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The Effects of Program Frequency on the Physical Fitness of Kindergarten Students

Tim Kliethermes

Eastern Illinois University

This research is a product of the graduate program in Physical Education at Eastern Illinois University. Find out more about the program.

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Date
The effects of Program Frequency on the Physical
Fitness of Kindergarten Students

(TITLE)

BY

Tim Kliethermes

THESIS
SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF

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I HEREBY RECOMMEND THAT THIS THESIS BE ACCEPTED AS FULFILLING
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The Effects of Program Frequency on the Physical Fitness of Kindergarten Students

Abstract

The purpose of this study was to examine the effect of program frequency of physical fitness scores of kindergarten students. Kindergarten students from a daily program (n=43, 21 males, 13 females) and a twice-weekly program (n=143, 85 males, 58 females) were compared on specific fitness scores from the President’s Challenge Physical Fitness Test (PCPFS, 2000). Specifically the purposes were to (a) determine if there were significant differences in males’ and females’ mean fitness scores compared across program frequency, (b) determine if there was a relationship between program frequency and percentage of male and female students meeting 50th percentile norms on the President’s Challenge, and (C) determining if there was a relationship between program frequency and self-reported physically active and sedentary behaviors. Six separate gender by program ANOVAs used to measure differences in mean scores across program revealed a significant program effect for the daily program ($F(1,172)= 25.53, p< .001$) for flexed arm hang scores. Separate 2x2 chi-square contingency tables were used to compare percentage of males and females meeting President’s
Challenge Test 50th percentile standards. Results revealed significant chi-square differences in favor of daily-program male students on flexed arm hang ($x^2(1) = 17.61$, $p < .001$) and half-mile run times ($x^2(1) = 19.37$, $p < .001$). For females there were no differences. Separate program by response chi-square analysis examined responses to self-reported physically active and sedentary behavior. Results revealed that daily program students indicated more activity in active games ($x^2(1) = 3.94$, $p < .05$), more activity in catching games ($x^2(1) = 4.34$, $p < .05$), and more activity in outside activity either alone or with friends ($x^2(1) = 12.32$, $p < .001$). For sedentary behavior, results revealed that daily program students engaged in less television watching ($x^2(1) = 6.52$, $p < .001$), and less activity which involved playing on the floor ($x^2(1) = 17.61$, $p < .001$). In addition, self-report scores for physically active and sedentary behaviors were totaled and compared across groups. Results revealed from separate gender by program ANOVAs a significant program effect for physically active self-report behavior favoring the daily program ($F(1,173) = 5.56$, $p < .05$). Overall results provide marginal support for the effectiveness of daily physical education for improvement in several areas of youth fitness, especially in kindergarten boys. Results from the self-report of lifestyle behavior suggest potential positive activity pattern outcomes.
provided by programs of greater frequency. Results are discussed for potential curricular modifications based upon the current findings and the importance of daily physical education upon youth fitness.
Dedication

This thesis is dedicated to the memory of Matthew Franks, Clarence Herndon, and Wilbur Kliethermes, three men who's brief window of time in my life had more influence than they will ever know.
Acknowledgments

Thank you to Dr. William Russell for his guidance and patients throughout the completion of this study.

I would like to extend my appreciation to Mark Twain and Bennett schools for cooperating in my study.

To all of my professors, friends, and roommates over the last few years, thank you for making the hard work and challenge of furthering my education the best years of my life.

To my grand mother, Frances Herndon, thank you for showing me that education is a lifelong pursuit and giving me an appreciation for knowledge.

Most of all, special thanks to my parents, Gene and Carolyn Kliethermes, who have always sacrificed their dreams so that I may pursue mine. This is for you.
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A study by the President's Council on Physical Fitness and Sports (PCPFS) conducted in 1984 found that America's youths exhibited worse physical condition when compared to the fitness level of children ten to twenty years prior to that period (Murphy, 1986). In general, children were performing poorly in the areas of cardiorespiratory endurance and shoulder girdle/upper body strength (PCPFS, 1985). In response to this study, the status of youth fitness levels and fitness programs came under investigation and specific areas of concern included duration of physical education classes (Perry, Stone, Parcel, et al., 1990), frequency of classes (Hayes, 1984), time on task, content, and activity levels of the students while participating in class (McKenzie, Feldman, Woods, et al., 1995). Specifically, concerns of program characteristics revealed that these program areas did not meet exercise prescription requirements for improving fitness.

Not only were suspicions of declining fitness confirmed, it was found that the number of overweight people in the U.S. had become greater than the number Americans at a proper weight (Anderson, 1997). More than sixty percent
of American adults are not regularly active (USDHHS, 1996) but more disconcerting is the fact that by the time they reach high school, 63 percent of children are no longer active (Worsnop, 1997). Only 22 percent of children are physically active for 30 minutes every day of the week (Hellmich, 1997) and 40 percent of children ages five to eight were found by the National Association for Sport and Physical Education to be obese, inactive, have high blood pressure or high cholesterol levels (Staed, 1996). The American Council on Exercise [ACE] concluded that today’s youth are fatter and less fit than previous generations. The council claims that between the mid-1960s and the late 1970s the number of overweight children (ages 6-11) increased 54 percent and recent studies show that this trend has continued to increase into the 1990’s (Worsnop, 1997).

**Status of Today’s Children**

Today, children are still significantly inactive (American Academy of Pediatrics [AAP], 1987, Perry et al., 1990, Stucky-Rupp & DiLorenzo, 1993). This may be attributed to much of the automation in the world today. Children do not have to chop wood or walk to school anymore and sedentary behaviors such as television viewing, computers, and video game playing occupy a greater portion of students free time activity (AAP, 1992). It is estimated
that children aged two to five watch 25.5 hours of television per week, which significantly competes with their time for vigorous activity (AAP, 1992).

This inactivity is becoming a concern because it has recently been recognized as a risk factor for cardiovascular disease in adults (McKenzie, Nader, Strikmiller, et al., 1996, McKenzie, et al. 1995, McKenzie et al. 1993, Stucky-Ropp and DiLorenzo, 1993) and linked to coronary artery disease, hypertension, diabetes mellitus, obesity, and other chronic diseases of adulthood (AAP, 1992). It is known that children develop habits and form lifestyles early in life (Stucky-Ropp and DiLorenzo, 1993) so developing healthy habits and positive attitudes for physical activity early on is essential for lifelong health (Perry et al. 1990).

Regular benefits of lifelong physical activity include increases in aerobic capacity, strength and endurance, and lower body fat percentages in youth (Arnheim, 1997).

Physical activity benefits for children extend beyond illness prevention. Research has indicated that physical activity may benefit adolescents by increasing their aerobic fitness, bone mass, bone mineral density, and HDL cholesterol and by reducing their body fat percentage and hypertension (McKenzie et al. 1996). Physical activity also fosters psychological benefits by eliciting increases in self-esteem and self-concept, lower anxiety and stress,
decreased resting heart rate, less stress reactivity, stronger muscles, and more energy for learning and playing (American Alliance for Health, Physical Education, Recreation and Dance [AAHPERD], 1999).

**Physical Fitness**

In the last decade, the term physical fitness has been redefined from motor skill development and athletic ability to a combination of muscle strength and endurance, flexibility, body composition, and cardiorespiratory endurance (AAP, 1987). Research shows that cardiorespiratory fitness and body composition can only be improved if moderate to vigorous physical activity (MVPA) is performed three to five times a week and recent reported recommendations advocate accumulating 30-60 minutes of physical activity all days of the week (American College of Sports Medicine [ACSM], 1998). Muscle strength and endurance is achieved by overloading the major muscle groups two to three times per week (ACSM, 1998).

Based upon the aforementioned exercise prescription criteria, a school curriculum that meets less than three times a week, theoretically, cannot meet the minimal fitness requirements necessary for physical fitness maintenance. Poor physical education programming could be especially detrimental for children getting their first experience of
organized physical education. This entry level physical education curriculum is usually offered to kindergarten students and is critical in beginning the process of showing students the importance of what it means to be physically educated. It also initiates their development of recommended daily activity patterns. The American Academy of Pediatrics claims that daily physical activity will reduce health risks and form healthy habits that will lead into adulthood (AAP, 1992).

**School Programs and Physical Fitness**

Because most young people between the ages of six and sixteen attend school, schools offer an ideal setting for promoting physical activity for young people, primarily through classroom curricula for physical education and health education. The Centers for Disease Control recommends that comprehensive school and community health programs promoting physical activity among children and adolescents be developed to increase knowledge about physical activity and exercise, develop behaviors and motor skills that promote lifelong physical activity, foster positive activities toward physical activity and encourage physical activity outside of physical education class (USDHHS, 1996).
The 1994 Centers for Disease Control school health policies and programs study, examined the current national status of policies and programs for multiple components of a school health program (Kann, Collins, Patemon, Small, & Ross, 1995). Results from the physical education component revealed that physical activity instruction is required by most states (94 percent) and school districts (95 percent) (Pate, Small, Ross, et al., 1995). These policies, however, do not require students to have physical education every year. For example, while most middle and junior high schools (93 percent) require at least one physical education course, only half of these middle and junior high schools require the equivalent of at least three years of physical education. This declined emphasis on physical education can be attributed to curriculum changes, elimination of consultants and supervisors of physical education at local and state levels, budget problems, changes in recreation habits, and cutbacks in public recreation programs for youth (Hays, 1984).

More than half of the physical education teachers devoted multiple class periods to traditional sport activities such as baseball, where the majority of students were not participating in physically active behaviors and not achieving minimal fitness criteria. A much smaller
proportion of teachers devoted multiple class periods to lifetime physical activities such as jogging, aerobic dance, and swimming where students developed long-term fitness skills and received the health benefits associated with exercise. Additionally, only 18 percent of all physical education teachers required students to develop individualized fitness programs (Pate, et al., 1995).

Role of the Teacher

Hays (1984) has indicated that a large portion of the responsibility to increase fitness of youth within the federal system lies with physical education. Hays refers to physical education as involved teachers, administrators, consultants, and anyone else associated with the physical education curriculum. Immediately following the Presidents' Council on Physical Fitness and Sport Fitness Survey (1985), a conference was held to discuss the findings. There was substantial support to make fitness a serious part of the educational system, placing responsibility on the physical educator to improve our nation's youth fitness levels since he/she has access to each and every child enrolled in public schools (Hays, 1984).

In 1990, the Public Health Service submitted Healthy People 2000, a document containing a strategy for significantly improving nationwide health over the following
decade (Public Health Service [PHS], 1990). One of many goals specific to youth fitness was to increase both the quality and quantity of school physical education, specifically increasing the number of children who participate in daily physical education to at least 50 percent, increasing the number of children who participate in extracurricular physical activities, increasing the amount of physical education class time in which the student is physically active to at least 50 percent, and encouraging those students aged six years and older to engage in at least 30 minutes of daily physical activity (PHS, 1990).

In 1995, the Public Health Service conducted a midcourse review. The review stated that two objectives moving in the wrong direction were the percentage of students engaging in daily physical education classes, and the proportion of physical education class time students spent engaging in physical activity (PHS, 1995). McKenzie (1995) found that only 36.2 percent of the typical physical education lesson was spent taking part in moderate to vigorous physical activity (MVPA), far below the 50 percent goal set by Healthy People 2000.

