zone
- **State:**

### Objectives:
SW keep Heart rate in target zone for at least 20 min.

### Time:
45 Min

### Description:
- Students meet outside the large gym and use the Locker rooms to change and prepare for Physical Education.
- Students enter Gym
- T tells S to report to squads
- T welcomes and takes role.
- T explains goals of the day and then the S begin Warm-up.
- Warm-up
  - 2.5 min run/jog
- T then tells S that they will be able to choose which activity they would like to do.
- Castle Ball
- Matt Ball
- See attached for directions
- S make a choice and then T runs activity
- At the end of the activity T dismisses S to locker rooms
- S change
- T dismisses to class

### Materials:
- Pinnies
- Gator skin ball
- Music
- Heart rate chart

### Closing/Assessment:
Did you like having a choice? Why?
- Game starts with two teams Batters/ Fielders
- The batters Line up Male Female
- The fielders spread out in the field
- The game starts with the pitcher rolling the ball to the batter
- The batter strikes the ball with their feet
- When the ball is kicked the:
  - RUNNER – runs to first base. Then they must proceed to 2nd, 3rd, back to 1st, 2nd, 3rd, and them home to score. The runner may steel bases at any time while they are on the bases. If the runner steps off the base with 1 or 2 feet they are committed to run to the next base. They may not run back to the privies base.
  - FIELDER – the fielder must field the ball and use the ball to get the runner out. The fielder can force the runner out at first base. After the runner makes it to 1st base the fielder must use the ball to tag the runner below the waist to get them out.
The score is kept with a scoreboard and each time a player crosses home plate they score one point for their team.

Lessons 3 & 4

Unit: Floor Hockey
Standard: 10.4.9 A
Objective: SW be actively engaged for at least 20 min
SWBAT engage in activity of their choice to increase enjoyment and participation in activity.
Activity 1: Floor Hockey
Description: Students will engage in game plan of floor hockey. Kids will be placed in teams of 5 people and
- T welcomes S
- S enters the gym and writes down their pedometer number and then moves to instant activity.
- Students will jog for 4 min and then be directed to check their pulse for 6 seconds
- T then will explain the safety rules for floor hockey
  - Always have goggles on face when you have a stick in your hand or are near a game.
  - Sticks must stay waist high.
  - Goalies need to be always suited up with pads goggles and gloves
- T then explains the face off rule. Ball is placed down in the center of the court and a player from each team places a stick on the opposite side of the ball they pick their sticks up and smack them together above the ball three times and then they can go after the ball.
- T then places S on a team and S begin to play
- T circulates and gives feedback and assures that safety is being kept.
- After S play for 5 min T switches teams and then S play again.
- T switches 3 times so that all the teams can play the different teams
- T then begins clean up reminding the S that they need to keep their goggles on until the sticks are in.
- Once all the equipment is collected T has S head to the locker rooms for changing a dismissal.
Lessons 5 & 6

Fitness
Standard 10.4.9 A
Activity 2: Aerobic/ Anaerobic Circuit
Description: Students will engage in a round of stations that are aerobic and anaerobic. Kids will be placed in groups of 4 people

- T welcomes S
- T then will explain the stations that the students will be rotating through
  - Sit ups
  - Push ups
  - Stepping u and down off step.
  - Dips
  - Dumb bell curls

- T then explains that the students will be going through the stations for 2 – 4 min each and then will rotate.
- T tells S that the goal is to be actively engaged for the entire circuit.
- T then begins music and S rotate through stations.
- T circulates and gives feedback and assures that safety is being kept.
- After S play for 2-4min T switches S to next station.
- T switches S through all stations
- T then begins clean up reminding the S that they need to keep in mind the choice for next class. They can come back to the stations or choose Hockey.
- Once all the equipment is collected T has S head to the locker rooms for changing and dismissal.
**Lessons 7 & 8**

<table>
<thead>
<tr>
<th>Lesson Key</th>
<th>S=students / T=teacher/ SWBAT = students will be able to…</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIT:</td>
<td>Fitness in games</td>
</tr>
<tr>
<td>Lesson/Activity:</td>
<td>Capture the flag</td>
</tr>
<tr>
<td>STANDARDS:</td>
<td></td>
</tr>
<tr>
<td>National:</td>
<td>4</td>
</tr>
<tr>
<td>State:</td>
<td>10.5.6 D Components of Fitness</td>
</tr>
<tr>
<td>Objectives:</td>
<td>SW keep their Heart Rate elevated for a period of 20 min.</td>
</tr>
<tr>
<td>Time:</td>
<td>40 Min</td>
</tr>
<tr>
<td>Description:</td>
<td>S enter gym and begin jogging. T takes role-using computer. After 2.5 min T asks S to find their pulse and count for six seconds trying to see if they can get their heart rate between 12 and 16 sec (Target Heart Rate zone)</td>
</tr>
<tr>
<td>Materials:</td>
<td>Capture the flag</td>
</tr>
<tr>
<td></td>
<td>Split the group up into two groups</td>
</tr>
<tr>
<td></td>
<td>Each side of the playing field should have the following things</td>
</tr>
<tr>
<td></td>
<td>One spot for flag</td>
</tr>
<tr>
<td></td>
<td>One spot for jail</td>
</tr>
<tr>
<td></td>
<td>One safe zone</td>
</tr>
<tr>
<td></td>
<td>Each team should have:</td>
</tr>
<tr>
<td></td>
<td>One member guarding the flag</td>
</tr>
<tr>
<td></td>
<td>One member guarding the safe zone</td>
</tr>
<tr>
<td></td>
<td>The rest of the team is trying to get the other teams flag</td>
</tr>
<tr>
<td></td>
<td>Rules:</td>
</tr>
<tr>
<td></td>
<td>The middle line separates the teams</td>
</tr>
<tr>
<td></td>
<td>If a member of the other team crosses the line they can be tagged</td>
</tr>
<tr>
<td></td>
<td>If a player is tagged they must go to the designated jail</td>
</tr>
<tr>
<td></td>
<td>TO get out of jail a member from their team must cross the line with out being tagged and tag them. All members get safe walk back to their side. They must go back to their side before trying to get the flag</td>
</tr>
<tr>
<td></td>
<td>The game is played until one team successfully gets the other teams flag to their side of the playing area</td>
</tr>
<tr>
<td></td>
<td>If that happens a team is given a point and then the game is reset and another round is played.</td>
</tr>
</tbody>
</table>
- A player is safe if they make it to the safe zone without being tagged by the other team.

