AN AFTER SCHOOL PROGRAM FOR 4TH AND 5TH GRADE STUDENTS: EFFECTS ON PHYSICAL FITNESS AND SELF-EFFICACY

by Elizabeth Gleason

The physiological and psychological effects of a tri-weekly physical activity and academic support, after-school program on 4th and 5th graders was studied. Body mass index, aerobic fitness, muscular fitness, and flexibility were assessed. Self-reported perceptions of sport competency, body attractiveness, strength, physical self-worth, and global self-worth were determined using the Children and Youth Physical Self-Perception Profile and the Children and Youth Perceived Importance of Physical Competence Profile. Significant increases in muscular fitness test results (curl-ups and push-ups) and significantly enhanced fitness classification zones for aerobic and muscular fitness occurred for boys and girls. Boys scored significantly higher on tests of aerobic and muscular fitness before and after the program. Additionally, perceived sport/athletic competence, condition/stamina competence, and physical self-worth improved significantly for boys and girls; improvements in global self-worth approached statistical significance. Participation in this program resulted in positive changes in both physical fitness and psycho-social well-being in these children.
AN AFTER SCHOOL PROGRAM FOR 4\textsuperscript{TH} AND 5\textsuperscript{TH} GRADE STUDENTS: EFFECTS ON PHYSICAL FITNESS AND SELF-EFFICACY

A Thesis Proposal

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Introduction

In the United States, as well as developed and developing countries, the number of children classified as overweight or obese is dramatically rising. According to Budd and Volpe (2006), the number of American children classified as “at risk for overweight” or “overweight” has tripled in the past two decades and presently exceeds more than 30%. The results of the 2007-2008 National Health and Nutrition Examination Survey (NHANES) found that 16.9% of children aged 2-19 years old were obese (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010). In this context, obesity refers to a high body mass index (BMI) based on reference standards developed by the Centers for Disease Control (CDC). Percentiles specific to age and sex classify underweight, healthy weight, overweight, and obesity in children. Overweight is classified as a BMI-for-age ≥ 85th percentile and obese as ≥ 95th percentile. The prevalence of obesity has increased from 7% in 1980 to 20% in 2008 in children aged 6-11 years old (Benson, Williams, & Novick, 2013; Ogden et al., 2010).

Obesity is a complex disease affected by genetic, metabolic, behavioral, and environmental factors (Slawta, Bentley, Smith, Kelly, & Syman-Degler, 2008). Theoretically, obesity results from an imbalance between caloric intake and energy expenditure. Recent studies suggest that children are more commonly exposed to high fat, high sodium, energy dense foods (Warren, Henry, Lightowler, Bradshaw, & Perwaiz, 2003). The increased consumption of these foods along with the decline in spontaneous physical activity leads to weight gain. The modern lifestyle of children and adolescents allows more opportunities to be sedentary and fewer demands to be physically active, leading to the current decline in physical activities such as youth sport participation (Topp et al., 2009). Mitchell, Pate, Beets, and Nader (2013) recently found that spending more time in sedentary behavior was associated with greater increases in BMI from ages 9-15 years at the 50th BMI percentile and above. Not only are sedentary behaviors an issue, the amount of required physical education (PE) classes and physical activity opportunities for children and adolescents have significantly decreased (Annesi, Westcott, Faigenbaum, & Unruh, 2005). Despite the research that suggests children are less physically active, schools are becoming increasingly more concerned about meeting academic standards, leaving little time for physical activity during the school day. Physical Education classes can provide up to 8-11% of a child’s physical activity; however, only a few states require daily PE
classes (Beets, Beighle, Erwin, & Huberty, 2009). By combining all of these factors, it is evident
that the childhood obesity epidemic will only worsen without interventions designed to
counteract these trends.

**Physiological and Psychosocial Consequences of Obesity**

Obesity has been shown to have negative implications both from a physiological and
psychological context. Physiological consequences include cardiovascular disease risks, insulin
resistance, and earlier maturation, of which the latter may be connected to lower self-esteem
(Dietz, 1998). Being overweight or obese as a child can lead to an amplified threat of premature
death, stroke, cancer, heart disease, Type 2 diabetes, and several other health repercussions such
as sleep apnea, high blood pressure, high blood lipids, bone and joint problems, and depression
in adulthood (Wang et al., 2008). Preventing overweight/obesity in childhood has the potential to
ameliorate the health related complications as well as diminish the risks of type II diabetes and
cardiovascular disease in individuals who achieve normal weight by adulthood (Rappaport,
Daskalakis, & Sendecki, 2013). Children and adolescents with a high body mass index compared
to their peers are more likely to have multiple risk factors, excess adiposity and have a higher
risk of being obese as adults (Flores & Lin, 2013; Freedman, Mei, Srinivasan, Berenson, &
Dietz, 2007). A high BMI as an adult is strongly linked to chronic and nonreversible diseases
(Gonzalez-Suarez, Worley, Grimmer-Somers, & Dones, 2009). The Bogalusa Heart Study
evaluated the relation of BMI for age to the grouping of multiple CHD risk factors. The
researchers found that the percentage of kids with at least 2 (of 5) risk factors spiked from 5% to
59% with increasing body mass index (Freedman & Sherry, 2009). A study by Burke, Beilin,
Dunbar, & Kevan (2004) showed that being overweight for ages 14-19 years old is associated
with an increased likelihood of premature mortality from chronic diseases after age 30 years.

In addition to the physiological consequences, the most prevalent consequences of
childhood obesity are psychosocial in nature (Dietz, 1998). Potential effects include widespread
discrimination, negative stereotypes, body image issues, progressive withdrawal, low self-
esteeem, depression, and social rejection by peers (Daniels, 2006; Dietz, 1998). Of these
psychosocial consequences, childhood depression has been found to contribute to an increased
risk of overweight and obesity in adulthood (Benson, Williams, & Novick, 2013). DiLorenzo,
Stucky-Ropp, Vander Wal & Gotham (1998) examined the impact of psychosocial factors on
physical activity and found that physical activity levels in boys and girls were consistently predicted by enjoyment of the activities. As the children grew older, the social learning variables changed in both boys and girls, with boys participating in physical activity due to additional family and peer social support, self-efficacy for physical activity, and increased physical activity knowledge. Social support was also important to girls, while self-efficacy for physical activity was found to be the only positive predictor in their physical activity participation (DiLorenzo et al., 1998). Boys may possess higher expectations for success in sports and physical activity due to a more male dominant gendered learning context in physical education. These gender stereotypes may form at an early age (Welk & Eklund, 2005). Raustorp, Mattsson, Svensson, and Stahle (2006) found similar results. Perceived physical self-esteem in girls and BMI level in boys was the most important predictor for a healthy lifestyle in the Swedish adolescent participants. These studies support the promotion of physical activity as a tool for increasing and maintaining physical self-esteem in adolescents.

Social cognitive theory recognizes that a part of self-motivation is goal-setting, and that this allows people to regulate and monitor their behavior and to compare their short-term goals, successes and failures with their long-term goals (Bandura, 1989). Goals should be specific, attainable but challenging and flexible, and attainable sub goals should lead into larger long-term goals (Bandura, 1982; Watson and Tharp, 1977). Self-evaluation may also be seen as highly motivating, as personal standards must be created so as to compare and evaluate one’s performance, and to achieve personal satisfaction based on a certain level of performance (Bandura, 1982). Self-evaluation further develops self-efficacy beliefs, as one is able to evaluate their abilities in achieving their goals (Bandura, 1982; Williams & French, 2011). McAlister, Perry, & Parcel (2008) proposed that self-efficacy has become so often associated with behavior change that research in determinants of behavior may no longer be considered complete without it. Dishman et al. (2005b) looked at self-management strategies in relation to physical activity in both sixth and eighth grade girls. The researchers proposed that girls with higher self-efficacy would perceive fewer barriers to physical activity, thus they would be more likely to pursue their goals due to positive expected outcomes, and be more likely to enjoy physical activity (Dishman et al., 2005b). The self-management measures included scales with cognitive and behavioral items, such as “I say positive things to myself about physical activity” and “I do things to make
physical activity more enjoyable” (Dishman et al., 2005b). Their results showed that self-efficacy had direct effects on physical activity in 6th grade girls, and indirectly on 8th grade girls, and that self-management strategies directly affected the relationship between self-efficacy and physical activity (Dishman et al., 2005b).

Physical self-perception is correlated with the degree of participation in physical activity and fitness. Perceived sports competence mediates the relationship between childhood skill proficiency and adolescent physical activity and fitness (Barnett, Moran, van Beurden, & Beard, 2008). Research has found that obese children and adolescents, specifically girls, report lower self-esteem, greater concern for body image, and higher somatization complaints than normal weight children (Benson, Williams, & Novick, 2013). It is plausible that a higher BMI inhibits motivation and/or activity levels in these children. Overall, the best psychosocial and mental health is experienced by normal-weight children and the worst by obese children. Overweight and obese adolescents report poorer global health, greater primary health care needs, and have a higher prevalence of wheezing/asthma than children of normal weight (Wake et al., 2013). Any deviation from normal weight is linked to changes in health in children and adolescents (Wake et al., 2013).