Schools are the logical environment for promoting health through physical activity, however poor quality curricula may impede improvements because of their lack of weekly frequency or insufficient activity duration during
class (McKenzie, 1996). Likewise, many physical education curricula are focused on traditional development of psychomotor skills and spend the majority of class time in sport skill development, which detracts from time spent in developing parameters of health and related physical fitness.

While most elementary school children in the United States are enrolled in physical education classes, not all receive the quality and quantity of instruction sufficient to improve fitness and motor skill development (McKenzie, 1993). Despite the existence of low quality programs, schools are still recognized as the optimal point-of-behavior-change setting to intervene in meeting the health related needs of children (McKenzie, 1995). Physical education classes provide some children with their only opportunity to engage in MVPA found to be essential for improving cardiovascular output (McKenzie, 1995).

The President's Challenge Fitness Test

The President's Challenge Fitness Test was designed by the (PCPFS) after conducting a study in 1985 showing public school children to be in poor physical condition. Results from the test concluded that children aged 6-17 were in worse shape than children of the same age 10-20 years earlier (PCPFS, 1985). Statistics showed the children to be
more overweight and having less muscle mass and cardiovascular endurance than previously tested children and established national norms to be used as the criteria in future assessments. The program focus is based upon an extrinsic rewards system whereby students are provided a normative database for each fitness category and are given a minimal criterion-referenced standard to obtain in order to qualify for program awards upon which the program is based.

The President's Challenge contains four award levels based on students' ability to score at the 85th percentile (President's Award), the 50th percentile (National Award), reach a healthy level of fitness (Health Fitness Award), or complete testing in all categories regardless of percentile (Participant's Award). The tests have been modified to be age appropriate for ages six to seventeen. The general goal of the President's Challenge Program is to establish a foundation of fitness upon which children ages 6-17 can build fitness habits that they will maintain into adulthood. It was also established for physical educators to reference and incorporate into their school curriculum. (PCPFS, 2000)

All of these awards are based on the criterion-referenced norms of six tests, including flexed arm hang (shoulder girdle strength and endurance), partial curl-up (abdominal strength and endurance), shuttle run (agility), half-mile run (cardiovascular endurance), sit and reach
(flexibility), and body mass index (body composition) (PCPFS, 2000).

**Purpose**

Program frequency is thought to impact measures of youth physical fitness (Pangrazi, Corbin & Welk, 1996). Daily physical activity has the capacity to improve fitness above physical activity of lesser frequency (Arnheim and Prentice, 1997, PHS, 1995, Perry et al. 1990, McKenzie, 1996). Significantly sub-standard fitness scores within programs of insufficient program frequency may provide the impetus for improved school curricula to increase comprehensive health-related fitness. Therefore, the purpose of this study was to compare the difference in health-related physical fitness levels for kindergarten students participating in a program consisting of two days per week or five days per week (daily) of organized physical education within the school curriculum.

**Hypotheses**

**Hypothesis One**

The null hypothesis was that there would be no difference between daily and twice-a-week program means on the six separate test items within the President's Physical Fitness Test. The research hypothesis was that six-year old
boys and girls from the twice-a-week program would have significantly worse scores on partial curl-ups, shuttle run times, sit-and-reach scores, half-mile run/walk times, arm-hang times, and body mass index scores compared to boys and girls from the daily program.

Hypothesis Two

The null hypothesis was that there would be no relationship between the percentage of male and female students meeting the 50th percentile standards on the Presidential Challenge and the frequency of the physical education program. The research hypothesis was that there would be a significantly greater percentage of students within the daily program meeting the minimal standards compared to the twice-a-week program.

Hypothesis Three

The null hypothesis was that there would be no relation between the percentage of male and females students' self-report of physically active and sedentary behaviors, and the frequency of the school physical education program. The research hypothesis was that there would be a significant difference in physically active behaviors and sedentary behaviors across boys and girls and program frequency. However, the self-report measure is of outside physical
activity and was exploratory in nature, therefore no specific directional hypotheses were made. In addition, to compare overall physically active and sedentary self-report patterns, there was an additional research hypothesis that physically active and sedentary self-report total scores would differ significantly across programs.

Assumptions

It was assumed that kindergarten students understood the nature of these tests and were able to understand questions asked of them by the investigator about outside personal activity. It was assumed that the children varied in the amount of physical activities they engage in outside of the physical education program and this variation represents a source of uncontrolled variability in physical activity with the proposed study.

It was assumed that the variability in the type, intensity, and frequency of outside activities exhibited by the students differed across students but that this variability was equally dispersed throughout the two programs. It was also assumed that the measurement error was minimized in administration of the test items and was consistent across both programs. Finally, it was assumed that varying degrees of motivation to participate in the
physical education program may have effected students’ fitness scores.

Delimitations

This study examined the physical fitness levels of two groups of six year old kindergarten students and use of only one physical fitness test battery. The President’s Challenge Fitness Test used in the current study is one of numerous standardized fitness test batteries used in physical education curricula.

Limitations

A potential limitation the President’s Challenge is that it contains items considered to be more skill related (e.g. shuttle run) (Murphy, 1986). However, this battery is already currently used within the daily school curriculum and does represent a widely-used standardized measure of youth fitness.

The study could not account for the new students that periodically moved into either school. Without a full year of the same physical education program it was implausible to account for multiple determinants of physical fitness. By the same token, those students who missed numerous days of school could not benefit nor be hurt by their school’s
program because of the inconsistency in their activity patterns.

The study represents a cross-sectional examination of two physical education programs or fitness levels, and as such, conclusions based on longitudinal fitness changes were not possible.

Definitions

**Agility:** quickness of motion, nimbleness (NCYFS, 1978)

**Body Composition:** percent body fat plus lean body weight (Arnheim, 1997)

**Cardiorespiratory Endurance:** ability to perform activities for extended periods of time (Arnheim, 1997)

**Flexibility:** range of movement about a joint, from a position of extension to flexion or the opposite movement (NCYFS, 1978)

**Muscular Endurance:** the ability to perform repetitive muscular contraction against some resistance (Arnheim, 1997)

**Muscular Strength:** the maximal force that can be applied by a muscle during a single maximal contraction (Arnheim, 1997)
CHAPTER II

LITERATURE REVIEW

Despite the value of physical activity in reducing health risks, the prevalence of sedentary lifestyle among Illinois residents ages 18 and older is 40 percent with another 26 percent engaging in an insufficient amount of exercise to improve or maintain cardiovascular benefits (Erdmann, McMillan, Piper, 1998). This finding is especially disturbing in light of research (Stucky-Ropp & DiLorenzo, 1993) indicating that families serve as important learning environments for enhancing health-related behavior and forming lifelong exercise habits.

Cardiovascular Disease Risk Factors

A sedentary lifestyle has been linked to the development of coronary artery disease, hypertension, diabetes mellitus, obesity, and other chronic diseases of adulthood. Although these diseases are associated with adulthood, they are thought to be the result of a lifelong process of sedentary living and unhealthy habits (AAP, 1992). The onset of the risk factors for these diseases has been traced back to children as young as five and six years old (McKenzie et al., 1995). It is important that children
have a positive first experience in physical education to promote a lifestyle of healthy living.

The promotion of exercise at a young age was recommended by Stucky-Ropp & DiLorenzo (1993), based on findings that children are very influential in their elementary school years. It is during this time frame that they develop the lifestyle and habits that continue into their later years. Stucky-Ropp & DiLorenzo (1993) observed physical activity patterns of 242 fifth and sixth grade children and their mothers. It was hypothesized that several social learning variables such as parental modeling would be extremely influential on the physical activity of the children. It was found that children's physical activity patterns are influenced by their physical environment and children who were most active had active families and friends. They perceived physical activity as fun and enjoyable and parents of these children did not report many barriers or excuses for inactivity in their own lives or their children. These children were expected to continue their activity into adulthood because it had become part of their social make-up (Stucky-Ropp & DiLorenzo, 1993).

According to the Surgeon General's Report (1996), exercise as a lifelong pursuit has the ability to prevent or reverse risk of premature mortality and coronary heart
disease, hypertension, colon cancer, and diabetes mellitus. Childhood (ages 6-11) and adolescence (ages 12-16) are pivotal times for discouraging sedentary behavior among future adults by maintaining the habit of physical activity throughout the school years before sedentary lifestyles disease states occur. For physical activity to maintain significant health benefits, children must meet the recommended minimal exercise prescription guidelines (ACSM, 1998). Infrequent or sporadic activity patterns will be insufficient to reduce health risk factors. Many of the beneficial effects of exercise, both aerobic and anaerobic, diminish and are substantially reduced within two weeks of inactivity. If the activity is not resumed, benefits well disappear within 2-8 months (USDHHS, 1999).

ACSM Exercise Recommendations

The American College of Sports Medicine (1998) studied the optimum quality and quantity of exercise best for developing and maintaining cardiorespiratory and muscular fitness, and flexibility. Results of previous studies revealed in the ACSM recommendations state the combination of frequency, intensity, and duration of consistent exercise has been found to produce an overload or physiological adaptation necessary for improving and maintaining cardiorespiratory and muscular endurance, strength and
flexibility, and improvement in body composition (ACSM, 1998). The American College of Sports Medicine Guidelines (1998) has recommended moderate to vigorous exercise 3-5 days a week for 20-60 minutes (or an accumulation of 10 minute bouts adding up to 20-60 minutes throughout the day) to improve and maintain cardiorespiratory fitness. The College also recommends individualized and progressive overloading of major muscle groups 2-3 days a week to enhance strength, muscular endurance, and fat free mass, accompanied by flexibility exercises for each major muscle group a minimum of 2-3 days a week (ACSM, 1998).

These recommendations are designed for the exercise patterns of adults (ACSM, 1998) however application of these recommendations to children is problematic because of children’s lower baseline functional capacity and strength levels. When given healthy opportunity to be physically active, it is not difficult to initiate activity from children. Children are innately active (Pangrazie et al., 1996). When given the chance, they will seek to quench their own need for activity. The major difference in child exercise and adult exercise is the intensity and duration. Children do not have cardiorespiratory systems sufficiently developed for high intensity or long duration activity. They wear out and overheat easily. Children do, however, have shorter recovery periods than adults. Therefore children
may gain substantial cardiorespiratory benefits by reducing exercise intensity and incorporating frequent bouts of rest (Pangrazi et al., 1996).

Nevertheless it is recommended that children get 20-30 minutes of activity three to five times a week through an accumulation of activity. Children should be encouraged to be moderately aerobically active for 20-60 minutes over the course of the day with periods of recovery dispersed between the periods of exercise to improve cardiorespiratory fitness (Pangrazi et al., 1996).

**Fitness and Youth Activity**

**Youth Cardiovascular Improvement**

A sedentary lifestyle is the cause of many diseases and risk factors in adults as well as contradictory to good fitness (AAP, 1992). Rowland (1994) studied the effects of prolonged inactivity on the aerobic fitness of children when compared to adults. He evaluated the impact of 9 weeks of bed rest on peak VO$_2$ in five children ages 7-11 (3 boys, 2 girls) who required post-accident immobilization for a broken femur. Starting two weeks after initial ambulation, peak VO$_2$ estimates were obtained monthly for four months and again at six and nine months. The difference between the initial peak VO$_2$ and the subsequent plateauing of peak VO$_2$ is
considered indicative of the prolonged bed rest. The amount of improvement/recovery was used to determine the amount of loss in aerobic capacity the children experienced while inactive (Rowland, 1994). Results showed that the peak VO\textsubscript{2} increased 13.3 percent to a plateau over three months while maximal aerobic power did not change significantly in five healthy control subjects. Between the first and third tests, treadmill endurance time improved 98 percent in the subjects and only one percent in the active control group (Rowland, 1994).

