

Running head: INTERVENTION TO PROMOTE PHYSICAL ACTIVITY

The Effect of a School Nurse Led Education Intervention on  
Blood Pressure and Physical Activity Levels in Adolescents

A dissertation submitted

by

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Dedication

“Clothe yourselves with compassion, kindness, humility, gentleness and patience.”

Colossians 3:12

This is dedicated to the empowerment and development of health promotion knowledge  
in the youth of the world.

### Acknowledgements

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To her husband and son the writer extends her eternal gratitude for they were the source of the sense of perspective and purpose that structured this research proposal and project.

To the youth in Lincoln, Nebraska, the writer expresses joy in the opportunity to minister to their health education needs.

“With God all things are possible.”

Matthew 19:26

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### Abstract

Regular physical activity (PA) is a necessary health promotion behavior for adolescents. Benefits of regular physical activity are optimal body weight, lowering blood pressure (BP), and decreasing risk factors for chronic illnesses. Yet declining physical activity levels and increasing sedentary behaviors along with the rising prevalence of overweight and obesity, type 2 diabetes, and hypertension exists in teenagers. The purpose of this quantitative research was to study the effects of a School Nurse led teaching intervention to promote physical activity as a healthy behavior on blood pressures and physical activity levels in adolescents. Youth empowerment was the theoretical framework for the study and a peer leader was incorporated. A true experimental design used repeated measures with the same intervention for a total of 4 measures (two before intervention and two after intervention) was implemented. The intervention group received a School Nurse led education session on the healthy benefits of PA. The measures were blood pressure, pulse, body mass index, and physical activity levels. A significant drop in systolic blood pressure was found in the intervention group after education. A negative relationship was found between both systolic blood pressure (SBP) and physical activity levels and diastolic blood pressure (DBP) and physical activity levels. Mean physical activity levels increased in the intervention group post education. Possible implications for School Nurse practice include further study, continued use of School Nurse led education programs with teens and dissemination of the findings to other School Nurses.

The Effect of a School Nurse Led Education Intervention on  
Blood Pressure and Physical Activity Levels in Adolescents

CHAPTER ONE: BACKGROUND, PURPOSE, RESEARCH QUESTIONS AND  
SIGNIFICANCE

Physical activity (PA) helps control weight, reduces blood pressure (BP) (American Academy of Pediatrics, 2000) raises high density lipoprotein (HDL) cholesterol, reduces risks of type 2 diabetes, and improves well-being (American Heart Association, 2007). However, there is a well-documented trend of declining PA levels in United States (US) adolescents and an increase in sedentary lifestyle practices while the prevalence of overweight and obese youth is climbing at an alarming rate. This study addressed an intervention that a school nurse can take to promote physical activity in youth.

Purpose and Objectives of Study

The purpose of the study was to examine the effect of a school nurse led educational intervention on the healthy benefits of PA by measuring PA levels and blood pressures in adolescents. The study had as its aim the following three objectives. The first objective was to implement an education lesson about blood pressure and the benefits of PA on blood pressure with the treatment group. Second, to measure 2 pre-treatment and 2 post-treatment blood pressure, pulse, body mass index (BMI), and PA measures, and third, to use the findings to suggest possible school nurse practice changes based on evidence.

The Significance of PA: Background and Rationale

PA has been studied to determine the health promotion benefits. Ishikawa-Takata, Ohta, and Tanaka (2003) found significant reductions in blood pressure in adult groups

that exercised on a regular basis. The study included a sedentary control group and groups that exercised for differing amounts for 8 weeks. Even the group that only exercised to 30 to 60 minutes per week had significant blood pressure reductions. The group that had the most blood pressure reduction was the group that exercised for over 120 minutes per week.

Blair, Thompson, and Church (2006) pointed out that over 20,000 articles were published yearly on the topic of exercise and cardiovascular disease. It was stressed that low fitness levels were the highest predictors of heart disease events. Although this is not specific to hypertension, lowering blood pressure was included in their findings as a benefit of exercise.