- Extras:
  - At the middle line kids can challenge each other. This is where they lock hands and try to pull the other person across the middle line. If they get pulled to the other side they must go to jail.

Closing/Assessment: What are the Five Components of Fitness? How many people were able to stay in the 12 – 16 range? T has S check with 3 other students to make sure that each student knows all 5 components.
### Lessons 9 & 10

<table>
<thead>
<tr>
<th>Lesson Key</th>
<th>S=students / T=teacher / SWBAT = students will be able to…</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIT:</td>
<td>Fitness / Organized sports</td>
</tr>
<tr>
<td>Lesson/Activity:</td>
<td>Fire ball</td>
</tr>
<tr>
<td>STANDARDS:</td>
<td></td>
</tr>
<tr>
<td>National:</td>
<td>4</td>
</tr>
<tr>
<td>State:</td>
<td>10.4.9 A</td>
</tr>
<tr>
<td>Objectives:</td>
<td>Students will analyze the benefits of participating regularly in organized sports.</td>
</tr>
<tr>
<td>Time:</td>
<td>45 min</td>
</tr>
<tr>
<td>Description:</td>
<td>S enters gym and T takes role.</td>
</tr>
<tr>
<td></td>
<td>T then allows S to warm up:</td>
</tr>
<tr>
<td></td>
<td>• 3 min Jog</td>
</tr>
<tr>
<td></td>
<td>• 10 push ups</td>
</tr>
<tr>
<td></td>
<td>• 10 sit ups</td>
</tr>
<tr>
<td></td>
<td>• 2 min stretching focusing on the legs due to the soccer game we will be playing today.</td>
</tr>
<tr>
<td></td>
<td>T then tells S that we are going to play the game FIRE BALL.</td>
</tr>
<tr>
<td></td>
<td>PLEASE REFER TO ATTACHED DIRECTION SHEET “FIRE BALL”</td>
</tr>
<tr>
<td></td>
<td>T then places the S into 2 teams.</td>
</tr>
<tr>
<td></td>
<td>S begins Game. While S are playing T gives feedback and keeps score.</td>
</tr>
<tr>
<td></td>
<td>T tosses in Fireball every two min. T switches Players and Goalies every three minutes.</td>
</tr>
<tr>
<td></td>
<td>T asks for a 6 second pulse check every 6 min. asking S to keep themselves in the target heart Zone.</td>
</tr>
<tr>
<td></td>
<td>T tells S that the focus is to keep yourself in that target Zone. If you stand around as goalie, make sure you are moving to keep your heart rate up!</td>
</tr>
<tr>
<td>Closing/Assessment:</td>
<td>How many were able to keep themselves in the target heart rate zone?</td>
</tr>
<tr>
<td></td>
<td>What is the target heart rate zone?</td>
</tr>
</tbody>
</table>
## Table 31. Pearson Correlations

<table>
<thead>
<tr>
<th>Variables</th>
<th>Change in PA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test Tardiness</td>
<td>-.122</td>
</tr>
<tr>
<td>Pre-test Attendance</td>
<td>.018</td>
</tr>
<tr>
<td>Pre-test GPA</td>
<td>.215*</td>
</tr>
<tr>
<td>Post-test Tardiness</td>
<td>-.006</td>
</tr>
<tr>
<td>Post-test Attendance</td>
<td>-.035</td>
</tr>
<tr>
<td>Post-test GPA</td>
<td>.101</td>
</tr>
<tr>
<td>Pre-test Curl Up</td>
<td>.338*</td>
</tr>
<tr>
<td>Pre-test Sit &amp; Reach</td>
<td>.127</td>
</tr>
<tr>
<td>Pre-test Pull Up</td>
<td>.124</td>
</tr>
<tr>
<td>Pre-test Shuttle Run</td>
<td>.295*</td>
</tr>
<tr>
<td>Pre-test Mile Run</td>
<td>.270*</td>
</tr>
<tr>
<td>Post-test Curl Up</td>
<td>.227*</td>
</tr>
<tr>
<td>Post-test Sit &amp; Reach</td>
<td>.120</td>
</tr>
<tr>
<td>Post-test Pull Up</td>
<td>.188</td>
</tr>
<tr>
<td>Post-test Shuttle Run</td>
<td>.239*</td>
</tr>
<tr>
<td>Post-test Mile Run</td>
<td>.327*</td>
</tr>
<tr>
<td>Tardiness Change</td>
<td>.119</td>
</tr>
<tr>
<td>Attendance Change</td>
<td>-.042</td>
</tr>
<tr>
<td>GPA Change</td>
<td>-.181</td>
</tr>
</tbody>
</table>
Curl Up Change     -.129
Sit & Reach Change  -.006
Pull Up Change      .007
Shuttle Change      -.027
Mile Change         -.022

Note. Significance was detected at $p < .05$. Changes in all variables reflect changes from pre- to post-test.