The dramatic rise of overweight children and adolescents has led policy makers to rank it as a critical public health threat (Wang et al., 2008). One way to combat the increasing prevalence of the childhood obesity epidemic is to introduce physical activity into the daily routines of children and adolescents. The physical activity guidelines for children and adolescents as defined by the Centers for Disease Control & Prevention (2008b) are supported by various researchers (Strong et al., 2005), and include one hour of moderate and/or vigorous physical activity each day. Muscle-strengthening, bone-strengthening, and aerobic physical activity is recommended at least three days a week.
After School Based Interventions for Children

Numerous intervention programs have been tested on various age groups and in various settings. The results of these studies are difficult to compare for a variety of reasons: many different methodologies, study durations, length of follow-ups, body mass index (BMI) cut points, and other outcome measures. Additionally, race/ethnicity, genetic factors, birth weight, socioeconomic status, geography, physical activity participation/opportunity, and timing of maturation may influence the tracking of childhood obesity (Freedman & Sherry, 2009). Because there are so many variables to consider, there is not a “one size fits all” intervention program that is capable of impacting obesity in youth. Many studies have examined physical activity, nutrition education, physical fitness, and body composition yet there is limited research on the impact of afterschool-based physical activity interventions on anthropometric characteristics, physical fitness components, and psycho-social (e.g., self-efficacy) attributes in overweight 4th and 5th grade students.

A potential solution to the lack of physical activity during the school day is to implement after-school intervention programs aimed at increasing physical activity. Schools are an ideal setting because the vast majority of children attend school. The location provides an existing facility that is functional. Personnel, activity opportunities, and parental and community involvement are also available to aid in the promotion of physical activity (Beets, Beighle, Erwin, & Huberty, 2009). Often times, schools are not used after school hours which provides the perfect opportunity to use the location efficiently. The organization Afterschool Alliance conducted a survey “America After 3pm”, and found that more than a million children in grades one through five were unsupervised at home after school hours (Afterschool Alliance, 2004). A safe alternative to unsupervised activity is the availability of after school programs. Fifteen percent or almost three million children in grades one through five participate in afterschool programs, with an estimated total of 6.6 million children involved in afterschool programming. An additional 22 million families would participate in afterschool programs if they were available (Beets, Beighle, Erwin, & Huberty, 2009). The top three reasons for selecting an afterschool program were cost, convenience and enjoyment of program, with parents perceiving the benefits being improved physical health and wellness, improved social skills, academic
enrichment, staying safe and personal enjoyment (Afterschool Alliance, 2004). School-based programs are an “untapped resource” that may allow for specifically tailored interventions during a time when many children and adolescents do not have access to productive surroundings (Story et al., 2003). After-school programs have been used in both the prevention and intervention of childhood obesity through increased physical activity and nutrition awareness (Coleman, Geller, Rosenkranz & Dzewaltowski, 2008; Slawta, Bentley, Smith, Kelly & Syman-Degler, 2008; Story et al., 2003; Trost, Rosenkranz & Dzewaltowski, 2008).

The purpose of this study was to evaluate the physiological and psycho-social effects of an after-school program focused on increasing physical activity and physical fitness, promoting healthy eating by providing healthy snack options, and providing academic support to 4th and 5th graders. The overall hypothesis of this study is that measures of physical fitness and measures of physical self-efficacy will improve as a result of participation in the afterschool program. The results from this study will provide valuable knowledge about the potential physical fitness and psycho-social benefits of participation in an after-school physical activity and academic enhancement program designed specifically for 4th and 5th graders.

**Specific Aims**

Specific aims of this program are to:

1. Test whether measures of aerobic fitness and muscular fitness will improve as a result of participation in the fall (Year 1 and 2) twelve-week afterschool program.
2. Test whether measures of aerobic fitness and muscular fitness will improve as a result of participation in the fall through spring twenty-four week after school program.
3. Test whether measures of physical self-efficacy will improve as a result of participation in the fall twelve-week after school program.
4. Test whether measures of physical self-efficacy will improve as a result of participation in the fall and spring twenty-four week program.
5. Determine if BMI changed after the fall session or after both the fall and spring sessions.
6. Determine if there is a relationship between an increase in physical fitness and physical self-efficacy for boys and girls.
Method

Participants

This study was approved by Miami University’s Institutional Review Board. The children eligible to participate in the study were currently enrolled in either the 4th or 5th grades at an elementary school in Cincinnati, Ohio within the Princeton City School District. The participants were recommended to join the program by the elementary school physical education teacher, the principal, and other teachers in the building based on their performance in their physical education classes, as well as their performance during the FITNESSGRAM battery of assessments as part of the district’s physical education curriculum. Students were recommended for participation in the program if they tested in the “Needs Improvement” category for BMI (e.g., overweight/obese) and/or for the PACER score (aerobic fitness). Consent forms (See Appendix B) were sent through the school to the parents, signed and returned in order for the students to participate in the study. A parent/guardian was required to fill out emergency contact information, any health concerns or food allergies, as well as other adults who were permitted to pick up their child from the afterschool program (This information was part of the Princeton City School District procedures). The designated guardian was required to sign-out the child each time they attended the afterschool program. All subjects participated strictly on a volunteer basis. Participants of the after-school program were given a verbal description of the study (See Appendix C). Year one of the program (2010-2011 school year) consisted of twenty 4th and 5th graders who participated in the study, including fourteen males (10.2 ± 0.9 years) and six females (9.8 ± 0.8 years). Year two (2011-2012 school year) consisted of twenty-three (9.73 ± .54 years) 4th and 5th graders who participated in the study, including fifteen females and eight males. Subjects were split into four groups, based on the start date of their participation in the program. Group 1 (n=10) participated from October 2010 to December 2010, Group 1a (n=9) participated from October 2010 to April 2011, and Group 2 (n=9) participated from January 2011 to April 2011. Group 2a (n=23) participated from September 2011 to April 2012. Overall, due to drop out, 40 participants were analyzed in this study. Of the 40 participants, 23 individuals participated in the entire program.

The program was administered in the school gymnasium along with a classroom used for the academic enhancement part of the program.
Procedure

The primary objectives of the program were to evaluate the physiological and psychosocial effects of an after-school program focused on providing structured physical activity time, academic support, and a healthy snack.

YEAR 1

Miami University undergraduate and graduate students underwent training to lead the program activities and help with individual and small group academic support. These students participated in the after-school program through independent study, a special topics course, or a service learning course. The program staff was organized into two areas: Kinesiology and Health students who lead the organized physical activities, created the healthy snacks, and provided additional support during the academic part of the program, and Service Learning students recruited through other departments who tutored and also assisted with physical activities. Prior to the start of the program, all Miami University students were trained in designing and leading group exercises for children, appropriate behavioral procedures, snack development, goal setting with the children, and the procedures for parents picking up their children. At least three Kinesiology and Health students and two Service Learning students attended the program each time to ensure at least a 4:1 ratio of children to staff members. The program was broken into several components: organized physical activity, a healthy snack, academic time, and a second physical activity time. Organized physical activities occurred during the first thirty minutes, focusing on games the participants were familiar with, as well as new games, relay races and obstacle courses designed to improve their cardiovascular endurance. A healthy snack and water were provided during the next ten minutes, followed by twenty-five to thirty minutes of homework or reading time. Subjects who did not have homework or other academic materials were provided with grade appropriate worksheets for math and/or reading. The materials were provided by the subjects’ teachers and/or Miami University students based on teacher recommendations. The last twenty minutes were structured “physical activity time” where children were split into small groups and participated in activities of their choosing. The last five minutes were a cool-down, with Miami University students leading various stretching exercises. Small incentives for program participation were handed out as subjects were leaving the program (wrist bands, pencils, erasers, etc.).
The incentives used in the program had three levels. The first level was a daily incentive where the subjects received (but were not limited to) one pencil, eraser, or wrist band at the end of each session. The second level was designed to incorporate the elementary school, where the subjects receive a coupon through the school that allowed them to pick out a prize, after they had spelled the word “Attendance” due to their attendance record. The third level occurred at the end of the program, where the participants received some form of sport equipment (pedometer, sports watch, etc.).