#### *Documented Levels of Physical Activity: The Problem*

There are declining levels of PA in adolescents, which may contribute to chronic health problems. Some investigators have studied levels of PA in adolescents by dividing time into early to middle adolescence and middle to late adolescence to assess for trends. The longitudinal and secular trends of PA in adolescents were studied by Nelson, Neumark-Stzainer, Hannan, Sirard, and Story (2006) in a sample size of 2,516 adolescents. Data were examined in two cohorts to observe for trends between early to middle adolescence and middle adolescence to late adolescence. The moderate to vigorous PA among girls decreased from 5.9 to 4.9 hours/week from early to middle adolescence and from 5.1 to 3.5 hours/week during middle to late adolescence. Computer use by girls increased from 8.8 to 11.1 hours/week. PA in boys did not change much until middle to late adolescence; 6.5 to 5.1 hours/week respectively. Computer use by boys increased from 11.4 to 15.2 hours/week, almost a 50% increase (Nelson, Neumark-

Stzainer, Hannan, Sirard, & Story, 2006). Consistent with earlier research, these findings showed a decline in PA from early to late adolescence. Also consistent was that PA in girls declined more than boys.

In a cross-sectional study by Page, Cooper, Stamatkis, Foster, Crowne, Saben, et al., (2005) 65 girls and 68 boys from schools in Bristol, England wore accelerometers (after receiving accelerometer education) for 7 days while carrying out their usual daily activities. Obese children in the study had significantly less PA than non-obese children. Obese children also spent significantly less time in vigorous PA than non-obese children. A strength of this study was using the minute-by-minute accelerometry because this measure is much more objective than self-reports. The cross-sectional study design disallows any causal relationship that can be concluded from the results.

#### *Recommendations and Guidelines for Physical Activity*

Throughout the years, a great deal has been studied and documented about what are appropriate amounts and intensities of PA for children and adolescents to have for health promotion and disease prevention. In 1994, Sallis and Patrick published the International Consensus Conference of PA Guidelines for Adolescents that advocate for all adolescents to have daily or nearly daily PA such as play, games, sports, work, transportation, recreation, physical education or planned exercise with family, at school, or community programs. Moderate to vigorous levels of exertion at least three times or more a week for a minimum of 20 minutes per day was recommended. Moderate level PA was defined by the CDC (2007) as a level of PA in which a person has increased breathing and heart rate, and perceived exertion. Activities that are consistent with moderate PA are walking briskly, dancing, mowing the lawn, or swimming. A vigorous

level of PA was defined as activity that is associated with a challenge and significantly increased breathing and heart rate in which it is difficult to finish a sentence (CDC, 2007). Activities that were considered vigorous level are jogging, running, high-impact aerobic dancing, or swimming continuous laps.

The American Heart Association (2007) Centers for Disease Control (CDC) (1997) and US Department of Health and Human Services, Surgeon General (1996) endorsed a minimum of 30 minutes each day of moderate to vigorous PA. Three of the Healthy People 2010 objectives that were specific to this topic will be discussed next (United States Department of Health and Human Services, 2000). Healthy People 2010 objective 22-6 addressed increasing the proportion of teens by 35 percent who have at least 30 minutes or more of moderate level PA for six of the past seven days. Healthy People 2010 objective 22-7 was to increase the proportion of teens that have 20 minutes or more of vigorous PA for 3 or more days per week. Healthy People 2010 objective 22-11 was to increase the proportion of teens who watch two or less hours of television a day.