The findings suggest that prolonged inactivity has a definite effect on the aerobic fitness levels of young children. It also shows that it is not detrimental, but essential to exercise regularly even in the pediatric age groups (Rowland, 1994).

**Lifestyle Physical Activity Patterns**

After school periods remain critical for studying children’s activity patterns related to overall health (Dale & Corbin, 2000). It is unknown whether children compensate for lack of opportunities to be physically active at school by increasing physical activity levels after school. Social learning theories would indicate that our behaviors are shaped by environmental factors (Bandura, 1977). Therefore, the concern is that children learn to be sedentary through
sedentary environments. The researchers looked at whether children were experiencing the suggested 60 minutes of daily physical activity required to obtain health benefits. Seventy-six fourth grade students were fitted with a accelerometer which recorded their activity levels for four days. Two of the days were classified as restricted with indoor recess and no physical education. The other two days were classified as active with outdoor recess and physical education class (Dale & Corbin, 2000).

Results support researchers’ concerns over activity patterns when activity opportunities are restricted during school time. Children did not compensate for the physical activity periods that were missed during the restricted days were less active after school on the restrictive days, compared to the active days (186 average movement counts per minute versus 525 average counts). On the days in which the students had activity in physical education class and recess, their activity continued when school ended (Dale & Corbin, 2000).

Katzmarzyk, Malina, Song & Bouchard (1996) also examined the relationship between activity patterns and health-related fitness. Specifically, these researchers were interested in examining whether healthy physical activity patterns translated into healthy adults.
Katzmarzyk et al. (1996) examined physical activity patterns using the 3-day activity record of 356 boys and 284 girls between the ages of 9 and 18 who were apparently healthy. The subjects recorded their energy expenditure on a scale of 1-9 for the dominant activity for that period. From this, an average daily energy expenditure and an estimate of moderate-to-vigorous-activity was derived. The subjects were also required to record the amount of time they spent watching television as an indicator of physical inactivity.

Health-related fitness data was also collected including submaximal aerobic work capacity, muscular strength, muscular endurance, and skinfold measurements of percent body fat. Results indicated a significant relationship between the youth activity levels and the health-related fitness of the subjects. The higher level of activity displayed by the youths directly related to the level of health-related fitness of the subjects, but a large part of the variability in fitness was not accounted for by the physical activity measured in the study (Katzmarzyk et al., 1996). This study restated the importance of early physical education and its relationship to the fitness of young children.

Physical fitness improvement in young children through physical activity is not limited to cardiorespiratory
fitness. Research has also indicated that improved strength is important to overall fitness as well. Payne, Morrow, Johnson and Dalton (1997) performed a meta-analysis examining studies related to resistance training and children. They examined children under 18 years of age and effects from resistance training. It was concluded that resistance training among children does increase muscular strength and endurance. Results vary by intensity, duration, and frequency of workouts as well as the physical development of the child (Payne, Morrow, Johnson & Dalton, 1997).

School Programs and Physical Fitness

Physical education classes have the opportunity to provide students with a major source of organized physical activity on a daily basis. Since many children are not actively involved in community programs due to financial constraints and many children are inactive after school due to parental work or time constraints, effective physical education programs present the most efficient delivery structure for preventing obesity in youth and promote healthy lifestyles. The question is whether school physical education programs provide the students with as much or more physical exertion than their normal activities.
Caloric Expenditure

Anderson (1998) examined the impact of physical education on children's daily activity patterns. The study observed the activities of six children (ages 8, 9, 11, 12, 14) over the course of a full day's events. While this study was small and based solely on the activities of a few children, it emphasized more generalized physical activity patterns of the nation's youth.

Subjects were fitted with Caltrac monitors and their caloric expenditure was monitored throughout the day. To accompany the Caltrac data, daily activity logs were maintained. Only two of the profiles (one boy and one girl age 8) were discussed in detail, however all of the profiles reported that physical education played a major role in increasing the caloric expenditure of the children. In the profiles he presented, Anderson stated that at no other time in the school day were the children's activities as focused, sustained, and consciously dedicated to physical skill improvement and physical activity as when they were in physical education class. The physical education classes appeared to meet the needs of the learners' age and stage of development; involved and challenged all students according to their interests and abilities; promoted physical, personal/social, and cognitive skill acquisition; and
emphasized building confidence and competence in activities through participation (Anderson, 1998).

Caloric expenditure values were higher at school compared to at home, and students caloric expenditure was highest in their physical education class (Anderson, 1998). The study showed that in these individual cases, organized school physical education programs provided children with their best source of physical activity and instruction over the course of an average weekday.

The fact that these students exhibited higher caloric expenditures in physical education classes than in recess is of significance. A common contention for not requiring daily physical education is that students can maintain sufficient caloric expenditure for health benefits through recess (Anderson, 1998). Anderson found that when compared to the observed physical education classes, recess time appeared to be random, unstructured, intermittent free play, with insufficient energy expenditure elicited, students were more active and focused when being instructed by a professional physical educator (Anderson, 1998).

Recess

Many school administrators have adopted the idea that recess provides a valid alternative to physical education (Silverman, 1998). In a longitudinal two year study,
McKenzie et al. (1997) examined the amount of physical activity preschool and elementary students received during recess. They also looked at whether there were gender and ethnic differences and if any group of students received more social prompts (encouragement) to participate in moderate to vigorous physical activity. European-American and Mexican-American girls and boys (n=256) had their physical activity measured during preschool and then two years later in elementary school. Results revealed the average preschool recess to be 26 minutes in duration and the average elementary (kindergarten) recess to be 14 minutes in duration. European-American boys participated in moderate to vigorous activity 52 percent of their recess while European-American and Mexican-American girls engaged in moderate to vigorous activity 40 percent of their recess. Comparatively, Mexican-American students participated in 17 percent less moderate to vigorous activity than European-American students (McKenzie et al., 1997).

The study showed that preschool students were less active than elementary students, that boys were more active than girls, and that girls received less encouragement to be physically active than boys at the preschool and elementary levels. Both boys and girls received more encouragement from their peers than their teachers (McKenzie, et al., 1997).
The researchers concluded that recess does not provide sufficient physical activity and that children need to be provided with physical education facilities and the time to participate in moderate to vigorous physical activity. This study also emphasized the importance of having the physical education curriculum taught by physical education specialists instead of untrained teachers (McKenzie, et al., 1997).

Physical Education Classes

In a study looking at variables effecting the activity levels of children, McKenzie, et al. (1995) addressed the issue of physical activity as it differs across gender. The researchers found that boys and girls display very similar activity levels in organized physical education classes, however boys were more active than girls during free-play activities. The boys' energy expenditures showed them to be more active and they were observed spending less time standing around. Their energy expenditure was higher than the girls when in recess or free-playing in physical education classes. Organized drills, games, and skill acquisition evened out the activity levels of the boys and girls though (McKenzie et al., 1995).

In another study, McKenzie and Sallis (1997) examined gender differences in physical activity for different
physical activity settings. They observed 110 fifth-grade students in four classes in a suburban elementary school. Children were randomly restricted to either a structured health-related physical education curriculum or unstructured recess period condition.

Recesses were monitored by classroom teachers untrained in the field of physical education while the physical education classes were taught by two trained physical education specialists following the SPARK (Sports, Play, and Active Recreation for Kids) curriculum. An accelerometer was used to determine the amount of physical activity that children engaged in over three days during a physical education class and the longest recess period of each day. It was found that all of the children exhibited approximately the same amount of physical activity during physical education classes, but differed during recess. The skilled students occupied the equipment while the less skilled students pursued more sedentary activities and females exhibited the lowest levels of physical activity across gender (McKenzie and Sallis, 1997).

These studies are of significance since children generally only receive two opportunities to be active during the school day: physical education and recess. In many cases, if the school does not offer daily physical education, recess is the only opportunity they receive to be
physically active. Recess often lacks supervision from trained professionals in physical education and it lacks enough equipment to equally occupy all students. Physical education offers structured and organized activities in which a certified specialist ensures opportunities for all students to use equipment and practice. Unfortunately, many physical education curricula are instructed by teachers who are untrained in physical education (James, 1999).

Teacher Considerations

In an observation of 293 third grade students in 95 schools, McKenzie, et al. (1995) attempted to find a relationship between physical activity and lesson content. The students were observed using SOFIT (System for Observing Fitness Instruction Time). The analysis of the data revealed that students are significantly affected by independent variables, such as procedure and teaching style, occurring in a physical education class (McKenzie et al., 1995).

Students were more active during outdoor lessons than indoor lessons. They had more time to be active when taught by a physical education specialist instead of a generalist. Boys were more active during free-play, but girls showed similar activity during organized lessons. Other outside factors that were observed to affect the class, but were out
of the control of the researchers were state and district mandates, teacher characteristics, facilities and equipment (McKenzie et al., 1995).

**Curriculum**

Teaching students how to be active is likely to be more productive than teaching them why to be active (McKenzie, 1999). The time on task associated with a physical education class should represent at least 50 percent of the class period according to Healthy People 2000. However, Parcel, et al. (1987) found the average child in 30 minute physical education classes to be vigorously active for only two minutes. Even if classes can begin to provide students with physical activity for half of a 30 minute class period, they are still not meeting the child’s needs for 20-60 minutes of continuous or accumulated moderate to vigorous physical activity. Sallis et al. (1997) recommends all elementary physical education teachers to adopt health-related physical education programs that provide large amounts of physical activity for students.

Pangrazi, Corbin & Welk (1996) provide more comprehensive recommendations for elementary physical education curriculums based on a review of the youth fitness literature. These recommendations include avoiding high intensity activity, focus on 20-60 minutes of moderate
intensity activity accumulated throughout each day; encourage children to perform high-volume, moderate intensity activity; and teaching children lifestyle activities that can be performed outside of the classroom. These activities will carry over into their everyday lives more than team activities or complicated skills (Strand, Scantling & Johnson, 1998). Lifestyle activities that are performed outside of the physical education setting help to fill the void left by a curriculum that cannot provide its students with enough opportunities for physical activity. It was recommended to allow students the flexibility to individualize their activity workload and encourage their best efforts in the time allowed, ensuring long-term exercise habits without being deterred by fear of failure from social comparisons. in the same activity. Opportunities need to be provided to learn basic motor skills and develop all parts of health-related physical fitness through appropriate moderate intensity activity and ensure development of behavioral skills that lead to lifetime activity (Pangrazi et al., 1996).

President's Challenge Fitness Test

Youth fitness is most commonly measured and described as a function of standardized fitness batteries measuring health-related physical tasks. One commonly used fitness
test is the President's Challenge Fitness Test. A study was funded by the President's Council on Physical Fitness and Sports (PCPFS) in September 1984. Its objectives were to assess the physical fitness status of school children ages 6-17 and establish national norms for these age groups (PCPFS, 1986).