YEAR 2

From year one to year two, modifications were made to the program in order to deliver the program more efficiently. During the first 25-30 minutes of each session, students cycled around 5 different stations, spending 5 minutes at each location. At each station, students were exposed to a different activity that triggered various muscle groups and components of the body. The stations used were recycled every day. These stations included: gross motor skill development (i.e., throwing/shooting), total body aerobic fitness activities, coordination/agility and flexibility activities (i.e., unidirectional movements), kicking/foot skills, multidirectional agility, vertical jumping, object jumping, and muscular fitness activities (i.e., upper body exercise, and lower body exercise). Following the stations, students were taken to a class room to receive a snack and work on homework. The allotted time was 30 minutes. All students were required to complete their assignments or were given additional worksheets. Additional worksheets consisted of math problems that were at the level of the student. Snacks were healthy alternatives that varied from fruit to yogurt and granola. After academic enhancement/snack time, students were taken back to the gymnasium for the final activity (25-30 minutes). The final activity consisted of a game involving all the students. This activity time was meant to keep students engaged with their peers while remaining physically active; an emphasis was placed on high-intensity aerobic activities to maximize energy expenditure. Common games that were used included various tag games, dodge ball, and other team-based games. Group leaders joined the students to encourage participation.
Measures

Physical fitness assessments were performed at baseline and post intervention time points. There was a pre-test in September of 2010, a post-test in December of 2010, a pre-/mid-test in January of 2011, a post-test in April of 2011, a pre-test in September of 2011, and a post-test in April of 2012. The mean values for weight and height were used to calculate BMI. BMI (kg/m²) is a measure of weight relative to height rather than adiposity (Freedman & Sherry, 2009).

To assess physical fitness, the FITNESSGRAM program was used. The FITNESSGRAM physical fitness assessment program is designed to assess health-related components of physical fitness including: cardiovascular (aerobic) fitness, body composition (body mass index; a proxy measure of body composition), muscle strength, muscular endurance and flexibility. The program is intended for children ages 5 and up, with formal testing beginning in the 4th grade, and has shown consistently high reliability (Welk & Meredith, 2008).

The fitness assessments were conducted during the first and last weeks of the after-school program, lasting no more than forty minutes for each session. Participant height and weight was measured without shoes using a portable stadiometer (measured in centimeters) and a digital scale (Secca Model 815; measured in kilograms). For the other fitness tests, participants were allowed two form corrections while performing each test, where the first one was a warning and the second one ended their fitness test. The PACER (Progressive Aerobic Cardiovascular Endurance Run) test is a 20-meter multistage shuttle run test designed to test aerobic fitness that involves walking/running back and forth to music or beeps on a CD. The beeps indicated when to start and stop walking/running, and increase in pace each minute (Plowman, 2008). Children completed as many laps as possible or until they could not maintain the pace of the test.

The curl-up assessment tested for abdominal strength and endurance, with a maximum of 75 curl-ups possible. Subjects used a measuring strip, where their fingertips were touching the top of the measuring strip when they were in the supine position, and slid their fingers over it to the other end when they were in the “up” position. The width of the measuring strips was dependent on the age of the participants. Potential form corrections included staying with the cadence, heels remained in contact with the mat, the head returned to the mat and fingertips touched the far side of the measuring strip (Plowman, 2008).
The 90 degree push-up test assessed upper body strength and endurance, and was performed on mats to an automated recording on a CD. Subjects were required to stay with the cadence, achieve a 90 degree angle with their arms, maintain the correct body position (flat back, knees straight) and fully extend their arms (Plowman, 2008).

The Back Saver Sit and Reach Test was used to assess the flexibility of the hamstring muscles, and was considered safer than the traditional Sit and Reach test due to reduced flexion of the trunk. The procedure involved testing flexibility in one leg at a time, without shoes, by placing one foot flatly against the apparatus, extending the leg, with the other leg flexed and the foot flat on the ground. Hands were placed one over the other, and the subject was encouraged to extend their arms, and slide their palms along the measuring scale, to be repeated three times before switching legs (Plowman, 2008). The children were familiar with the FITNESSGRAM physical fitness test battery as this test was used in their physical education classes; the FITNESSGRAM was first introduced in the 3rd grade and was administered in the Fall and Spring of each academic year. The FITNESSGRAM was administered to the children in the program at either the beginning of the program (Winter/Spring semester) or the end of the program (Fall) as the FITNESSGRAM was administered by the physical education teacher as part of regular physical education class activities.

The Children and Youth’s Physical Self-Perception Profile (CY-PSP) was developed to assess perceptions of the participants’ physical competencies (Whitehead, 1995). The subscales used in this particular survey included body attractiveness, physical self-worth, global self-worth and perceived scholastic competence, of which the latter subscale was taken from Harter’s original scale (Harter, 1982). As the program partially focused on academic enhancement, it was appropriate to measure perceived scholastic competence as well. Body Attractiveness is a measure of body image, or how kids perceive their physical attractiveness; Global Physical Self-Worth describes overall perception of physical selves; Global Self-Esteem describes overall perception of their total selves; and Perceived Academic Competence focuses on perceptions of academic abilities (Whitehead, 1995; Harter, 1982). Each subscale contained six closed-format questions, for a total of twenty-four questions. Each question was scored from 1 – 4, with “1” being low perceived competence, and “4” being high perceived competence. All six questions from each subscale were added together and then divided by the number of questions to obtain
the total score for each subscale. Survey questions were designed to provide participants with two statements (Ex: Some kids like to play outdoors, BUT other kids like to watch T.V.). Participants then decided if they were more like the children from the first statement or from the second statement. A final decision was if the statement they had chosen was “Sort of true for me” or “Really true for me”. Participants marked one response option per question. Internal consistency for the subscales was examined by Eklund, Whitehead & Welk (1997) and produced coefficients ranging from .77 to .91. Attached to the CY-PSPP were two individual four item Likert scales, “What I think about physical activity, games and sports”, and “What I think about myself”. The scales were adapted from original scales created to assess elementary students in physical education settings (Gao, 2009; Xiang, McBride, Guan & Solomon, 2003; Xiang, McBride & Bruene, 2004). The adapted scales related to the physical activity context, asking about the subjects’ views of physical activity, and their perceptions of their abilities in the physical activity context. An example question was “How important do you think it is to be physically active?” Response options included (1) Not at all important, (2) Not so important, (3) In between, (4) Sort of important and (5) Very important.

The Children and Youth Perceived Importance of Physical Competence Profile (CY-PIP) was administered in order to determine the importance of certain physical aspects to each child. This test usually accompanies the CY-PSPP assessment. A total of 8 questions were present on the questionnaire, examining sport/athletic competence importance, condition/stamina competence importance, attractive body importance, and strength competence importance. In this questionnaire, reverse coding was once again employed. In addition, each question was scaled out of four points. A higher point value was designated as high perceived importance (Whitehead, 1995). All questionnaires were administered during the academic support time of the after-school program, on the first and last week of the program, lasting no more than thirty minutes.

Exposure to the program was determined by attendance. Attendance was recorded for each student at the beginning of each session of the program. A parent/guardian was required to sign each participant out at the end of the session. Taking attendance and time of departure was one way to monitor exposure to the program. Across studies, attendance rates have been found to be positively associated with program outcomes related to physical fitness and body
composition, suggesting that greater exposure to after-school programs is related to improved outcomes (Beets et al., 2009).

**Results**

The purpose of this study was to evaluate the physiological and psychosocial effects of an after-school program focused on increasing physical activity and physical fitness, promoting healthy eating by providing healthy snack options, and providing academic support to 4th and 5th graders. The overall hypothesis of this study was that measures of physical fitness and measures of physical self-efficacy would improve as a result of participation in the after-school program. Furthermore, it was hypothesized that any increases observed in children's physical fitness scores as a result of their participation in the after-school program would be linked to increases in their physical self-efficacy.

**Preliminary Analyses**

A series of one-way MANOVAs were conducted to compare the pre scores of children who completed the fall semester only and those who completed the spring semester only as well as to compare children across the two years. Dependent variables for the first analysis were physical anthropometry scores (height, weight, and BMI). Dependent variables for the second analysis were physical fitness scores (curl up, push-up, flexion, and PACER). Dependent variables for the third analysis were psycho-social well-being scores (perceived sport competence, perceived stamina, perceived physical attractiveness, perceived strength competence, physical self-worth, and global self-worth). The results of the preliminary analyses indicate no significant differences between the fall and spring participants or between the two different years at the pre time point. Thus, the groups were combined for all subsequent analyses.

**Descriptive Results**

Descriptive statistics (means and standard deviations) for all physical anthropometry, physical fitness, and psycho-social well-being variables for the pre and post time points are presented in Tables 1 to 3. Examination of pre- and post-score means indicate that this group of children, according to criterion-referenced standards, is in the needs improvement category for BMI and in the healthy fitness zone for flexibility, PACER, curl-ups, and pushups. However, the standard deviations also show that there was considerable variability within the sample in their physical anthropometry and psycho-social well-being status at both the pre and post time points.
Table 1. Descriptive statistics on physical anthropometry (n = 23).