More recently, others favor at least 60 minutes of PA each day. Strong, et al., (2005) evaluated 850 published research articles and reported that most intervention studies used programs of 30 to 45 minutes of supervised moderate to vigorous PA on three to five days per week. However, based on the evidence from the intervention studies, it was concluded that school-aged youth should participate in 60 minutes or more of developmentally appropriate, enjoyable and varied moderate to vigorous PA each day. More vigorous PA was believed by the research panel to be of greater benefit in promoting health. Denehy (2005) stressed that school nurses have an important role in

educating students, parents, and school staff about the benefits of PA to promote the recommendations of 60 minutes each day of enjoyable and varied moderate to vigorous PA.

The International Consensus Conference on PA Guidelines for Adolescents Panel (1993) recommended that 1) all adolescents should be active daily or nearly daily as a part of work, play, games, sports, recreation, and physical education in the family, school, and community; and 2) adolescents should have three or more times per week of PA that is vigorous and lasts at least 20 minutes (Sallis & Patrick, 1994). Yet, a majority of adolescents were not meeting the recommendations of PA levels of 60 minutes per day (Biddle, Sallis, & Cavill, 1998). It is imperative that school nurses study the efficacy of interventions to promote PA as a health promotion method in youth.

There are also PA recommendations for schools. In 1997, the CDC published guidelines for school and community programs to promote lifelong PA. School and community policies should be established to 1) promote enjoyable, lifelong physical activities; 2) require daily physical education for students in kindergarten through 12th grade; and 3) require health education for students in kindergarten through 12th grade. A scientific statement from the American Heart Association in Collaboration with the Councils on Cardiovascular Disease in the Young and Cardiovascular Nursing recommended that children and youth should participate in a minimum of 30 minutes of moderate-to-vigorous PA during each school day. Extracurricular school-linked community programs should provide additional PA (Pate et al., 2006a).

The National Association of School Nurses (2002) position statement on overweight children and adolescents stressed that being overweight is a serious problem

because it leads to significant health concerns such as cardiac disease, hypertension, type 2 diabetes, hyperlipidemia and other medical conditions. Increasing PA in young people was one of the national priorities by Healthy People 2010 (Department of Health and Human Services, 2000; Secretary of Education, 2000).

*Research Questions.* The research questions for the study focused on the role of the school nurse in promoting PA through an educational intervention.

1. What effect does a school nurse led educational intervention on the benefits of PA have on blood pressure in adolescents?
2. What effect does a school nurse led educational intervention on the benefits of PA have on PA levels in adolescents?
3. What effect does a school nurse led educational intervention on benefits of PA have on the weight of adolescents?
4. What effect does a school nurse led educational intervention on benefits of PA have on the BMI of adolescents?
5. What effect does a school nurse led educational intervention on benefits of PA have on the pulse rate of adolescents?

*Research Hypotheses*

1. The school nurse led educational intervention will decrease blood pressure in adolescents.
2. The school nurse led educational intervention will result in an increase in the amount of PA in adolescents.
3. The school nurse led educational intervention will result in a decrease in the weight of adolescents.

4. The school nurse led educational intervention will decrease BMI in adolescents.

5. The school nurse led educational intervention will have a decrease in the pulse rate of adolescents.

#### *Assumptions*

A major assumption of this study was that a research design with a pre test and post test, along with a control group, experimental group and educational intervention will cause a measurable decrease in blood pressure and increase in physical activity levels in adolescents. This will be measured by doing pre test and post test measures and if the assumption is correct, then the blood pressure will be less and the physical activity will be more. The true experimental design of the study will discover if this assumption is valid or not. Pre test and post test measures will be done in the control and experimental group. The experimental group will have a school nurse led educational intervention. Thus, to test if the educational intervention made a difference, the average means between the control and experimental groups will be compared.

#### *Definition of Terms*

Physical activity in adolescents and their health status are interrelated concepts. The Centers for Disease Control (CDC) defined PA as “any bodily movement produced by skeletal muscles that results in an expenditure of energy” (2007). Generally, it was considered that regular PA promotes health, including a normal BMI-for-age, blood pressure, and serves to decrease risk factors for chronic illnesses.