A committee of experts in physical fitness was selected to create and analyze the study. The committee was composed of university professors of physical education, orthopedic surgeons, cardiologists, physical education teachers, directors of physical education at both the school district and state levels, school principals from both elementary and secondary schools and members of the (PCPFS) staff. The population they decided to sample was composed of public school children ages six to seventeen years old. The sample consisted of 18,857 (9,678 boys and 9,179 girls) students (PCPFS, 1986).

In 1985, each of the 167 participating schools were assigned six tests. Test items were provided to each school in modules. The nine designated test items were divided into three subsets of three each and two modules were then given to each individual school based on controlled random assignments (PCPFS, 1986).

This sample design permitted data collection from the largest sample of public school students, the most tests,
and the largest range of ages of any national physical fitness study ever completed. Comparisons made to previous tests were limited to ages 10-17 so all data collected for ages 6-9 would serve as baseline data to be compared with future surveys (PCPFS, 1986).
CHAPTER III

METHOD

The purpose of this study was to compare the physical fitness levels of kindergarten students participating in a program consisting of either two days per week or daily organized physical education. Results from the Presidential Challenge physical fitness test were compared between the two school districts and with 50th percentile national norms established by the Presidents Council on Physical Fitness and Sport (PCPFS) to evaluate students' fitness levels as a function of program frequency. Examination of program frequency as it relates to fitness scores of young children can provide evidence for the fitness benefits of daily physical education (Hays, 1984, Perry et al. 1990, PHS, 1995). Differences across school curricula in fitness measures may provide the impetus for schools to examine their program development and provide empirical evidence to support daily physical education curriculum.

Participants

There were two comparison groups involved in this study. Subjects of both groups were kindergarten students (six years old). Group A consisted of 34 students (21 boys,
13 girls) engaged in daily physical education at Bennett school in Mattoon Illinois. Group B consisted of 143 students (85 boys, 58 girls) engaged in twice-weekly physical education from Mark Twain Elementary in Charleston Illinois. The programs were selected because of their availability to the researcher and for the frequency of their physical education program. Both groups are located in communities of similar population and location (Central Illinois). Charleston has a population of 20,400 and Mattoon has a population of 18,400. Both communities are considered rural towns heavy in agriculture with some manufacturing. Charleston contains a University and Mattoon houses a community college.

Groups Characteristics

Group A (Daily Physical Education)

Group A represented daily organized physical education for 25 minutes per session. The nature of this program is structured toward motor skills development and fitness. Fitness related activities that require endurance and powerful movements such as leaping, pushing, and pulling are performed at least three times a week to elicit gains. Team building activities such as obstacle courses and problem solving were examples of an activity used to incorporate lifting, running, pushing, pulling as students collectively
try to overcome obstacles. On alternative days the classes work on mastering motor skills such as throwing, catching, and manipulating various objects. Each class period began with a warm-up activity. Estimated time on task was 20 minutes of physical activity after instruction. Activities range from running laps to team building games. The teacher did not set days aside to solely focus on fitness, but did make sure the students received at least three days of physical exertion each week. The kindergarten was divided into two classes and met for the same physical education class each day. Each physical education class maintained three instructors; the primary physical educator, a teacher’s aid, and a student teacher.

**Group B (Twice-a-Week Physical Education)**

Group B represented organized physical education meeting two days per week for 35 minutes a session. The activities were motor skill related and emphasized coordination and manipulation of objects. An average class period began with a warm up activity, and progressed to motor skills such as skipping, hopping, balancing, or the manipulation of an objects like a soccer ball, scarf, or balloon. Most often, stations were used to introduce as many activities as possible each class period. An example class activity would include a soccer station to work on the
skill of kicking, a baseball station to working on manipulating objects, a hula-hoop station for body awareness, and a throwing station to work on coordinated arm movements. Average time on task was estimated at twenty-five minutes.

**Measures (Test Battery)**

Programs A and B used the same fitness tests to evaluate their students. The test battery chosen to evaluate the fitness levels of the children was the "President's Challenge" created by the President's Council on Physical Fitness and Sports (PCPFS, 2000). This is a norm-referenced test containing criteria for national standards used as a regular fitness assessment tool. This test uses extrinsic rewards based on four separate fitness standards as the basis of its normative fitness assessment. The results of this test battery formed the basis for the norms in the "President's Challenge," and includes test items in the areas of: abdominal muscle endurance, shoulder girdle muscle endurance, agility, flexibility, cardiorespiratory endurance, and body composition. Those children reaching the 85th percentile or above on all five items of the test become eligible to receive the Presidential Physical Fitness Award. The National Physical Fitness Award was added in 1987 and recognizes those who
Procedures

A convenience sample of students was selected from both school districts with a goal of maximal student participation. The investigator had personal access to every kindergarten student in program B and personally administered the tests to group B. The test battery was administered over four separate, consecutive class periods. While measurement error is reduced by using the same test administrator, this was not possible, therefore the investigator collected the results of group A’s testing from its head physical educator who administered the test to those students. The Group A’s testing was completed the last week in April 2000. Group B’s testing was completed the week of May 1st, 2000. Students were given advance notice of the testing so that absences could be minimized on those days.

During testing sessions, both program A and B had half of the class performing fitness testing while the other engaged in structured free-play. The first assessment period included the following measures; height and weight assessment and the partial curl-up. The second day consisted of the V-sit and flexed arm hang. The third day was spent testing students on the shuttle run and the fourth day included the half-mile run/walk.
In addition to the Presidential Fitness items, qualitative interview data was collected to obtain information on students' physical lifestyle activity levels outside of structured physical education. The self-report physical assessment was designed to assess information on students' choices of after school activities and the frequency with which they engaged in either active or sedentary activities. The format of the self-report was designed to be age appropriate, and students were individually, verbally asked for their response to activity items (Appendix C). The survey was administered during the same week fitness testing was administered. In order to prevent response bias and reduce the problem of self-report comprehension, classroom teachers administered the questionnaire individually to students during free class time at both schools.

Permission was obtained from the school administration prior to data collection and a consent form was sent home with each child prior to testing (a copy of the consent form is provided in Appendix D). The Presidents Challenge was already part of the school's curriculum. Therefore, a letter explaining this project was sent home. Student data was then collected unless the parents expressed their child be excluded from the study. Fitness scores from students
who were absent for any part of the fitness assessment were discarded.

Data Analysis

In this study there were three major research questions addressed: (1) the first question addressed whether there was a difference between program frequency and children's absolute scores on the physical fitness test scores of the Presidential Physical Fitness Challenge test, (2) the second question examined whether there was a relation between the number of male and female students meeting a minimal criteria (50th percentile) on the President's challenge as a function of program frequency, and (3) whether there was a relationship between male and females' self-report of physically active and sedentary behaviors and the frequency of the school physical education program. All statistical tests adopted a priori alpha level of significance at the .05 level.

Hypothesis One

The null hypothesis was that there would be no difference between program A and program B means on the six separate test items within the President's Physical Fitness Test. The alternate hypothesis was that six-year old boys and girls from the program B would score worse on partial
curl-ups, shuttle run times, sit-and-reach scores, half-mile run/walk times, arm-hang times, and body mass index scores than boys and girls from the program A. In order to determine whether the two-day program test scores were different from the daily curriculum, program frequency served as the nominal level independent variable (twice-a-week, daily), and Presidential test battery score means for the two groups (Curl-ups, half-mile run/walk times, arm-hang times, shuttle run times, sit-and-reach scores, and BMI) served as continuous level dependent variables. The statistical test of choice for Hypothesis one was six separate two way ANOVAS (gender x school). Since there were only two levels of each independent variable, means of significant ANOVAS were inspected for significant group differences. A Bonferonni family-wise alpha test was used to control for family-wise error inflation. Significantly higher scores from program A boys and girls would result in a rejection of the null hypothesis in favor of the research hypothesis.

**Hypothesis Two**

The null hypothesis was that there would be no relationship between the number of male and female students meeting the 50\textsuperscript{th} percentile standards on the Presidential Challenge and the frequency of the physical education
program. The alternate hypothesis was that there would be a significantly greater number of students within program A meeting the minimal standards compared to program B. In order to compare the percentage of male and female students who met the minimal criteria from these two programs, a two-way chi-square analysis was performed with gender (male and female) and program frequency (daily, twice-a-week) serving as independent variables and frequencies of students meeting the 50th percentile criteria used as dependent variables. Since the 2 X 2 chi-square test is a test with one degree of freedom, Yate's correction for continuity was used. In order to reject the null hypothesis, the $X^2_{\text{observed}}$ was compared with the $X^2_{\text{critical}}$. Support for the alternate hypothesis was provided if $X^2_{\text{observed}}$ exceeded $X^2_{\text{critical}}$ and the percentage of students meeting the 50th percentile for the Presidential Fitness test was significantly greater than program A compared to program B.

**Self-Report of Physical Activity**

A major concern of this study was the extracurricular physical activity of the students being tested. Research (Stucky-Ropp & DiLorenzo, 1993) has indicated that there are different determinants for physical activity in boys and girls, and that different physical activity levels outside of organized physical education are important variables in
determining youth fitness (McKenzie, 1995). Since it is known that children's leisure time physical activity has an influence on their physical fitness levels (Stucky-Ropp & DiLorenzo, 1993), it was felt necessary to examine the nature and frequency of physical activity outside the school curriculum. In order to gain more accurate information regarding weekly physical activity outside of the classroom setting, a self-report questionnaire of physical activity was also administered to each child.

The questionnaire used in this study provided a list of physically active and sedentary examples that are typical for this age group. Students were asked whether or not they engaged two sets of behaviors; physically active and sedentary behavior. These two sets of questions included ten questions representing typical physically active behaviors and ten questions representing typical sedentary behaviors. The rationale for these questions was not to provide an exhaustive list of behaviors, but to include both physically active and sedentary behaviors representative of this populations. While not providing specific information on the amount of time or intensity of physical activity levels, this information was useful in providing a diagnostic measure of whether children were physically active outside of the physical education curriculum. A copy of the questionnaire is provided in Appendix C.
It is acknowledged that the self-report questionnaire did not assess specific information about intensity level or frequency of various activities. However, the results of the self-report provide quantitative and qualitative information upon which to compare fitness test results and physical education program frequency, thus gauging weekly amounts of free-time physical activity. This data was used to test hypothesis three.

**Hypothesis Three**

The null hypothesis was that there would be no relationship between the percentage of self-report of physically active and sedentary behaviors, and the frequency of the school physical education program. The alternate hypothesis was that there would be a significant difference in physically active behaviors and sedentary behaviors across program frequency. However, since this self-report data was exploratory in nature regarding the relationships between outside physical activity and physical education curricula, no specific directional hypotheses were made. In order to compare the percentage of males and females who indicate participation in physically active or sedentary behaviors, two separate 2 X 2 chi-square analyses were performed using gender (male and female) and program frequency (daily, twice-a-week) as independent variables and
percentage of students responding "yes" to individual questions as the dependent variable. Two separate chi-square analyses were performed. The first test examined a 2 X 2 chi-square test to examine physically active behaviors and the second analysis examined a 2 X 2 chi-square analysis to examine sedentary behaviors.