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<th>Pre Mean ± SD (Min to Max)</th>
<th>Post Mean ± SD (Min to Max)</th>
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<tr>
<td>Height (m)</td>
<td>1.26 ± .45 (1.0 to 2.0)</td>
<td>1.30 ± .44 (1.0 to 2.0)</td>
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<tr>
<td>Weight (kg)</td>
<td>43.04 ± 16.0 (24.0 to 87.0)</td>
<td>44.06 ± 15.7 (25.0 to 90.0)</td>
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<tr>
<td>BMI</td>
<td>20.35 ± 5.3 (15.0 to 34.0)</td>
<td>20.49 ± 5.0 (15.0 to 34.0)</td>
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Table 2. Descriptive statistics on physical fitness (n = 23).

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<th>Performance variables</th>
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<th>Post Mean ± SD (Min to Max)</th>
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<tbody>
<tr>
<td>Flexibility, R</td>
<td>10.78 ± 3.6 (5.0 to 20.0)</td>
<td>10.23 ± 2.1 (7.0 to 16.0)</td>
</tr>
<tr>
<td>Flexibility, L</td>
<td>10.65 ± 3.6 (6.0 to 20.0)</td>
<td>10.13 ± 1.9 (6.0 to 14.0)</td>
</tr>
<tr>
<td>PACER (# of laps)</td>
<td>19.00 ±11.0 (5.0 to 49.0)</td>
<td>21.09 ± 9.9 (9.0 to 45.0)</td>
</tr>
<tr>
<td>Curlups (#)</td>
<td>25.00 ± 17.7 (2.0 to 80.0)</td>
<td>46.78 ± 23.3 (14.0 to 80.0)</td>
</tr>
<tr>
<td>Pushup (#)</td>
<td>9.22 ± 6.0 (2.0 to 23.0)</td>
<td>11.05 ± 7.8 (3.0 to 28.0)</td>
</tr>
</tbody>
</table>

Table 3. Descriptive statistics of the CY-PSPPP questionnaire (n = 40).

<table>
<thead>
<tr>
<th>CY-PSPPP Components</th>
<th>Pre Mean ± SD (Min to Max)</th>
<th>Post Mean ± SD (Min to Max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Sport/Athletic</td>
<td>2.88 ± .61 (2.0 to 4.0)</td>
<td>2.93 ± .76 (1.0 to 4.0)</td>
</tr>
<tr>
<td>Competence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Condition/Stamina</td>
<td>2.82 ± .55 (2.0 to 4.0)</td>
<td>2.94 ± .69 (2.0 to 4.0)</td>
</tr>
<tr>
<td>Competence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Attractiveness</td>
<td>2.86 ± .71 (1.0 to 4.0)</td>
<td>2.93 ± .78 (1.0 to 4.0)</td>
</tr>
<tr>
<td>of Body</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Strength Competence</td>
<td>2.81 ± .66 (1.20 to 4.0)</td>
<td>2.95 ± .87 (1.0 to 4.0)</td>
</tr>
<tr>
<td>Physical Self-Worth</td>
<td>2.97 ± .59 (1.67 to 4.0)</td>
<td>3.26 ± .68 (2.0 to 4.0)</td>
</tr>
<tr>
<td>Global Self-Worth/Self-esteem</td>
<td>3.20 ± .69 (1.50 to 4.0)</td>
<td>3.47 ± .66 (2.0 to 4.0)</td>
</tr>
</tbody>
</table>
Main Study Results

To determine whether children who participated in the 12 week program exhibited any changes from pre to post-program, a series of three 2x2 (gender by time) mixed model MANOVAs were conducted. For all 3 MANOVAs, the between-subjects factor was gender (boys and girls), and the within-subjects (repeated) factor was time (pre-program and post program). The results of these analyses are reported in the following sections.

Program Effects: Physical Anthropometry

For the first MANOVA, the dependent variables were physical scores of height, weight, and BMI. Because the results of the Box's $M$ test were significant, $M = 56.01$, $df = 21$, $p = .03$, indicating inequality of variances across cells, the main and interaction effects were examined using Pillai's Trace. These results showed that the gender main effect was not significant ($p=0.54$). The gender by time interaction effect was also not significant ($p=0.91$). The time main effect was significant, Pillai’s trace =0.52, $F (3, 19) = 6.90$, $p=0.00$, $eta^2=0.52$. Examination of the univariate F- values showed that height was significant, $F (1, 13)=13.45$, $p=0.00$, $eta^2=0.39$. Weight was significant, $F (1, 13)=9.18$, $p=0.01$, $eta^2=0.30$. BMI was not significant ($p=0.36$).

Examination of the pre and post height and weight scores in Table 1 indicates that both increased from Time 1 to Time 2 and that BMI did not.

Program Effects: Physical Fitness

For the second 2x2 (gender x time) MANOVA, the dependent variables were curl-ups, push-ups, PACER, flexibility R, and flexibility L. The results of this analysis indicated that the time by gender interaction effect was not significant ($p=0.49$). The gender main effect was significant, Pillai's Trace = .69, $F (5, 15)=6.80$, $p=0.00$, $eta^2=0.69$. The time main effect was also significant, Pillai's Trace=0.52, $F(5,15)=3.28$, $p=0.03$, $eta^2=0.52$. As a follow-up to the significant gender and time main effects, the univariate F-values were examined. These results are summarized in Table 4. As these results show, significant gender differences were found from pre- to post program for curl-ups and the PACER test with boys scoring higher on both tests than did the girls. Two other variables were close to significance ($p = .08$) suggesting a trend for boys to score higher than girls on push-ups and for the girls to score higher than the boys on the right leg back-saver sit & reach test; a measure of right hamstring flexibility.
The univariate F-values for the Time main effect indicate significant increases in physical fitness from pre to post time in two of the fitness measures: curl-ups and push-ups.

Table 4. Follow-up univariate F-values for gender and time main effects for physical fitness.

<table>
<thead>
<tr>
<th>Performance variables</th>
<th>Gender Main Effect F-value (eta²)</th>
<th>df=1, 19</th>
<th>Time Main Effect F-values (eta²)</th>
<th>df=1, 19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexibility, R</td>
<td>3.44 (0.15)*</td>
<td>.92 (0.05)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexibility, L</td>
<td>1.56 (0.08)</td>
<td>2.30 (0.11)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PACER</td>
<td>33.38 (0.64)***</td>
<td>.69 (0.04)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curlups</td>
<td>7.72 (0.29)***</td>
<td>12.06 (0.39)***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pushup</td>
<td>3.42 (0.15)*</td>
<td>2.94 (0.19)**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p<0.08, ** p<0.05, *** p<0.01

Program Effects: Psycho-Social Well-Being

For the third 2x2 (gender x time) MANOVA, the dependent variables were the six subscales from the CY-PSPP that measured children’s perceptions of their competence in several fitness domains and also their overall physical self-efficacy and global self-esteem. The results of this analysis revealed that the gender main effect was not significant (p=0.69). The time by gender interaction effect was also not significant (p=0.35). However, the time main effect was significant. Wilk’s lambda=0.70, F (6, 31)=2.86, p=0.04, eta²=0.42. The examination of univariate F-values, as seen in Table 5, showed that three of the variables showed significant changes across time: perceived sport/athletic competence, perceived condition/stamina competence, and overall physical self-worth. In addition, the global self-worth score approached significance (p = .08).

Table 5. Follow-up univariate F-values for time main effects for psycho-social well-being.

<table>
<thead>
<tr>
<th>Psychological variables</th>
<th>Time Main Effect F-values (eta²)</th>
<th>df=1, 36</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sport/Athletic</td>
<td>2.92 (0.19)**</td>
<td></td>
</tr>
<tr>
<td>Condition/Stamina</td>
<td>3.85 (0.28)***</td>
<td></td>
</tr>
<tr>
<td>Attractive Body</td>
<td>1.02 (.03)</td>
<td></td>
</tr>
<tr>
<td>Strength</td>
<td>1.38 (.05)</td>
<td></td>
</tr>
<tr>
<td>Physical Self-Worth</td>
<td>2.64 (0.16)**</td>
<td></td>
</tr>
<tr>
<td>Global Self-Worth</td>
<td>2.22 (0.09)*</td>
<td></td>
</tr>
</tbody>
</table>

* p<0.09, ** p<0.05, *** p<0.01
Interrelationships between Physical Fitness and Psycho-Social Well-Being Changes

In order to examine the relationship between changes over the course of the afterschool program in physical fitness and measures of psycho-social well-being scores, a series of change scores were calculated by subtracting the pre scores from the post scores. A higher change score indicates a greater change from pre to post intervention.