BMI is a calculation of height and weight with age and sex considered and in youth is referred to as BMI-for-age (CDC, 2007). Grethe and Klepp (2003) studied the

relationship between BMI and PA from adolescence to adulthood and found that increased levels of PA were associated with a lower rate of being overweight as an adult.

Moderate level PA was defined by the CDC (2007) as a level of PA in which a person has increased breathing and heart rate, and perceived exertion. Activities that are consistent with moderate PA are walking briskly, dancing, mowing the lawn, or swimming. A vigorous level of PA was defined as activity that is associated with a challenge and significantly increased breathing and heart rate in which it is difficult to finish a sentence (CDC, 2007). Activities considered vigorous level are jogging, running, high-impact aerobic dancing, or swimming continuous laps.

A school nurse was defined as a registered nurse employed in the school setting by a school district to supervise and implement the school health program. Adolescent was defined as youth aged 13 to 19 years of age. An educational intervention was a lesson plan with objectives, method of instruction, supplies, equipment, lesson content, and method of evaluation.

## CHAPTER TWO: REVIEW OF THE LITERATURE

### Historical Perspectives of Physical Activity

Consistent trends in PA have been well documented. Hardy, Bass, and Booth (2007) found the most common sedentary behaviors among girls during early to middle adolescence were watching television, videos and playing video games. The time spent in sedentary activities increased from 1.4 hours/day during the week to 3.3 hours/day on the weekend. Sallis, Prochaska, and Taylor (2000) also found an inverse association between PA and age. Additionally, Sherar, Esliger, Baxter-Jones and Tremblay (2007) studied age and PA in teens using Actigraph accelerometry and found that PA diminished as age increased in the adolescent years. Voorhees et al., (2005) found that early adolescent girls self-reported more PA than older adolescent girls. Well-thought out health promotion activities should target these findings. In addition, studies to explore causation of the decline in PA that occurs in later adolescence could provide valuable information.

### *Racial/Ethnic and Gender Influences on Physical Activity*

The influence of racial/ethnic and gender to PA levels has also been studied. Kimm et al., (2002) prospectively studied 1,213 Black girls and 1,166 White girls in the National Heart, Lung, and Blood Institute Growth and Health Study from the ages of 9 or 10 until 18 or 19 years-of-age. The median activity scores for Black girls were 27.3 and White girls were 30.8 metabolic equivalents (MET)-times per week and had declined to 0 for black girls and 11.0 for White girls by the tenth year of the study. Pregnancy was associated with a decrease in PA in Black girls but not in White girls. White girls who reported smoking had a decrease in PA. Richmond, Hayward, Gahagan, Field, and Heisler (2006) found that White adolescent girls reported higher levels of PA than Black

and Hispanic adolescents. Black and Hispanic adolescent boys had higher rates of PA than White adolescent boys did.

Dowda et al., (2004) examined physical activities and sedentary pursuits of 1,124 African American and 1,068 Caucasian American girls in 8<sup>th</sup> grade from 31 different middle schools. A three day PA Recall (3DPAR) was used to measure PA and sedentary behaviors. Walking, basketball, jogging or running, bicycling and social dancing were the most frequently reported PA. African American girls preferred social dancing, basketball, watching television and attending church. This study suggested consideration of group cultural preferences when planning PA promotion.

An examination of physical activity among Hispanic and Non-Hispanic White adolescents was the purpose of the study by Stovitz, Steffen, and Boostrom (2008). A cross-sectional study design used height, weight, and a modified Youth Risk Behavior Survey measures to study adolescent aged 14 to 17 years old in Texas. Linear regression analysis was used to determine the relationship being within normal limits for weight or overweight to PA and screen time. Males that were normal weight reported more vigorous PA than at-risk or overweight males. Males were more active than females. Hispanic females also had higher BMIs and rates of overweight than Non-Hispanic White females. Strengths of this study included the objective measures and focus on the specifics in the Hispanics and Non-Hispanic White population. A limitation was the self-report aspect of the survey measure. This study found boys to be more active than girls. School nurses should focus projects with girls, since girls are more often found to be less active.