In addition, comparison of overall self-report data was compared by summing scores on the self-report according to whether students' answers were indicative of a physically active or sedentary response. For physically active items, "yes" answers to physical activities were coded "1" while "no" answers were coded "0". Likewise, for sedentary items "no" answers to sedentary activities were coded "1" while "yes" answers were coded "0". These scores were summed so that group means could be compared. In order to compare the means of the two programs on these calculated means, two separate two-way analyses of variance (gender X program) were calculated using gender (male, female) and program (daily, twice) as independent variables and self-report questionnaire means as dependent variables. The null hypothesis was that there would be no differences between boys and girls, and program frequency on self-report means. The alternate hypothesis was that there was a significant difference across programs on self-report questionnaire means.
CHAPTER IV

RESULTS

In this study there were three major research questions examined to determine the relationship between physical fitness parameters of six year old children and frequency of physical education programs. (1) The first research question compared whether there was a difference in physical fitness test scores across programs of different frequency as measured by test scores of the President’s Challenge fitness test. (2) The second research question examined whether there was a relationship between program frequency, and the percentage of kindergarten boys and girls meeting minimal criteria standards (50th percentile) on the President’s Challenge fitness test norms. Finally, (3) the third research question examined whether there was a relationship between children’s self-report of physically active and sedentary behaviors as a function of program frequency. An A priori significance level of \( p < .05 \) was adopted for all statistical analyses.

There were a total of 177 students across both programs upon which complete fitness test data was collected (106 boys, 71 girls). Of this total sample size, 34 students' fitness data was obtained from program A (daily program) (21
boys, 13 girls) and 142 students' fitness data was obtained from program B (twice-a-week) (85 boys, 58 girls).

Descriptive Results

Means and standard deviations for Presidential Test scores across gender and program are shown in Table 1. For Program A, males had a mean age 5.43 (SD= .51), and Presidential test scores were as follows; the arm hang mean was 20.63 (SD= 16.44), the mean for partial curl-ups was 18.62 (SD= 6.01), shuttle run mean was 14.20 (SD= 1.27), half-mile run/walk mean was 8.28 (SD= 11.05), sit and reach mean was 25.81 (SD= 4.82), body mass index mean was 16.63 (SD= 1.42). In addition, students' physically active behavior questions and sedentary behavior questions were coded so that subscale totals could be compared. For physically active behaviors a "yes" response was coded =1 and a "no" response =0; for sedentary behavior questions, A "no" response was coded =1 and a "yes" response =0. Physically active behavior totals mean was 8.29 (SD= 1.65), while the sedentary behavior total mean was 2.71 (SD= 2.22), respectively for program A males.

For program B males, mean age was 5.91 (SD= .40), and Presidential scores were as follows; arm hang mean was 6.87 (SD= 6.68), partial curl-ups mean was 13.51 (SD= 9.18), shuttle run mean was 14.26 (SD= 1.88), half-mile run/walk
### Table 1

Means and Standard Deviations for Presidential Challenge Test Scores for Gender and School

<table>
<thead>
<tr>
<th>School</th>
<th>Sex</th>
<th>Arm Hang</th>
<th>Curl-Ups</th>
<th>Shut. Run</th>
<th>Half-Mile</th>
<th>Sit/Reach</th>
<th>BMI</th>
<th>Physical Activity Totals</th>
<th>Sedentary Activity Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>20.63</td>
<td>18.62</td>
<td>14.2</td>
<td>8.28</td>
<td>25.81</td>
<td>16.63</td>
<td>8.29</td>
<td>2.71</td>
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</tr>
<tr>
<td>Program A</td>
<td>(16.44)*</td>
<td>(6.01)</td>
<td>(1.27)</td>
<td>(1.05)</td>
<td>(4.82)</td>
<td>(1.42)</td>
<td>(1.65)</td>
<td>(2.22)</td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>11.62</td>
<td>12.85</td>
<td>15.12</td>
<td>6.99</td>
<td>26.46</td>
<td>17.11</td>
<td>8.85</td>
<td>2.31</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(12.09)</td>
<td>(7.99)</td>
<td>(0.94)</td>
<td>(1.65)</td>
<td>(4.58)</td>
<td>(2.16)</td>
<td>(0.99)</td>
<td>(1.44)</td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>6.87</td>
<td>13.51</td>
<td>14.26</td>
<td>7.73</td>
<td>25.87</td>
<td>17.09</td>
<td>7.73</td>
<td>2.73</td>
<td></td>
</tr>
<tr>
<td>Program B</td>
<td>(6.68)</td>
<td>(9.18)</td>
<td>(1.88)</td>
<td>(2.19)</td>
<td>(7.00)</td>
<td>(2.38)</td>
<td>(2.3 )</td>
<td>(1.85)</td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>7.89</td>
<td>12.69</td>
<td>15.43</td>
<td>8.01</td>
<td>28.3</td>
<td>16.79</td>
<td>7.66</td>
<td>2.18</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(9.13)</td>
<td>(8.8)</td>
<td>(2.11)</td>
<td>(1.78)</td>
<td>(4.98)</td>
<td>(2.02)</td>
<td>(2.2 )</td>
<td>(1.83)</td>
<td></td>
</tr>
</tbody>
</table>

* Standard Deviations are in Parentheses
mean was 7.73 (SD= 2.19), sit and reach mean was 25.87 (SD= 7.00), body mass index mean was 17.09 (SD= 2.38). Finally the mean for physically active behavior was 7.73 (SD= 2.30), while the sedentary behavior mean was 2.73 (SD= 1.85), respectively, for program B males.

Program A females had a mean age 5.46 (SD= .52), and Presidential scores were as follows; the flexed arm hang mean was 11.62 (SD= 12.09), partial curl-ups mean was 12.85 (SD= 7.99), shuttle run mean was 15.12 (SD=.94), half-mile run/walk mean was 7.00 (SD= 1.70), sit and reach mean was 26.46 (SD= 4.58), body mass index mean was 17.1 (SD= 2.16). In addition, physically active behavior total mean for program A 8.85 (SD= .99), and sedentary behavior total mean was 2.31 (SD= 1.44).

For Program B females, the mean age was 5.70 (SD= .49), and Presidential scores were as follows; arm hang mean was 7.89 (SD= 9.13), partial curl-ups mean was 12.69 (SD= 8.80), shuttle run mean was 15.43 (SD= 2.1), half-mile run/walk mean was 8.01 (SD= 1.78), sit and reach mean was 28.3 (SD= 4.98), body mass index mean was 16.79 (SD= 2.02), physically active behavior total mean was 7.66 (SD= 2.20) sedentary behavior total mean was 2.18 (SD= 1.83).
Hypothesis One

This Hypothesis examined whether there was a significant difference in test score means across program frequency. The null hypothesis was that there would be no differences across program frequency when comparing means of Presidential Challenge test scores. Evidence was provided for the research hypothesis if means of Presidential test scores were significantly different across program and means favored higher performance scores within the daily program. In order to test this hypothesis, six separate two-factor ANOVAS (school x gender) were performed to test for differences in Presidential test scores. Gender and Program served as the categorical independent variables while Presidential test scores served as continuous level dependent variables. In order to correct for cumulative type I error because six separate ANOVAS were performed, a Bonferroni correction was applied to control for inflation of the familywise error rate. The familywise error rate, or alpha (p = .05) was divided by the number of comparisons to yield a more stringent alpha (p = .008) (Keppler, 1991). This procedure was performed to protect against over-inflation of the familywise error, and erroneous rejection of the null hypothesis.

Results from six separate two-way ANOVAS revealed a significant program effect for flexed arm hang scores,
53

\[ F(1,172)=25.53, \ (p = .0001), \] a non-significant main effect for gender \[ F(1,172)=5.93, \ (p = .0159), \] and a non-significant interaction \[ F(1,172)=6.44, \ (p = .0121), \] after family wise error rate correction. Examination of the flexed arm hang means indicated that program A had significantly higher flexed arm hang scores \((\bar{x}= 17.19, \ SD= 15.39)\) compared to program B \((\bar{x}= 6.94, \ SD= 7.32)\). In addition, there was a significant gender effect for shuttle run scores \[ F(1,172)=8.28, \ (p = .005) \] indicating that boys had significantly lower shuttle run times than girls. Results from the remainder of two-way ANOVAS were non-significant. Summary tables for the separate two-way ANOVAS are shown in Table 2. These results indicate that, with the exception of flexed arm hang scores there were no significant differences comparing test score means across school programs. Thus, hypothesis one was largely unsupported with the exception of flexed arm hang scores favoring the daily program.

**Hypothesis Two**

This hypothesis examined whether there was a significant difference in the percentage of students meeting 50th percentile standards of the President’s Challenge across school programs as a function of program frequency. The rationale for choosing the 50th percentile standard was because this represents the criterion performance level...
### Table 2

**Gender by Program ANOVA Summary Tables for Hypothesis One**

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Flexed Arm Hang</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School</td>
<td>1</td>
<td>25.533</td>
<td>0.0001</td>
</tr>
<tr>
<td>Gender</td>
<td>1</td>
<td>5.932</td>
<td>0.0159</td>
</tr>
<tr>
<td>School X Gender</td>
<td>172</td>
<td>6.438</td>
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</tr>
<tr>
<td><strong>Curl-Ups</strong></td>
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<td>1</td>
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<td>0.1234</td>
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<td>Gender</td>
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<td>3.739</td>
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<tr>
<td>School X Gender</td>
<td>173</td>
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</tr>
<tr>
<td><strong>Shuttle Run</strong></td>
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<td>School X Gender</td>
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<tr>
<td><strong>Half-Mile Run</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
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<td>0.224</td>
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</tr>
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<td>School X Gender</td>
<td>173</td>
<td>1.181</td>
<td>0.2787</td>
</tr>
<tr>
<td><strong>Sit and Reach</strong></td>
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<td></td>
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</tr>
<tr>
<td>School</td>
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<td>0.329</td>
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<td>Gender</td>
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<td>0.1412</td>
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<td>School X Gender</td>
<td>173</td>
<td>0.856</td>
<td>0.3561</td>
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### BMI

<table>
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<tr>
<td>Gender</td>
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<tr>
<td>School X Gender</td>
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### Physical Activity Totals

<table>
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</thead>
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<td>0.789</td>
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<tr>
<td>School X Gender</td>
<td>173</td>
<td>1.106</td>
<td>0.2943</td>
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### Sedentary Activity Totals

<table>
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</thead>
<tbody>
<tr>
<td>Gender</td>
<td>1</td>
<td>1.744</td>
<td>0.1884</td>
<td></td>
</tr>
<tr>
<td>School X Gender</td>
<td>173</td>
<td>0.051</td>
<td>0.8217</td>
<td></td>
</tr>
</tbody>
</table>

# Significant After Familywise Error Rate Correction.
standards for the National Physical Fitness Award and recognizes what is considered a basic yet challenging level physical fitness (PCPFS, 2000). The null hypothesis was that there would be no relation between percentage of male and female students meeting 50th percentile standards and program frequency. Evidence for the research hypothesis was supported if there were significant differences between observed and expected frequencies across programs, with a significantly higher percentage of program A students meeting the 50th percentile criterion compared to program B.

In order to test this hypothesis, students were separated by gender and a 2 x 2 (school x test) chi-square contingency table was performed for each Presidential Challenge test. In analyzing data in this hypothesis a separate category was created so that genders could be compared separately across programs. Each student's score was then binomially coded as to whether the criterion score was met for that particular test (yes: at or above the 50th percentile or, no: below the 50th percentile on the Presidents' Challenge). Therefore, the 2 x 2 chi-square analysis was used with gender and program combined as the independent variable and criterion category (above, below) as the dependent variable. Since it is recommended that for small values of N the continuous normal curve is a poor fit
to the discrete binomial, A Yate’s correction for continuity was used to adjust for 2 x 2 chi-square analysis with 1 df.