A series of bivariate correlational analyses were then run to determine the relationships between change in physical fitness and psychological well-being scores. Because gender differences were found in physical fitness scores, the correlations were run separately for boys and girls. The results of the correlational analyses for boys are presented in Table 6. As these results show, there were a number of significant correlations between the change scores for the two sets of variables. Specifically, perceived sport/athletic competence was significantly correlated with physical self-worth, push-ups, both flexibility scores, and PACER test. Perceived condition/stamina competence was significantly correlated with physical self-worth and the two flexibility scores. Perception of body attractiveness was correlated with global self-worth, and perceived strength competence was related to physical self-worth, curl-ups, push-ups, and the PACER test. As a general summary, these results show that for boys significant increases in their fitness scores from pre-to post-program were associated with corresponding increases in their perceptions of fitness competence as well as their overall physical self-worth.
Table 6. Correlations between physical fitness and psycho-social well-being change scores for boys.

<table>
<thead>
<tr>
<th></th>
<th>Perceived Sport/Athletic Competence</th>
<th>Perceived Condition/Stamina Competence</th>
<th>Perceived Body</th>
<th>Perceived Strength Competence</th>
<th>Physical Self-Worth</th>
<th>Global Self-Worth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Sport/Athletic Competence</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Condition/Stamina Competence</td>
<td>0.39</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Body Attractiveness</td>
<td>0.02</td>
<td>0.08</td>
<td>0.22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Strength Competence</td>
<td>0.07</td>
<td>0.05</td>
<td>0.22</td>
<td>0.29</td>
<td>0.49*</td>
<td></td>
</tr>
<tr>
<td>Physical Self-Worth</td>
<td>0.53**</td>
<td>0.51*</td>
<td>0.29</td>
<td>0.49*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global Self-Worth</td>
<td>0.08</td>
<td>0.21</td>
<td>0.62**</td>
<td>0.23</td>
<td>0.14**</td>
<td>-</td>
</tr>
<tr>
<td>Curls</td>
<td>0.12</td>
<td>0.02</td>
<td>0.47</td>
<td>0.69**</td>
<td>0.65**</td>
<td>0.07</td>
</tr>
<tr>
<td>Pushup</td>
<td>0.75**</td>
<td>0.25</td>
<td>0.07</td>
<td>0.59**</td>
<td>0.08</td>
<td>0.35</td>
</tr>
<tr>
<td>Flexibility, R</td>
<td>0.52*</td>
<td>0.64**</td>
<td>0.45</td>
<td>0.08</td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td>Flexibility, L</td>
<td>0.48*</td>
<td>0.77***</td>
<td>0.27</td>
<td>0.19</td>
<td>0.18</td>
<td>0.10</td>
</tr>
<tr>
<td>PACER</td>
<td>0.48*</td>
<td>0.21</td>
<td>0.04</td>
<td>0.59**</td>
<td>0.43</td>
<td>0.42</td>
</tr>
</tbody>
</table>

* p<0.10, ** p<0.05, *** p<0.01

The corresponding correlational results for girls are presented in Table 7. As these results show, increases in perceived sport/athletic competence were related to increases in both flexibility scores while increased perceptions of condition/stamina were correlated with increases in curl-ups and push-ups. Enhancement of perceived body attractiveness was related to overall physical self-worth as well as increases in push-up scores. Overall, physical self-worth changes were related to increases in push-ups and both flexibility scores. Again, these results show that for the girls, increased physical fitness from pre to post afterschool program involvement was associated with increased perceptions of competence and self-worth.
Table 7. Correlations between physical fitness and psycho-social well-being change scores for girls.

<table>
<thead>
<tr>
<th></th>
<th>Perceived Sport/Athletic Competence</th>
<th>Perceived Condition/Stamina Competence</th>
<th>Perceived Attractive Body</th>
<th>Perceived Strength Competence</th>
<th>Physical Self-Worth</th>
<th>Global Self-Worth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Sport/Athletic Competence</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Condition/Stamina Competence</td>
<td>0.31</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Body Attractiveness</td>
<td>0.10</td>
<td>0.07</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Strength Competence</td>
<td>0.26</td>
<td>0.27</td>
<td>0.20</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Self-Worth</td>
<td>0.09</td>
<td>0.08</td>
<td>0.48*</td>
<td>0.03</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Global Self-Worth</td>
<td>0.08</td>
<td>0.12</td>
<td>0.08</td>
<td>0.06</td>
<td>0.06</td>
<td>-</td>
</tr>
<tr>
<td>Curlups</td>
<td>0.43</td>
<td>0.53*</td>
<td>0.00</td>
<td>0.11</td>
<td>0.01</td>
<td>0.42</td>
</tr>
<tr>
<td>Pushup</td>
<td>0.30</td>
<td>0.46*</td>
<td>0.58**</td>
<td>0.07</td>
<td>0.62**</td>
<td>0.23</td>
</tr>
<tr>
<td>Flexibility, R</td>
<td>0.68***</td>
<td>0.14</td>
<td>0.43</td>
<td>0.03</td>
<td>0.61**</td>
<td>0.01</td>
</tr>
<tr>
<td>Flexibility, L</td>
<td>0.66***</td>
<td>0.26</td>
<td>0.34</td>
<td>0.06</td>
<td>0.51*</td>
<td>0.11</td>
</tr>
<tr>
<td>PACER</td>
<td>0.15</td>
<td>0.31</td>
<td>0.17</td>
<td>0.35</td>
<td>0.05</td>
<td>0.29</td>
</tr>
</tbody>
</table>

* p<0.10, ** p<0.05, *** p<0.01

Categorical Change in Physical Fitness

To assess changes from pre to post intervention in the classification of ‘Healthy Fitness Zone’ or ‘Needs Improvement Zone’ for each of the FITNESSGRAM physical fitness assessments, a series of Wilcoxon Signed Ranks Test was used. These results are presented in Table 8. As indicated, there was a significant change in the number of program participants who were classified as either in the ‘Healthy Fitness Zone’ or ‘Needs Improvement Zone’ for three physical fitness assessment tests. Specifically, the number of children in the Needs Improvement category at the pre time point for curl-ups and flexibility left and right decreased significantly at the post time point and the number of children in the Healthy Fitness Zone category increased from the pre- to the post time point. Additionally, the results of these analyses suggested the
change in fitness categories for the PACER approached significance (p = .08) from the pre- to the post time point.

Table 8. Changes in fitness categories

<table>
<thead>
<tr>
<th>Fitness Variable</th>
<th>Pre-Categories</th>
<th>Post-Categories</th>
<th>Wilcoxon Z-Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>NI: n = 7</td>
<td>NI: n = 7</td>
<td>.00</td>
</tr>
<tr>
<td></td>
<td>HFZ: n = 16</td>
<td>HFZ: n = 16</td>
<td></td>
</tr>
<tr>
<td>Curl-Ups</td>
<td>NI: n = 5</td>
<td>NI: n = 0</td>
<td>-2.24**</td>
</tr>
<tr>
<td></td>
<td>HFZ: n = 18</td>
<td>HFZ: n = 23</td>
<td></td>
</tr>
<tr>
<td>Flexibility Right</td>
<td>NI: n = 7</td>
<td>NI: n = 2</td>
<td>-2.24**</td>
</tr>
<tr>
<td></td>
<td>HFZ: n = 16</td>
<td>HFZ: n = 21</td>
<td></td>
</tr>
<tr>
<td>Flexibility Left</td>
<td>NI: n = 6</td>
<td>NI: n = 2</td>
<td>-2.00**</td>
</tr>
<tr>
<td></td>
<td>HFZ: n = 17</td>
<td>HFZ: n = 21</td>
<td></td>
</tr>
<tr>
<td>PACER</td>
<td>NI: n = 5</td>
<td>NI: n = 2</td>
<td>-1.73*</td>
</tr>
<tr>
<td></td>
<td>HFZ: n = 18</td>
<td>HFZ: n = 21</td>
<td></td>
</tr>
<tr>
<td>Push-Ups</td>
<td>NI: n = 10</td>
<td>NI: n = 6</td>
<td>-.13</td>
</tr>
<tr>
<td></td>
<td>HFZ: n = 13</td>
<td>HFZ: n = 16</td>
<td></td>
</tr>
</tbody>
</table>

*p<.10, **p<.05

Assessment of Children Across a 24-Week Program

A small sample of children (n = 12) participated in two full semesters of the program. Specifically, these children started in the fall semester and continued through the spring semester. Thus, data was obtained across three time points for this group of children. To assess the degree to which changes occurred across this 24-week period, two repeated measures MANOVAs were conducted. For both of these analyses, the within-subjects (repeated) factor was time (pre-program, mid-way, post program). For the first analysis, the dependent measures were the three anthropometric variables (height, weight, BMI), and for the second MANOVA the dependent measures were the physical fitness performance scores (curl-ups, push-ups, two flexibility scores, and the PACER test). A corresponding analysis of the psycho-social well-being scores could not be conducted due to the small number of children who completed the final (post-program) questionnaires (n = 6).