Pate et al., (2006b) studied sixth grade girls using accelerometers for seven days. White girls were found to be more active than non-White girls. Girls who did not receive free or reduced-lunch were found to be more active than girls who did. Girls who lived in the Western United States were the most active. A study by Mo, Turner, Krewski, and Mo (2005) found Canadian adolescents aged 12 to 20 years of age from low socioeconomic status were more physically inactive than those from higher socioeconomic status. Hanson and Chen (2006) documented that teens from lower socioeconomic status (SES) and minority groups were found to have higher BMIs. In addition, higher sedentary levels were related to higher BMI (Hanson & Chen). Planners of interventions should incorporate techniques for reaching these sub-groups to promote PA.

Santos, Page, Cooper, Ribeiro, and Meto (2009) used a cross sectional design to study perceptions of the environment and PA in 1,124 Portuguese adolescents. Self-report questionnaires were used. Girls were less active than boys. It was found that when free or low-cost recreational activity was available in neighborhoods that girls had more physical activity. Boys were found to be more active when others in their neighborhoods were active.

#### *Race and Environment Influences*

Adolescents' perceptions of environmental influences on physical activity was examined by Ries, Voorhees, Gittelsohn, Roche, et al., (2008) in 377 African American students in ninth through twelfth grades in Baltimore, Maryland. Concept mapping was used to develop seven domains: places for PA, encouraging and supportive people, negative social influences, parental control, negative environmental influences,

transportation and technology issues, and financial issues. Gender was found to be significant in how adolescents rated the importance of the influence on PA. Females rated crime and violence as the top two influences whereas males rated places for physical activity and friends to be physically active with as the top two influences. A strength of the study was the concept mapping design because it was participant focused. A limitation of the study was that participants were all from magnet high schools, meaning these high schools draw in students with higher test scores. This may limit transferability and application of the findings. Further study was recommended.

#### *School Environmental Influences*

Coleman, Geller, Rosenkranz and Dzewaltowski (2008) studied the quality of the after-school environment for PA and healthy eating. Participants were 144 elementary aged students in third, fourth, and fifth grades in Kansas. Researchers observed after school programs and found more moderate-to-vigorous physical activity (MVPA) during free play sessions than adult-led sessions. Adult leaders were observed to discourage movement in youth. Fruits and vegetables were the least common type of snacks provided, but breads and candy were the most common types of snacks provided. At no time did researchers observe adults to promote healthy eating in youth. The system for observing Fitness Instruction Time was used as well as an author developed after school observation system.

#### *Age Influences on Physical Activity*

Correlates of exercise participation were analyzed in a cross-sectional survey of 300 adolescents recruited at an urban clinic (Ammouri, Kaur, Neuberger, Gajewski et al., 2007). A descriptive, correlational design was employed to examine the factors and self-

reported levels of PA. Older female adolescents were found to report the lowest rates of PA. A positive correlation was found between adolescent females that reported a strong relationship with their parents and higher PA levels. Female adolescents that reported ample environmental opportunities for exercise also reported higher participation in PA. Self-reported measures: Self-Administered PA Checklist (SAPAC), Depressive Scale, Social Provision Scale, Godin Leisure-Time Exercise (GLTE) questionnaire, and the modified Neighborhood Scale (NES) were used in the study. Although these were fair to good measures when identified by reliability and validity measures, self-reporting is a limitation of the study.

Saksvig et al., (2007) examined “travel by walking” before and after school in 1596 sixth grade adolescent girls to determine how it contributed the their PA levels. Girls who reported walking to or from school, or both, had about 2.5 minutes more each day of moderate to vigorous PA. The 3-day PA Recall and accelerometry were used to assess participant activity levels in a subjective measure. The accelerometry measure was a strength of this study because it is an objective reliable, accurate measure of PA.