**50th Percentile Comparisons for Males**

Chi-square results for flexed arm hang scores were significant ($X^2(1) = 17.61, p < .0001$), indicating that a significantly higher percentage of program A males met or exceeded the 50th percentile norms, compared to program B males. Specifically 95.24 percent of program A compared to 41.18 percent of program B met 50th percentile criterion standards on the Presidents’ Challenge. Chi-square results for males across test scores are shown in Table 3. Partial curl-up comparisons resulted in a non-significant chi-square ($X^2(1) = .01, p = .75$), and chi-square results for shuttle run times were also non-significant ($X^2(1) = .02, p = .90$). There was however, a significant chi-square result for the comparison of half-mile run/walk times ($X^2(1) = 19.37, p = .0001$) indicating that a significantly higher percentage of program A males met 50th percentile criterion compared to program B. Specifically 42.86 percent of males in program A, compared to 4.71 percent of program B males met or exceeded 50th percentile norms of the Presidents’ Challenge. Chi-square results were also non-significant for sit and reach ($X^2(1) = .01, p = .92$) and BMI scores ($X^2(1) = .08, p = .78$), respectively.
## Table 3

### Percentage & Number of Males Meeting 50th Percentile Standards

<table>
<thead>
<tr>
<th></th>
<th>Program A</th>
<th></th>
<th>Program B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Percentage Meeting 50th Percentile (Total N)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexed Arm Hang</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Made 50th %</td>
<td>95.24 (20)* #</td>
<td></td>
<td>41.18 (35)</td>
<td></td>
</tr>
<tr>
<td>Below 50th %</td>
<td>4.76 (1)</td>
<td></td>
<td>58.82 (50)</td>
<td></td>
</tr>
<tr>
<td>Curl-Ups</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Made 50th %</td>
<td>28.57 (6)</td>
<td></td>
<td>22.36 (19)</td>
<td></td>
</tr>
<tr>
<td>Below 50th %</td>
<td>71.43 (15)</td>
<td></td>
<td>77.65 (66)</td>
<td></td>
</tr>
<tr>
<td>Shuttle Run</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Made 50th %</td>
<td>28.57 (6)</td>
<td></td>
<td>32.94 (28)</td>
<td></td>
</tr>
<tr>
<td>Below 50th %</td>
<td>71.43 (15)</td>
<td></td>
<td>67.06 (57)</td>
<td></td>
</tr>
<tr>
<td>Half-Mile Run</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Made 50th %</td>
<td>42.86 (9) #</td>
<td></td>
<td>4.71 (4)</td>
<td></td>
</tr>
<tr>
<td>Below 50th %</td>
<td>57.14 (12)</td>
<td></td>
<td>95.29 (93)</td>
<td></td>
</tr>
<tr>
<td>Sit and Reach</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Made 50th %</td>
<td>47.62 (10)</td>
<td></td>
<td>51.22 (42)</td>
<td></td>
</tr>
<tr>
<td>Below 50th %</td>
<td>52.38 (11)</td>
<td></td>
<td>50.59 (43)</td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Made 50th %</td>
<td>94.74 (18)</td>
<td></td>
<td>89.41 (76)</td>
<td></td>
</tr>
<tr>
<td>Below 50th %</td>
<td>5.26 (1)</td>
<td></td>
<td>10.59 (9)</td>
<td></td>
</tr>
</tbody>
</table>

* Actual Number is in Parentheses

# Significant At .05 Level
50th Percentile Comparisons for Females

The six separate 2 x 2 chi-square contingency tables indicated non-significant results for flexed arm hang ($x^2(1) = .05, p = .82$), partial curl-ups ($x^2(1) = .06, p = .80$), shuttle run ($x^2(1) = .09, p = .77$), half-mile run/walk scores ($x^2(1) = .49, p = .48$), and BMI ($x^2(1) = 1.23, p = .27$).

Percentages and numbers of females across program meeting 50th percentile standards are shown in Table 4. Overall, there was partial support for Hypothesis Two, in that boys in program A met National Award criteria significantly more than program B boys on a measure of static muscular endurance (flexed arm hang scores) and cardiorespiratory endurance (half-mile run/walk) times. For females, hypothesis two was not supported.

Hypothesis Three-Self-Reported Activity Behavior.

The third hypothesis examined whether differences existed across program in self-reported physically active behavior and sedentary behavior, as a function of program frequency. In order to test this hypothesis, separate 2 x 2 (program x response) chi-square analyses were performed for each behavior question on the survey. In these analyses, program was used as the independent variable while percentage of students responding "yes" to each question was used as the dependent variable. Gender was collapsed for
### Table 4

**Percentage & Number of Females Meeting 50th Percentile Standards**

<table>
<thead>
<tr>
<th>Test</th>
<th>Program A</th>
<th>Program B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Flexed Arm Hang</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Made 50th %</td>
<td>61.54 (8)*</td>
<td>53.45 (31)</td>
</tr>
<tr>
<td>Below 50th %</td>
<td>38.46 (5)</td>
<td>46.55 (27)</td>
</tr>
<tr>
<td><strong>Curl-Ups</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Made 50th %</td>
<td>15.38 (2)</td>
<td>17.24 (10)</td>
</tr>
<tr>
<td>Below 50th %</td>
<td>84.62 (11)</td>
<td>82.76 (48)</td>
</tr>
<tr>
<td><strong>Shuttle Run</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Made 50th %</td>
<td>7.69 (1)</td>
<td>15.52 (9)</td>
</tr>
<tr>
<td>Below 50th %</td>
<td>92.31 (12)</td>
<td>84.48 (49)</td>
</tr>
<tr>
<td><strong>Half-Mile Run</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Made 50th %</td>
<td>15.38 (2)</td>
<td>5.17 (3)</td>
</tr>
<tr>
<td>Below 50th %</td>
<td>84.62 (11)</td>
<td>94.83 (55)</td>
</tr>
<tr>
<td><strong>Sit and Reach</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Made 50th %</td>
<td>46.15 (6)</td>
<td>67.24 (39)</td>
</tr>
<tr>
<td>Below 50th %</td>
<td>53.85 (7)</td>
<td>32.76 (19)</td>
</tr>
<tr>
<td><strong>BMI</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Made 50th %</td>
<td>76.92 (10)</td>
<td>91.38 (53)</td>
</tr>
<tr>
<td>Below 50th %</td>
<td>23.08 (2)</td>
<td>8.62 (5)</td>
</tr>
</tbody>
</table>

* Actual Number of Students is in Parentheses
this analysis because the intent was to simply compare self-report of outside activity behaviors across program and results were not limited to gender specific norms as in Hypothesis Two. Separate chi-square analyses were performed for physically active and sedentary questions. In addition, self-report subscale totals were calculated for both physically active behaviors and sedentary behaviors. Scores were summed so that group means on physically active and sedentary behaviors could be compared using two separate two-factor (gender x program) ANOVAS using physically active behavior and sedentary behavior totals as dependent variables.

Physically Active Behavior Self-Report

Results for physically active self-report behavior revealed significant differences across programs for question number 3 ("Do you play games where you jump, hop, or skip around?") \( (x^2(1) = 3.94, p < .05) \). Specifically for question number 3, 84 percent answered yes to this question in program A, compared to 66 percent in program B. Results revealed significant chi-square results for question number 5 ("Do you play games where you catch things like baseball?") \( (x^2(1) = 4.34, p < .04) \). Specifically, 92 percent of program A compared to 75 percent of program B answered yes for question number 5. Finally, significant chi-square
results were also found for question number 9 ("Do you play outside either by yourself or with friends?") \( (x^2(1)=12.32, p < .0009) \). Specifically for question number 9, 87 percent of program A, compared to 98 percent of program B. Results indicated non-significant chi-square findings for the remaining self-report questions \( (p > .05) \). Table 5 displays percentages and numbers of students across program engaging in self-reported physically active behaviors.

**Sedentary Behavior Self-Report**

Results for self-reported sedentary behavior revealed significant differences across program for question number 1 ("Do you watch television?") \( (x^2(1)=6.52, p < .01) \). Specifically, 82 percent of program A students answered yes compared to 95 percent of program B students for question number one. The results reported significant differences across program for question number 8 ("Do you play on the floor?") \( (x^2(1)=12.32, p < .0004) \). Specifically, 66 percent of program A answered yes to question number 8 compared to 90 percent of program B. Chi-square analysis results for the remaining sedentary behavior questions were non-significant \( (p > .05) \). Table 6 displays percentages and numbers of students across program engaging in self-reported sedentary behaviors.
| Question #1: | Do you play games where you run, like tag? | 81.58 (31)* | 76.80 (139) |
| Question #2: | Do you play games where you throw things, like basketball? | 84.21 (32) | 73.48 (133) |
| Question #3: | Do you play games where you jump, hop, or skip around? | 84.21 (32)^ | 66.30 (120) |
| Question #4: | Do you ride a bicycle outside? | 92.11 (35) | 88.40 (160) |
| Question #5: | Do you play games where you catch things, like baseball? | 92.11 (35)^ | 75.14 (136) |
| Question #6: | Do you play at the playground or park? | 94.29 (33) | 88.95 (161) |
Question # 7:
Do you climb things, like trees or playground equipment? 73.68 (28) 85.64 (155)

Question # 8:
Do you help your parents with chores, like raking the leaves, etc.? 84.21 (32) 79.01 (143)

Question # 9:
Do you play outside either by yourself or with friends? 86.84 (33)^ 98.90 (179)

Question # 10:
Do you play with a ball of some kind? 92.1 (35) 87.29 (158)

^ p < .05
<table>
<thead>
<tr>
<th>Question</th>
<th>Program A</th>
<th>Program B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Question #1:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you watch TV?</td>
<td>81.58 (31)*</td>
<td>95.03 (172)</td>
</tr>
<tr>
<td><strong>Question #2:</strong></td>
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<td></td>
</tr>
<tr>
<td>Do you play games?</td>
<td>81.58 (31)</td>
<td>75.14 (136)</td>
</tr>
<tr>
<td><strong>Question #3:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you play on the computer?</td>
<td>71.05 (27)</td>
<td>81.22 (147)</td>
</tr>
<tr>
<td><strong>Question #4:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you nap during the daytime?</td>
<td>52.63 (20)</td>
<td>49.72 (90)</td>
</tr>
<tr>
<td><strong>Question #5:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you read or look at books?</td>
<td>86.84 (33)</td>
<td>84.53 (153)</td>
</tr>
<tr>
<td><strong>Question #6:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you play in your room quietly sitting?</td>
<td>76.32 (29)</td>
<td>79.56 (144)</td>
</tr>
</tbody>
</table>
Question # 7:  
Do you play at the table?  
 39.47 (15)  56.91 (103)  

Question # 8:  
Do you play on the floor?  
65.79 (25)^  89.50 (162)  

Question # 9:  
Do you sit or play on the couch?  
68.42 (26)  83.43 (151)  

Question # 10:  
Do you do school work?  
92.1 (35)  85.08 (154)  

^ p < .05
Total Self-Report Comparisons

In order to obtain a more global analysis of engagement in physically active and sedentary behaviors, responses to the physically active behaviors and sedentary behaviors were coded and total scores were obtained so an overall composite could be obtained and assessed regarding active and sedentary behavior self-report using ANOVA procedures. Results from a two factor (gender x program) ANOVA on total physical activity behavior self-report indicated a significant program main effect $F(1,173)=5.56, p < .05$ a non-significant gender effect $F(1,173)=.07, p = .79$ and a non-significant program by gender interaction $F(1,173)=1.11, p = .29$. These results are also reported in Table 2, without a Bonferroni familywise correction. Specifically, examination of program means indicated significantly higher physical activity self-report totals for program A ($\bar{x}=8.5$) compared to program B ($\bar{x}=7.59$). Results from a two factor (gender x program) ANOVA on sedentary behavior self-report totals indicated a non-significant gender by program interaction $F(1,173)=1.05, p = .82$, a non-significant main effect for program $F(1,173)=.03, p = .85$, and gender $F(1,173)=1.74, p = .19$. Hypothesis three was largely exploratory in nature, however there was some marginal support for the contention that children within program A
engaged in significantly more self-reported physically active behaviors compared to program B.
CHAPTER V

DISCUSSION

The purpose of this study was to compare the difference in physical fitness levels for kindergarten students participating in a program consisting of two days per week or five days per week (daily) of organized physical education within the school curriculum. School program means were compared for significant differences in fitness test measures and 50th percentile norms from the President’s Challenge physical fitness test were used to measure the fitness levels of the students and to compare two school districts on their ability to meet these criterion-referenced standards. Significant differences between the two programs supportive of the research hypotheses were interpreted as evidence of validating program frequency as a determining factor in the fitness levels of kindergarten students.