The repeated measures MANOVA results for the anthropometric measures indicated a significant time main effect, Pillai's Trace = .51, F (6, 42) = 2.37, p = .05, eta2 = .25. Examination of the univariate F-values (see Table 9 for means, standard deviations, and univariate F-values) revealed that there was a significant effect for weight (p = .04) and a close to
significant effect for height ($p = .11$). For both height and weight, the within-subjects follow-up indicated linear increases, suggesting that the children as a group showed significant increases across all three timepoints. There was no significant time main effect for body mass index.

The repeated measures MANOVA results for the physical fitness performance scores indicated a significant time main effect, Wilk's lambda = .38, $F (10, 32) = 2.05$, $p = .05$, $\eta^2 = .38$. Examination of the univariate F-values (see Table 10 for means, standard deviations, and univariate F-values) indicates that there was a significant time effect for curl-ups ($p = .02$) and PACER scores ($p = .04$). Examination of the results of the within-subjects contrasts indicate that there was a linear increase for both variables, suggesting that children's scores increased significantly across all three of the timepoints.

Table 9: Descriptive statistics and univariate F-Values for time main effect

<table>
<thead>
<tr>
<th>Physical Index</th>
<th>Pre Mean ± SD</th>
<th>Mid-Way Mean ± SD</th>
<th>Post Mean ± SD</th>
<th>Time Main Effect F-values (eta²) df=2, 22</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height (m)</td>
<td>1.08 ± .29</td>
<td>1.15 ± .31</td>
<td>1.33 ± .49</td>
<td>2.42* (.18)</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>42.33 ± 15.96</td>
<td>42.95 ± 14.84</td>
<td>43.67 ± 15.14</td>
<td>3.81** (.26)</td>
</tr>
<tr>
<td>BMI</td>
<td>20.67 ± 5.31</td>
<td>20.61 ± 4.79</td>
<td>20.42 ± 4.40</td>
<td>.50 (.04)</td>
</tr>
</tbody>
</table>

*p<.12, **p<.05

Table 10: Descriptive statistics and univariate F-Values for time main effect: Physical fitness changes over a 24-week program

<table>
<thead>
<tr>
<th>Fitness Performance</th>
<th>Pre Mean ± SD</th>
<th>Mid-Way Mean ± SD</th>
<th>Post Mean ± SD</th>
<th>Time Main Effect F-values (eta²) df=2,20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curl-Ups</td>
<td>27.45 ± 22.15</td>
<td>48.36 ± 24.56</td>
<td>48.45 ± 28.22</td>
<td>4.78* (.32)</td>
</tr>
<tr>
<td>Push-Ups</td>
<td>9.00 ± 5.48</td>
<td>11.90 ± 8.58</td>
<td>9.27 ± 5.06</td>
<td>1.65 (.14)</td>
</tr>
<tr>
<td>Flexibility Right</td>
<td>11.09 ± 3.51</td>
<td>10.64 ± 2.29</td>
<td>10.00 ± 1.41</td>
<td>.96 (.09)</td>
</tr>
<tr>
<td>Flexibility Left</td>
<td>10.45 ± 3.11</td>
<td>10.09 ± 2.07</td>
<td>9.55 ± 1.51</td>
<td>.62 (.06)</td>
</tr>
<tr>
<td>PACER</td>
<td>18.27 ± 10.94</td>
<td>22.73 ± 10.32</td>
<td>25.55 ± 10.43</td>
<td>4.15* (.29)</td>
</tr>
</tbody>
</table>

*p<.12
Discussion

After-school programs are a potential resource to provide children with additional physical activity they are unable to obtain during the school day, along with opportunities for academic support and increased knowledge of healthy eating options. The purpose of this study was to determine if a tri-weekly after-school program, which focused on physical activity, healthy snacks and academic support, could positively influence physical fitness, self-esteem, and physical self-efficacy of fourth and fifth graders. The overall hypothesis of this study was that measures of physical fitness and measures of physical self-efficacy will improve as a result of participation in the after-school program. A diverse range of students enrolled in the 12-week after-school program, which was provided biannually to a suburban, public elementary school for two consecutive years. The participants were able to enter the program in the fall and in the spring. Some students chose to participate in both the fall and spring 12-week programs.

Physical fitness was determined using FITNESSGRAM testing. Physical self-efficacy was determined using the Children and Youth Physical Self-Perception Profile. Only those who had completed all questionnaires and physical testing were used in the statistical analyses of the data.

As shown in Table 1, there was no significant difference in physical anthropometry between the fall and spring participants at the pre time point. Therefore, the two groups were combined for all analyses (n=23). As indicated in Table 1, height and weight scores both increased from Time 1 to Time 2. However, the change in height, weight, and BMI was not significant. Although BMI did not significantly decrease, it did remain somewhat constant throughout the duration of the program and did not increase over time. These results are similar to the findings of the Minnesota GEMS study. Story et al. (2003) showed similar results in that no change was found in BMI in this study, despite a measured significant increase in moderate to vigorous physical activity in the participants.

Flexibility of the trunk and the number of completed curl-ups and push-ups, as seen in Table 2, significantly increased from pre-intervention to post-intervention and the increase in the PACER score nearly reached statistical significance for both males and females. Such increases are indicative of greater flexibility and upper body strength, particularly in the abdominal area. Additionally, although not statistically significant, both boys and girls did make improvements in the PACER.

Stretching during warm-ups and cool downs were part of each session of the
program, which explains the improvements in flexibility. The results of the physical fitness measures are similar to the findings of the Slawta et al. (2008) and the Be a Fit Kid study, which was similar in structure to this program. The results of these studies showed an increase in the number of sit-ups the participants were able to complete in one-minute, which was similar to this study, where both males and females increased the number of paced, curl-ups they could complete correctly, demonstrating an improvement in muscular endurance (Slawta et al., 2008). Additionally, Colchico, Zybert and Basch (2000) found significant increases in the 1 mile run, push-ups, curl-ups and flexibility in their twelve week pilot after-school program. These results are similar to the findings of this study as flexibility, curl-ups, and pushups increased significantly from pre to post intervention. Limited data exists on after-school programs measuring the components of health-related physical fitness; many studies have focused on the objective measurement of daily and/or weekly physical activity while the subjects participated in these types of after-school programs (Annesi, 2005; Coleman et. al, 2008; Kelder et. al, 2005; Trost, Rosenkranz & Dzewaltowski, 2008).

From the measures and analysis of the components of health-related physical fitness conducted in this study, the results indicate that the time by gender interaction effect was not significant. Therefore, the direction of change was similar for males and females. The data suggests that the afterschool intervention played a positive role in the increase in health-related physical fitness for the participants. However, the gender main effect and the time main effect were significant. Despite the positive change in physical fitness over time, males exhibited greater absolute levels of physical fitness than females for the paced curl-up and PACER test. These results are typical of this age group, as males have been shown to participate in more aerobic and strength requiring activities, leading to higher fitness levels (Barnett et al., 2008). The data suggests a trend for boys to score higher than girls on push-ups and for the girls to score higher than the boys on the right leg back-saver sit & reach test; a measure of right hamstring flexibility. These results are typical of this age group and the differences conform to sex characteristics. Previous researchers have found that over a three-year middle school period, absolute fitness scores increase faster among boys than girls in the PACER, curl-up, and push-up, whereas scores of girls increase faster than boys’ in estimated percent body fat, BMI, and sit and reach (Liu, Zillifro, & Nichols, 2012).
The univariate F-values for the Time main effect indicate significant increases in physical fitness from pre to post time in two of the fitness measures: curl-ups and push-ups. Farris, Taylor, Williamson, & Robinson (2011) found similar results in their interdisciplinary intervention program that was designed to improve the health of children who were obese. The researchers found that muscular strength and muscular endurance was improved as noted by the significant increases in both the push-up and curl-up performances of the children at the post intervention measurements. Keeping in mind that the children who participated in this study were involved with three 90 minute sessions of guided exercise per week for 12 weeks, it would seem that this amount of activity elicits measurable and significant gains in cardiovascular and muscular fitness.