The Trial of Activity for Adolescent Girls (TAAG) examined the effectiveness of an intervention to decrease the decline of PA levels in middle school-aged girls (Elder, Shuler, Moe, Grieser, et al., 2008). Thirty-six middle schools were used for random, cross-sectional samples of 120 sixth grade girls that were enrolled for 2 years in the study. Random assignment was made to intervention or control group. The girls were PA monitored for 24 hours per day times seven days. Recruitment rates into the study significantly increased during the study. The authors wrote that participant incentives,

recruitment presentations, a coordinated recruitment strategy and consistent communication increased the recruitment rates.

### *Weight Influences*

McMurray, Ward, Elder, Lytle et al. (2008) examined whether or not overweight adolescent girls were more likely to over-report PA levels. Using a cross-sectional study, the data were collected in baseline measurements of the Trials of Activity for Adolescent Girls (TAAG) in randomly selected middle schools in six states in America. The previous day PA recall (PDPAR) was the measure used in 1,021 girls aged 11-14 years of age. Also, a more objective measure: the MVPA accelerometry was used. The two measures were compared in the “at risk for overweight” group and the “overweight” group. It was found that overweight teen girls over-reported their total PA levels.

### *Television Watching as a Sedentary Activity*

Sedentary behaviors have been found to be strongly associated with obesity (Must & Tybor, 2005). The following section reviews the research published on a common sedentary activity in youth: television/video watching. Multiple studies have found a strong relationship between the amount of time spent watching television and BMI. Andersen, Crespo, Bartlett, Cheskin, and Pratt (1998) and Crespo, et al (2001) found a greater body fat and greater BMI in boys and girls, aged 8 to 16 years-old who watched 4 or more hours of television each day. In a study done by Eisenmann, Barteel, and Wang (2002), teenage boys and girls that reported watching 1 hour or less of television each day were found to be about 40 percent less likely to be overweight when compared with teens who watch four or more hours a day. Watching television between the ages of 5 and 15

had a strong association to having a higher BMI when an adult. (Hancox, Milne, & Poulton, 2004).

Heath, Pratt, Warren, and Kann (1994) studied participation in vigorous PA, physical education (PE), team sports, and time spent watching television in 11,631 American high school students, grades 9 through 12. The measure was a self-report and part of the 1990 Youth Risk Behavior Survey. Vigorous PA of 20 minutes, three or more times per week was reported by 37% of participants and was higher in boys than girls and Whites more than any other race/ethnic group. Forty-three percent of boys and 52 percent of girls in the study reported they were not currently enrolled in physical education classes. Of the students who reported being currently enrolled in physical education classes, 33.2 percent reported exercise of 20 minutes or more in PE class 3 to 5 times per week. Above 70% of students reported watching one hour of television each school day and 35% of students reported watching three hours of television each school day.

Although the self-report measure was subjective, the sample size was large.

Taveras et al., (2007) examined longitudinal changes in television watching and PA in 6,369 girls and 4,487 boys, aged 10 to 15 years old in 1997. An annual, mailed, self-administered questionnaire was their measure of television watching and PA. No significant relationship was found between time spent watching television and time spent doing leisure-time moderate/vigorous PA when evaluated on a year to year basis. It was concluded that the time spent watching television and the time spent in leisure-time PA were separate constructs instead of functional opposites. A limitation of this study was the annual questionnaires, because they were a subjective measure. Although the Pearson's product-moment correlation was  $r = 0.80$  on this questionnaire, the ability to

self-report accurately one's activities from the past year may be a weakness. Another study also found no significant relationship between after-school television watching, level of PA and BMI (Robinson et al., 1993). The researchers concluded that television watching time had a weak, if any relationship to BMI and PA. The self-reports of hours of television watching and PA may be a weakness in this study. Replication of the research but using pedometers or accelerometers as measures instead of self-reports would provide more objective data.