Hypothesis One

Hypothesis one examined whether there was a significant difference in absolute test score means across program frequency. Hypothesis one was largely unsupported, showing no significant differences in mean scores across program
with the exception of the flexed arm hang, a measure of upper shoulder girdle strength and endurance (large standard deviations were found due to a large range of scores). Updated revisions of the President’s Challenge to make the test appropriate for all ages (6-17) suggest replacing push-ups with the flexed arm hang as a valid indicator of muscular strength and endurance in both males and females six years of age (PCPFS, 2000).

These findings concur with research by Payne, Morrow, Johnson, and Dalton (1997) examining the ability of children under the age of eighteen to increase muscle strength and endurance. They found that muscular strength and endurance does increase among children dependent upon training programs. Results of their study varied on three determining factors; intensity, duration, and frequency of workouts. In the present study program A and program B, having similar durations and intensities, only significantly differed in program frequency. It can be argued that program A’s daily activity provided more opportunity for the children to increase shoulder girdle strength.

The main gender effect and interaction were non-significant with the Bonferroni correction. However, careful examination of means from this ANOVA results indicated that males’ differences contributed more to the
significant program effect than females scores. Females’ scores showed no significant difference in arm hang scores.

McKenzie et al. (1995) studied differences in boys’ physical activity patterns to girls’ physical activity patterns. He found boys to be more aggressive and outgoing when participating in physical activities. They monopolized the equipment and spent less time at sedentary pursuits McKenzie et al., 1995). It is possible that McKenzie’s findings are true for program A, thus explaining the gender effect in favor of program A boys in the present study.

Another reason for the lack of difference across gender can be attributed to the ages of the subjects. At six years old, many of the differences in size and strength associated with males and females have yet to take place. Developmentally, males and females are very similar physically at this age. For this reason, a primary objective was to focus on differences across program. Males and females were separated in scoring solely for comparing them to the 50th percentile norms examined in Hypothesis two. Stronger support for this hypothesis would have been evidenced by more consistent differences across programs in fitness scores favoring the daily program. However, one reason why more systematic differences were not observed may be linked to the finding (Pate et al., 1995) that physical activity patterns at younger ages are higher than in
children by the time they reach high school. Additionally, the daily program curriculum focused more on skill related activities, and this emphasis within the program may have ultimately limited more systematic differences.

**Hypothesis Two**

Hypothesis two examined whether there was a significant difference in the percentage of students meeting 50th percentile standards of the President's Challenge across school programs as a function of program frequency. There was partial support for hypothesis two where boys in program A met National Award criteria significantly more than program B boys on flexed arm hang scores and 1/4 mile run times, but for females, hypothesis two was not supported.

50th percentile norms of the President's Challenge were chosen as the criteria for measuring fitness because of the intent of this study. The global purpose of this study was to determine if students were benefiting from daily physical education when compared to a biweekly program. A common objective measure of fitness in measurement and evaluation of youth fitness parameters is a norm-referenced test upon which to measure individual youth performance standards. 50th percentile norms were determined as average marks in which scores below could be considered below average and scores at or above could be considered good levels of
fitness. In addition, the President's Challenge (PCPFS, 2000) indicates this percentile for the National Award, for its required basic, yet challenging level of fitness. Finally, since this study examined school physical education programs, using a 50th percentile as the pass/fail mark was deemed appropriate since that grading system is enforced throughout all subjects across the curriculum.

Comparison of percentages of students meeting 50th percentile norms across program A and program B shed a different light on the scores collected for hypothesis one. While direct comparison of means from hypothesis one accounted for extreme scores, the comparison in Hypothesis Two simply examined the percentage of students from each program who were able to score at or above a criterion score. This type of comparison is critical because it is the most common norm-referenced comparison upon which norm-referenced tests are based and most commonly reported statistically to administrations regarding program quality.

Program A had a significantly higher percentage of students scoring at or above the 50th percentile on the flexed arm hang and half-mile run. Closer examination of these chi-square results indicated that, while not receiving statistical significance, program A maintained a higher percentage of students meeting the 50th percentile on all tests except the sit and reach and shuttle run. These
findings, while not all statistically significant, provide further evidence in favor of daily physical education.

Results from the present study are supported by Payne et al. (1997) who found muscular strength and endurance in children under eighteen can be improved with sufficient intensity, duration, and frequency of workouts. In the present study, 95.24 percent of program A's boys met the 50th percentile criteria for flexed arm hang compared to only 41.18 percent of program B's boys. Having similar programs, it is possible that the frequency of program A alone is the most determining factor in this extreme difference across programs. Rowland (1994) examined whether cardiovascular fitness improvements were possible in children ages 7-11 and found that the pediatric age level cardiovascular fitness can be improved or decreased based upon the activities of the individual. Findings from this study support Rowland (1994) in that program A had 42.86 percent of its males meeting the 50th percentile criteria compared to only 4.71 percent of program B. A difference of this magnitude must be taken seriously in light of new discoveries in the origin of cardiovascular disease risk factors (McKenzie et al., 1995). Frequency was the most identifiable difference across program in the present study and suggests children in program B may be performing poorly because ACSM frequency guidelines are not being met. For
example, if students in program B were obtaining two 30 minute sessions of aerobic activity, that corresponds to 8.5 minutes of aerobic activity per week day compared to program A if students obtained 20 minutes of physical activity five days a week, corresponding to 14 minutes of physical activity per weekday. Neither program is meeting ACSM (1998) minimal requirements for fitness improvements, but program A is consistently higher than program B.

It is important when examining the results of the present study to understand proper exercise guidelines for improving fitness. The American College of Sports Medicine (1998) recommends moderate to vigorous activity three to five days a week for twenty to sixty minutes (or accumulating bouts of 10 minutes a day to equal twenty to sixty minutes) to improve cardiovascular fitness. The ACSM (1998) also recommends progressive overloading of major muscle groups a minimum of two to three days a week to improve muscular strength and endurance. Meeting just the minimum criteria set by the ACSM for cardiovascular fitness and each main muscle group takes proper time and planning to elicit results.

An important outcome in this study was quantifying overall fitness of both programs. The purpose of this study was to compare programs, but upon analysis of the data it became clear that neither program was in exceptional
condition. In fact, the total population of the present study performed poorly on the President’s Challenge. Program A boys had less than half the group reach the 50th percentile criteria on four of the six tests. Program B boys also failed to reach the 50th percentile in four of the President’s Challenge Tests. This observation is indicative of previous research (McKenzie et al., 1995) reporting decreasing fitness levels at a young age (see table 3). Program A girls failed to make the 50th percentile on four of the six tests while program B girls missed the 50th percentile mark on three of the six tests (Table 4). This finding supports the literature that poor conditioning, obesity, and sedentary habits are forming at early ages and that the fitness levels of children are worse today than 1985 when the standards were set.

Interpreting this data across both programs, it may be concluded that in general, neither current program could meet the minimal program criteria for the National Physical Fitness Award (PCPFS, 2000). Most students in this sample could have only qualified for the Participant Award. This award was created for students who could not meet the 50th percentile criteria on multiple tests, but are awarded for attempting them. Translated into a grading scale, most students in this sample would have received a score beneath the 50th percentile or a failing grade.
Another finding of great concern was the mean scores for BMI. Nearly all students met the minimal criteria by scoring within the recommended range (boys, 13.3-19.5 and girls, 13.1-19.6), but upon closer examination the majority of students in this study had BMI values at the higher end of the recommended range. Mean BMI scores were consistently high, some even exceeding the recommended healthy range. This is of concern when the majority of all six year olds tested are approaching obesity at such an early age.

Obesity is one of the most serious risk factors for heart disease in adulthood (AAP, 1992), and as McKenzie et al. (1995) found, the healthy or unhealthy habits a child carries into adulthood begin to form at the kindergarten level. These BMI values are also a source of concern in that, if activity patterns decrease throughout school years, as has been previously indicated (Pate et al., 1995), these BMI values may be projected to increase to unhealthy levels by the time the children have entered high school.

Hypothesis Three

Hypothesis three examined whether differences existed across program in self-report of outside activity behavior. There was some marginal support for the contention that children within program A engaged in more outside physically active behavior, as indicated by significantly higher
percentages of program A students' responses on questions 3, 5, and 8 and significantly higher physically active totals for group A.

This finding is supported by Dale and Corbin (2000) who found that students receiving physical education during the school day were actually more likely to continue that activity outside of the school setting. Dale and Corbin (2000) found sedentary patterns at school produced sedentary activity at home. Physically active days at school produced physically active lifestyles at home. It should be noted that within the current study, there was no direct analysis of outside physical activity as a direct result of the physical education curriculum, therefore conclusions regarding self-report of physical activity remain speculative. When looking at meeting recommended activity durations and frequencies it is very important to try and assess the outside activity of the subjects. It is an influential variable that is difficult to control for. The self-report is admittedly inconclusive but indicative of patterns outside of program curricula.

Limitations

There were several noted limitations from the data collected within the current study. Absences caused limitations by loss of data as many students' scores were
unusable because of incomplete data. Program B teachers used physical education time to pull children out for one on one aid or for class field trips. Physical education was not a priority to everyone in the school building.

Differences across programs were not as evident in comparison of females. This may have been due to low numbers of program A females participating in the testing. Equal numbers of males and females across programs would have made the results more reliable.

The biggest limitation was the inability to administer the President's Challenge to both schools using only one teacher. Each teacher tested his/her own students. Reliability and objectivity of fitness test administration is facilitated when measurement error sources are reduced. One primary method of reducing this error is to maintain consistency across test administrations by use of the same tester or instructor (Hastad & Lacy, 1998). While the President's Challenge has very precise directions, it is possible that some differences took place between the two programs during testing. It is also difficult to judge full effort from six year olds. Their inconsistent attention span and effort made it impossible to assume accurate scoring across test items. It is a given that some students simply were not interested enough to score their best on some test items. Along the same lines, one researcher spent
the entire year with program B, knowing exactly what types of activities were taking place but was completely uninvolved in the classes at program A.