Participation in this program had a positive impact on categorical change in physical fitness. Results indicate there was a significant change in the number of program participants who were classified as either in the ‘Healthy Fitness Zone’ or ‘Needs Improvement Zone’ for three physical fitness assessment tests. Specifically, the number of children in the Needs Improvement category at the pre time point for curl-ups and flexibility left and right decreased significantly at the post intervention time point while the number of children in the Healthy Fitness Zone category increased. Additionally, the results of these analyses suggested the change in the numbers of children who moved from the “NI” zone to the “HFZ” categories for the PACER approached significance (p = .08). Also, it should be noted that none of the participants regressed from the Healthy Fitness Zone to the Needs Improvement category with participation in this program. In 2012, Murray, Eldridge, Silvius, Silvius, & Squires conducted a study evaluating individual FITNESSGRAM performances in a cross-sectional analysis of 6th graders comparing baseline scores (year 1) with outcomes of a physical activity intervention in years 2 and 3. Similar to this study, the results indicate that the “FITNESSGRAM® Friday” intervention significantly increased the percentage of boys and girls that not only met HFZ standards, but exceeded them for pushups, curl ups, and the mile run. The FITNESSGRAM standards indicate levels of fitness necessary for good health; these are criterion-referenced standards that have established by “experts” in the fitness and medical fields. A score in the HFZ represents the level of fitness thought to provide some protection from the potential health risks that result from a lack of fitness in a particular measure (Welk & Meredith, 2008). The standards
reflect reasonable levels of fitness that can be attained by most children who participate regularly in various types of physical activity. The FITNESSGRAM program recommends that all participants should strive to achieve a score that places them inside the HFZ. Healthy Fitness Zones differ for boys and for girls, and they differ based on age. However, these are considered to be Health-Criterion referenced standards for U.S. children.

The Children and Youth Physical Self-Perception Profile (CY-PSPP) questionnaire was used to determine the competencies of students in physical aspects, such as sport, body attractiveness, strength, physical self-worth, and global self-worth. Physical self-worth was used to determine physical self-efficacy. The results of the CY-PSPP, as seen in Table 3, showed significant increases in perceived sport competence and perceived stamina competence. Increases in sport/athletic competence scores may indicate greater levels of comfort with sports and physical activity due to the physical activity intervention. Significant increases in physical self-worth indicate a positive change in physical self-efficacy for all participants due to the intervention. This increase in physical self-worth positively impacted the increase in global self-worth, which approached statistical significance. As students become more involved with activity, they may feel more comfortable with their own physical bodies and ability to perform physical tasks. This was further investigated due to a significant gender main effect for performance scores. The correlational data for boys indicate that changes in perceived sport competence, stamina, and strength significantly increase physical self-worth. Males also showed that a significant increase in body attractiveness influenced global self-worth. In contrast, an increase in body attractiveness for girls significantly increased physical self-worth.

Previous research supports this gender difference. Welk & Eklund (2005) found that boys may possess higher expectations for success in sports and physical activity due to a more male dominant gendered learning context in Physical Education classes. Raustorp et al. (2005) found that body attractiveness in girls and physical condition in boys is replaced by sport competence in both genders three years post intervention due to maturation. Taken together, the results from these studies support the findings obtained in the current study; that increases in perceived body attractiveness for girls and increases in perceived sport competence, strength, and stamina for boys were significantly correlated with increased physical self-worth, for girls and boys. Overall, the results from this study support the overall hypothesis; measures of physical fitness,
specifically flexibility, curl-ups, pushups and PACER scores, and measures of physical self-efficacy, specifically perceived sport competence, stamina competence, and physical self-worth, improved, for girls and boys, as a result of participation in the afterschool program.

The results also showed significant changes across time in perceived sport/athletic competence, perceived condition/stamina competence, and overall physical self-worth. In addition, the global self-worth score approached significance (p = .08). A study conducted by Raudsepp, Liblik, & Hannus (2002) found that specific components of physical self-perceptions are moderately related with both physical fitness and physical activity measures of health-related behavior in children and adolescents. The results showed that perceptions of sport competence and physical self-worth were the strongest predictors of moderate to vigorous physical activity and fitness in both sexes. Biddle et al. (1993) found that a measure of fitness (shuttle run) was moderately correlated with physical perceptions of sport competence, physical conditioning, and physical self-worth in British school children. In 2000, Crocker, Eklund, & Kowalski found that physical self-perceptions, especially conditioning and sport competence, are significant correlates of physical activity in 10-14 year old Canadian school children. Sport competence is likely to be influential in children’s exercise participation because of widespread involvement in organized sport in both elementary school system and outside sport club organizations (Raudsepp et al., 2002).

Lastly, examination of these data to determine if there was a relationship between the fitness variables and the psycho-social variables suggest that changes in, perceived sport/athletic competence was significantly correlated with physical self-worth, push-ups, both flexibility scores, and PACER test. Additionally, perceived condition/stamina competence was significantly correlated with physical self-worth and the two flexibility scores while perceived strength competence was related to physical self-worth, curl-ups, push-ups, and the PACER test. Collectively, these results show, for boys, a high change score in perceived sport/athletic competence and perceived condition/stamina competence was significantly correlated with physical self-worth. Perceived strength competence was related to physical self-worth. For the girls, increases in perceived sport/athletic competence were related to increases in both left and right flexibility scores while increases in perceptions of condition/stamina were correlated with increases in curl-ups and push-ups. Enhancement of perceived body attractiveness was related to
overall physical self-worth as well as increases in push-up scores. Similar results were found in Sweden where a controlled six month exercise intervention study was conducted on adolescent girls 13-20 years of age. Lindwall (2004) found that perceived physical condition and perceived body attractiveness increased significantly. Overall in this study, physical self-worth changes in the girls were related to increases in push-ups and both left and right flexibility scores. In general, regardless of gender, three variables showed significant changes from pre- to post-intervention: perceived sport/athletic competence, perceived condition/stamina competence, and overall physical self-worth. The significant changes in these variables indicate positive changes in perceptions of physical self-worth as evidenced by the significant improvement in physical self-efficacy. In addition, the global self-worth score approached significance. The connection between exercise and self-esteem has been reported in a meta-analysis of 37 randomized controlled studies and concluded that exercise is a valuable tool for increasing and maintaining physical self-worth and other physical self-perceptions (Fox, 2000). A positive effect on global self-esteem was only reported in half of the studies (Fox, 2000).

This study demonstrated that a relatively inexpensive program is effective in improving physical fitness and physical self-efficacy in elementary students, and can be used as a model for future programs. The correlational data for boys indicate that changes in perceived sport competence, stamina, and strength significantly increase physical self-worth. Males also showed that a significant increase in body attractiveness influenced global self-worth. In contrast, an increase in body attractiveness for girls significantly increased physical self-worth. The results identify an association between improving physical self-efficacy and physical fitness. The afterschool program provided an opportunity for self-evaluation and skill development, allowed children to increase their confidence in participating in physical activities in multiple contexts, and improved their overall belief in the importance of maintaining physical activity.

Study Limitations

A limitation of this study was the lack of a control group, which is necessary to protect against maturation effects, testing effects, and instrumentation effects. As a field-based study, an advantage to this research was that two different groups, year 1 and year 2, were measured throughout the course of the program, and were compared to see if differences occurred in physical fitness levels, physical self-efficacy, and global self-esteem. Results indicated
significant gender differences were found for muscular fitness (Paced curl-ups) and aerobic fitness (PACER) with boys scoring higher on both tests. Significant increases in physical self-worth indicate a positive change in physical self-efficacy for all participants due to the intervention. This increase in physical self-worth positively impacted the increase in global self-worth, which approached statistical significance. It is of importance to address possible issues with administration and participant comprehension of the CY-PSPP questionnaire. Such issues could potentially influence results of the study. In order to prevent the influence of others while taking the exam, students could take the questionnaires in a classroom setting, with each having a desk separate from their surrounding peers. Finally, further steps need to be taken to ensure that all of the students enrolled in the afterschool program complete all of the pre- and post-tests. Out of the students enrolled within the program, students could not be included within the statistical analyses due to the lack of pre-intervention and/or post-intervention physical tests and/or CY-PSPP and CY-PIP assessments. By performing the physical fitness tests and physical competency questionnaires multiple times throughout the intervention, all participants may be more likely to complete all aspects of assessment.

A benefit of this program was that it was free for the participants, and provided physical activity, a healthy snack, and time devoted to academics. The average attendance rate for this program was 74.1% (SD=16.8) with no significant difference in attendance between males and females. The high attendance rate strengthens conclusions that the intervention played a pivotal role in inducing changes in physical fitness and physical competency levels, as measured by the CY-PSPP and CY-PIP. Previous studies indicate a dose-response effect due to high attendance levels, indicating an attendance rate of 40% or more show greater improvement in physical fitness compared to control students (Beets et al., 2009). High attendance rates (>70%) in the Youth Fit for Life 12-week physical activity program were positively associated with improvement in physical variables (Annesi & Westcott, 2005). The high attendance rate (74.1% (SD = 16.8)) during both years of the program suggests that the program was well liked by both the participants and their parents. A second benefit was that over a short period of time, significant improvements in physical fitness performance scores were made.
Future Directions

Further studies need to be performed that include a larger number of participants and a longer intervention. Tailoring the program by gender and age may further facilitate the increase in physical self-worth. As the results indicate, positive changes in perceived sport competence, stamina, and strength can significantly increase physical self-worth in boys. A significant increase in body attractiveness in males can also influence global self-worth. Positive changes in body attractiveness can significantly increase physical self-worth in girls. In addition, studies should be performed with a control group by administering the questionnaires and fitness tests to students not enrolled in the after-school physical activity/academic enhancement program. The control group should be similar in age, ethnicities, in a similar school and geographical region, with the same amount of exposure to physical activity (number of PE classes), and with similar socio-economic statuses. Longitudinal designs examining the development of physical self-perceptions over time would be particularly helpful since they would reveal how changes in physical activity and changes in physical fitness influence a child’s perceptions. Follow-up studies appear to be necessary in order to better understand the effectiveness and long-term effects of after-school interventions on physical fitness, self-esteem, and physical self-efficacy as maturation occurs and the participants enter adulthood. Such studies could further highlight the importance of physical activity after school programming for elementary school-aged children.
References


Williams, S. L., & French, D. P. (2011). What are the most effective intervention techniques for changing physical activity self-efficacy and physical activity behaviour--and are they the same?. *Health Education Research, 26*(2), 308-322. doi: 10.1093/her/cyr005

Appendix A: Parent Consent Form

Fitness and Fun After-school Physical Activity and Academic Enhancement Program

Dear Parent/Guardian,

Your child has been asked to participate in a research study described below. Before agreeing to take part in the study, please read the entire form. If you have any questions, please ask Elizabeth Gleason, the primary person responsible for this study (gleasoea@muohio.edu, 513-378-6249).

The purpose of this study is to gather information about the Fitness and Fun after-school program through your child’s participation. This will be done by conducting fitness testing. As we would like to improve this program, you and your child will be asked to evaluate the program each week.

The research procedures of this study will require your child to be between 8 and 12 years old. The program will run Monday, Wednesday and Friday from 4pm - 5:30pm for twelve weeks, except on holidays or school days off. Participants will take part in both organized and free time physical activity, and will be provided a healthy snack and water. Academic time with tutors will also be provided. FITNESSGRAM testing will occur twice as part of your child’s regular Physical Education curriculum, administered by the Physical Education teacher. The researcher will evaluate the results of these assessments, once during the first week and once during the last week of the program, with height, weight, the back-saver sit and reach, the PACER test, curl-ups and push-ups all being recorded, the same procedures your child has done during physical education classes. Your child’s Physical Education teacher will also administer the FITNESSGRAM tests at the beginning and end of each semester during class time, as part of the regular Physical Education curriculum. The duration of the fitness testing will be no longer than forty minutes for each testing period. Your child will also be asked to evaluate the program, by rating the different activities, snacks and interactions with staff each week. Your child will be identified using stickers only; his/her evaluations will be kept anonymous and confidential. Your child’s participation in the evaluations, surveys and fitness testing are strictly voluntary.

There is no attendance requirement for this program. The duration of each program session is ninety minutes, three days a week (Monday, Wednesday and Friday) for twelve weeks, and participants may leave with a parent/guardian at any time during the program. Participation and attendance are completely voluntary.

The risks and discomfort in this study are minimal, although your child may feel tired after participating in physical activity, or feel embarrassed when answering survey questions. Your child may skip any question they do not feel comfortable answering at no penalty. The benefits of this study may include possible improvement in FITNESSGRAM scores, along with potential health benefits and confidence in their physical activity skills. Records containing your child’s
survey answers and FITNESSGRAM scores will be kept strictly confidential. Your child’s name will not be associated with his/her responses.

Participation is voluntary; your child does not have to participate in this study and has the right to refuse to answer any question, with no penalty or loss of benefits. If you do not wish for your child to participate in the study, he/she will still be able to participate in the Fitness and Fun after-school program. Participation in this study is not expected to cause injury or harm you in any way. If you are injured, please contact Dr. Randal Claytor at (513) 529 – 5815.

In addition, we would like to ask you to participate by quickly evaluating the program each week. You will be given a short form each Friday, where you will be asked to rate different components of the program (activities, snacks, homework). You may fill out the form at home and return it the next week to the researcher. Your participation is voluntary, and if you do not wish to participate there will be no loss of benefits to your child’s participation in the program. You may refuse to answer any question and can stop participating at any time. Your child will also be filling out evaluation forms. You will be given a sticker on your form each week, the same one as your child. You will be identified by sticker type only; your information will be anonymous and kept strictly confidential.

We will also be asking your child’s teacher to evaluate their students participating in the “Fitness and Fun” program in general. Questions include asking teachers to compare overall mood and energy levels, attentiveness, class attendance and homework completion prior to entry into the “Fitness and Fun” after-school program. Your child will not be evaluated by his/her teacher individually. These evaluations will be kept anonymous and confidential as teachers will only be identified by grade level.

If you have any questions about the study, you can contact Dr. Randal Claytor at (513) 529-5815 or through e-mail at claytorp@muohio.edu. If you have questions about your rights as a research participant, you can contact the Office of Advancement of Research and Scholarship at 513-529-3734 or email: humansubjects@muohio.edu

You may keep this section of the page

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Return this section to the researcher

I agree to allow (child’s name) _____________________ to participate in the study of the Fitness and Fun after-school program. I understand my child’s participation is voluntary and that his/her information will be kept strictly confidential.

. Parent/Guardian Signature ________________________________ Date: __________
I agree to my child’s teacher including my child in their overall evaluation of students participating in the “Fitness and Fun” after-school program. I understand that this is a general evaluation and my child will not be individually evaluated, and that this information will be kept anonymous and confidential.

Parent/Guardian Signature ____________________________ Date: __________

I agree to participate in the weekly program evaluations of the *Fitness and Fun* program. I understand my participation is voluntary and refusing to participate will not result in any loss of benefits to my child. I understand my information will be anonymous and kept strictly confidential.

Signature ____________________________________________ Date: __________
Appendix B: Assent Script:

My name is Elizabeth Gleason, and I am a graduate student at Miami University. Right now you are a participant in the *Fitness and Fun* after-school program. I would like to ask you to participate in a study, where we will test your fitness levels and ask you to complete weekly forms to evaluate the program.

The fitness testing will be the *FITNESSGRAM* assessments you are doing in your physical education class, including the *PACER* test, curl-ups, push-ups and measuring height, weight and flexibility.

The evaluation forms will be completed every Friday, where you will be provided with a list of activities we did that week, and snacks that you had. You will be asked to rate these and explain why you liked or disliked them. You will be given a sticker for your form each week – you should *not* put your name on the form.

Your participation in this study is completely voluntary; if you choose not to participate you can still continue in the program each week, and you can stop at any time. Your information will be kept completely confidential, and your name will not be associated with any of your responses or fitness data. If you have any questions please ask me. Thank you for your help.
Appendix C: *FITNESSGRAM* Recording Form
DATA RECORDING FORM
Princeton School District
(FitnessGram Physical fitness Test Battery)
2010-2011

TESTING DATE:

NAME OF STUDENT: ___________________________; STUDENT ID#:

SCHOOL: ___________________________; CLASS (Teacher): _______

GRADE: ______________; AGE: ______________; DOB (mm/dd/yyyy):

RACE / ETHNICITY: ___________________________; GENDER:____

STATION - Body Mass Index (Calibrated Scale & Calibrated Stadiometer)

HT ( ____________ cm)

WT ( ____________ Kg)

STATION - Muscular Fitness (CD Player & Mats)

Paced Curl-Ups: ____________________________

90Push-Ups: ____________________________

STATION - Flexibility (Sit & Reach Box)

Back Saver Sit & Reach: (R) ______________ in.

(L) ______________ in.

STATION - Aerobic Fitness (CD Player & Cones) circle one 20 m / 15 m
The PACER: _____________# of Laps; Laps 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 
21 2223
24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85
86 87 88 89 90

Waist Circumference:
Appendix D: Registration Form
Stewart Elementary “Fitness and Fun”
Registration Form

Student Name: ______________________ Grade: ____________

Emergency Contact: _______________________________________________________

Relationship to Student: ____________________________________________________

Emergency Contact Phone Number(s): ____________, ______________

Does your child have permission to go outside on school property?  YES/NO

May we ask your child to fill out some questions for evaluation purposes?  YES/NO

Does your child have any food allergies? YES/NO

If yes, please specify: _______________________________________________________

________________________________________________________________________

If I am unable to pick up my child at the scheduled time (5:30pm), these people have my
permission to pick-up ____________________________ (Child’s Name):

Name: ______________________ Name: ______________________

Relationship: ________________ Relationship: ________________

Phone #: ______________________ Phone #: ______________________

Is there any additional information we should know about your child that would be
beneficial to us? (Injuries, medical conditions, etc.)

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Signature: ____________________________ Date: ____________________