An important factor left off the self-report survey was the frequency in which the children participated in the activities they indicated. Answering yes to riding a bike could have varied from once a week to daily, which left much measurement error unaccounted for. The original self-report accounted for this variable by having a frequency rating scale from one to ten following each question. This limitation is important and acknowledged, however, the frequency question was rejected for inclusion by program B administration and thus critical information for this self-report analysis was not capable of being examined. Future studies should try and record more specific data on the frequency and intensity of the outside activities of the children. Without this information, it cannot be determined decisively whether differences across program are due to program frequency or some difference in the after school activities of the children. Use of this information may be helpful in determining whether program frequency has an impact on positively influencing increases in children’s physical activity patterns.

Self-report questions may not have accurately described activities in a way which the children could interpret and
associate their own activities. They may not have been able to relate their activities to the examples provided by the self-report, thus answering no to activities in which they actually partake.

Finally, the current study did not account for parental activity. Stucky-Ropp & DiLorenzo (1993) studied the relation between the activity patterns of children and their parents. Results indicated a strong parental influence on activity levels in that children patterned their activities after their parents' activity levels. To conclude the effects of the curriculum on the fitness levels of the children in the current study, examination of family activity patterns at home must be conducted.

Recommendations for Future Study

Future study in this area should better account for the specifics of the students' outside behavior. It is recommended that in the future, comparison of program differences should be done by using the same individual to administer tests across programs to reduce measurement error. A longitudinal study would be very beneficial as the children could be followed while they progress through school into adulthood, measuring fitness levels and risk factors as they age.
Conclusion

The twice-a-week program never scored significantly higher than the daily program on the President's Challenge fitness tests. The daily program had a significantly greater number of students meeting the 50th percentile norms of the President's Challenge arm hang and half-mile endurance run tests. This finding supports research that cardiorespiratory fitness gains can be made at the pediatric ages (Rowland, 2000) as well as gains in muscular strength and endurance (Payne et al., 1997) if proper intensity, duration, and frequency of activity are consistently maintained. Results from the present study show strong support for the influence program frequency has on cardiorespiratory fitness. These results are especially important in light of recent discoveries that cardiorespiratory disease risk factors begin forming as early as age six (AAP, 1992). The lack of significant differences in females on cardiorespiratory endurance may have been due to lower effort output and lower numbers of females in the daily program.

Results indicated that students in the daily program were more likely to be physically active at home than the twice-a-week program. Thus, getting even more exercise while students in the twice-a-week program continue to form sedentary habits that will carry into their adult lives.
References


APPENDIX A - DESCRIPTIONS OF PRESIDENTIAL TEST ITEMS
Abdominal Muscle Endurance

The partial curl-ups are an option to the full sit up. They put less strain on the lower back and isolate the abdominals from the hip flexors by only requiring the subject to curl the head and shoulders on the floor while keeping the small of the back flat on the floor. Partial curl-ups measure abdominal strength and endurance by the maximum number of curl-ups the student can do before muscle failure.

The students laid on a cushioned, clean surface with knees flexed and feet 12 inches from buttocks. His/her arms were extended forward with fingers resting on the legs and pointing toward the knees. Every student had a partner seated behind them with hands cupped under their head. The student being tested curled up slowly sliding their fingers up their legs until the fingertips touch the knees, then back down until their head touches the hands of their partner. The curl-ups are done to an prerecorded audio cadence that is sounded every three seconds until the student cannot keep up or breaks form. The cadence was prerecorded on a cassette tape. The students' score was calculated by the number of correctly executed sit-ups.
Minimal cut-off scores for the 50th percentile are 33 and 32 for boys and girls, respectively.

**Cardiorespiratory Endurance**

The half-mile run/walk was used as the cardiorespiratory test because it is considered more age appropriate for six year olds (PCPFS, 2000). Walking may be interspersed with running, however, students were encouraged to cover the distance in as short a time as possible. Times were recorded in minutes and seconds. 50th percentile norms were taken from the National Youth Fitness Survey II due to missing half-mile norms in the President's Challenge testing materials (USDHHS, 1987). Minimal cut-off scores for the 50th percentile are 5:23 and 5:44 minutes for boys and girls, respectively.

**Agility**

The shuttle run evaluates speed, strength, and agility of the lower body. Two parallel lines were marked 30 feet apart from one another with two blocks placed at the distal line. Students started behind the line opposite the blocks. On the signal "Ready? Go!" the student ran to the blocks, picked one up, ran back to the starting line, placed a block behind the line, ran back and picked up the second block before running back across starting line. Scores were
measured in seconds to the tenth of a second. Minimal cut-off scores for the 50th percentile are 12.1 and 12.4 seconds for boys and girls.

Upper Body Muscle Endurance

The flexed arm hang is an alternative to the pull-up and push-up to test upper body strength and endurance. Since young children are often less developed in shoulder girdle strength, the flexed arm hang is a more age appropriate and accurate measurement of upper-body endurance in this situation (PCPFS, 2000). The test was performed on a horizontal straight bar high enough off the ground that the student cannot touch his or her feet. Each student could take either an underhand or overhand grip on the bar. The student was lifted into a flexed-arm hanging position with the chin just above the bar. The chest was held close against the bar. The time started as soon as the student was holding himself/herself in the proper position without assistance. Students' performance times began as soon as the participating student was in the proper position and stopped once the chin falls below the bar. Minimal cut-off scores for the 50th percentile are 6 seconds and 5 seconds for boys and girls, respectively.
Flexibility

The sit and reach test is a more accurate option to the V-sit and reach for testing flexibility. A specially constructed box with a measuring scale marked in centimeters is used. The measuring scale has the 23rd centimeter mark located at the level of the feet. With shoes off and knees extended, the student sits down and places his/her feet onto the front of the box. Palms down and one hand on top of the other, the student reaches forward along the measuring tape as far as possible without bouncing or jerking. After three practice reaches, the fourth is held and recorded. Scores are recorded to the nearest centimeter. The minimal cut-off scores for the 50th percentile are 3.5 centimeters and 5.5 centimeters for boys and girls, respectively.

Body Composition

The body mass index (BMI) is used to estimate the students' body composition. BMI is calculated by dividing each child's weight in kilograms by the square of their height in inches (PCPFS, 2000). While skinfold assessment of body composition is more accurate, BMI is a part of the Presidents Fitness challenge and was used in this study to parallel the President's Fitness challenge and its scores. BMI was also used because of time constraints and sensitivity issues regarding skinfold testing. Height and
weight measurements were assessed on the first day of my testing. The desirable BMI range taken from the National Fitness Award standards of the Presidents' Challenge for six year old boys and girls is 13.3-19.5 and 13.1-19.6 respectively.
APPENDIX B - 50th PERCENTILE NORMS FOR THE PRESIDENT'S CHALLENGE
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* Desirable BMI as set by the National Award of the President's Challenge is 13.3-19.5 and 13.1-19.6 for boys and girls respectively.

** Half-mile run/walk times taken from the National Children and Youth Fitness Study II (1987)
APPENDIX C - SELF-REPORT SURVEY
Please ask the child if he/she takes part in any of these activities. Reference the questions as: "When you get home or to the daycare after school..." Circle the appropriate answer. You may offer as many examples or explanations of the activity as the student needs.

**Physical Activities**

Do you play games where you run like tag? 
Yes  No

Do you play games where you throw things like basketball? 
Yes  No

Do you play games where you jump, hop, or skip around? 
Yes  No

Do you ride a bicycle outside? 
Yes  No

Do you play games where you catch things like baseball? 
Yes  No

Do you play at the playground or park? 
Yes  No

Do you climb things like trees or playground equipment? 
Yes  No

Do you help your parents with chores like raking the leaves, etc.? 
Yes  No

Do you play outside either by yourself or with friends? 
Yes  No

Do you play with a ball of some kind? 
Yes  No

**Sedentary Activities**

Do you watch television? 
Yes  No

Do you play Video games? 
Yes  No

Do you play on the computer? 
Yes  No

Do you sleep or nap during the daytime? 
Yes  No

Do you read or look at books? 
Yes  No

Do you play in your room quietly sitting? 
Yes  No

Do you play at the table? 
Yes  No

Do you play on the floor? 
Yes  No

Do you sit or play on the couch? 
Yes  No

Do you do school work? 
Yes  No
April 2000

Dear Parents,

My name is Tim Kliethermes. I have been your child’s physical education teacher during the fall 1999 and spring 2000 semesters at Mark Twain Elementary School in Charleston, Illinois. My employment at Mark Twain comes as part of an assistantship I applied for through Eastern Illinois University. Currently, I am completing my Master’s degree in sport administration. To fulfill a requirement in my department, I am in the process of writing my Master’s thesis under the supervision of Dr. William Russell.

The topic of my study is the fitness of today’s youth, particularly kindergarten students. There is much literature and many studies supporting the concern that children today are not as physically fit as similar children ten to twenty years ago. This is a serious issue. Healthy bodies live longer, learn easier, harbor less stress, and defend illnesses. We also know that lifestyle decisions and the formation of habits begin at very early ages. I want to make sure that my students get the best educational atmosphere to begin a long, happy, healthy life.

Important in physical education today is the number of physical education classes included in the curriculum per week. Most schools meet either two or five times a week. At Mark Twain, we have physical education twice a week. Organizations such as the American College of Sports Medicine have recommended frequency of exercise for fitness gains at 3 days per week. Right now we focus on the equally important domain of motor development, but there is so much more we could do.

My study involves fitness testing the two day per week physical education classes at Mark Twain and comparing them to the scores of a five day per week program at Bennett School in Mattoon. The test battery will be the President’s Challenge fitness test designed by the Presidents Council on Physical Fitness and Sport. The tests have been approved for this age group and include: arm hang, curl-ups, shuttle run, ¼ mile run/walk, sit and reach flexibility test, and height and weight measurements for BMI scores. All of the results will remain completely anonymous and your child can drop out or refuse to participate in any activity without consequence. I plan to test in May. The tests will be a lot of fun for every student. The President’s Challenge fitness test is a staple in many physical education curriculums as an evaluative tool, including Charleston High School.

I would like to take this opportunity to ask your consent to include your child in this study. You will be doing me a great service and helping to evaluate/improve education at the same time. Please call me at home or at Mark Twain if you have any questions, comments, or concerns. Thank you for your time.

Tim Kliethermes (Mr. K)  
217/348-0642  
William Russell, Ph. D.  
217/581-2418  
Mark Twain Elementary  
217/345-6018

I, ___________________________, give permission for ___________________________ to participate in the President’s Challenge, and for his/her results to be confidentially added into a published thesis. All student data will remain anonymous and confidential.

Date ___________________________
VITA

Tim Kliethermes was born January 7, 1976 in the small town of Lexington, Illinois. After completing high school there, he received a B.S. degree in Physical Education with an option in Athletic Training (1999), and a M.S. degree in Physical education with an emphasis on Sport Management (2000) while attended Eastern Illinois University in Charleston, Illinois. He is currently living in Tampa, Florida.