A cluster analysis of 878 adolescents studied patterns of sedentary behavior among adolescents (Zabinski, Norman, Sallis, et al., 2007). The sedentary behaviors of watching television, talking on the telephone, using a computer, listening to music, doing homework and reading were compared with household rules, self-efficacy, enjoyment, PA and diet. Four clusters were identified as low sedentary, medium sedentary, selective high sedentary and high sedentary behavior levels. A convenience sample was a limitation of the study. The authors recommended further study to determine how interventions may use clusters to target specific population segments.

Because many of these studies had designs that cannot imply a causal relationship, Robinson (1999) advocated use of an experimental trial to investigate the effects of reducing television, videotape and video game use on adiposity, PA, and dietary intake. Third and fourth grade students in San Jose, CA were randomized into an intervention group that received education on reducing television, videotape and video game usage and a control group. Children in the intervention group had significant decreases in BMI, triceps skinfold thickness, and waist-to-hip ratio than the group of children who did not decrease its media watching. The reduction of watching television,

videotapes, and video game use may be a helpful approach to prevent childhood obesity (Robinson, 1999). Further research with youth of varying ages on this topic would add more evidence to the conclusion.

The effects of television watching on metabolic rates in children have also been studied. Klesges, Shelton, and Klesges (1993) found that metabolic rates in 15 obese children and 16 normal weight children were significantly lower while watching television than when at rest but not watching television. Further research was suggested on this topic, especially because the sample size was so small. Hancox, Milne, and Poulton (2004) found no significant association between television watching and blood pressure readings. However, Sugiyama et al., (2007) reported a positive association between systolic blood pressure and hours of television watching, but not computer use or computer games. More investigations of this topic are needed to find consistent results.

Another slant to the topic of television watching, PA, and BMI is television viewing in the bedroom. A cross-sectional survey study of 2,761 adults with children less than 5 years of age reported by Dennison, Erb, and Jenkins (2002) found that a television in the bedroom is a strong marker of increased risk of being overweight. It was recommended that televisions be kept out of the bedrooms of children. Because the design of this study was not causal it would be helpful, albeit complex, to study the effects of television watching in the bedroom using an experimental design.

#### *Self-Efficacy and PA in Youth*

Wu, Pender, and Nouredine (2003) studied gender differences in the psychosocial and cognitive correlates of PA among Taiwanese adolescents. Perceived self-efficacy had the strongest correlation of PA in adolescents. Taiwanese male

adolescents reported twice as much PA per day than Taiwanese female adolescents. Females reported a lower perceived self-efficacy of PA than males. The significance of this study was that in another population group, self-efficacy was also found to be the strongest correlation. The study was a cross-sectional design and confidence in the findings could be boosted by a randomized sample.

There were a number of studies that have tested the Revised Health Promotion Model (HPM). Wu and Pender (2005) studied the Revised HPM in the Taiwanese adolescent population in a longitudinal, cross-sectional design. The revised HPM was found to have a good fit to the data. Female teens were found to be less active than male teens in both eighth and ninth grades. In Wave 1, teens with parents of higher education levels were found to have less PA. In Wave 1 and 2, perceived self-efficacy had a direct effect on PA. The gender differences found in these Taiwanese teens were consistent with data on American teens. These findings are consistent with earlier research and support Bandura's self-efficacy theory. This study used self-reports to measure PA. The use of pedometers or accelerometers would strengthen the results of the study.

In a study by Robbins, Pender, Ronis, Kazanis, and Pis (2004a) a 3 (developmental) x 2 design was used to study self-efficacy in PA skills in relation to perceived exertion among African American and European American adolescents. Girls reported a pre-activity self-efficacy lower than boys and also a greater perceived exertion. In both boys and girls, a lower perceived exertion during PA resulted in a higher self-report of post-activity self-efficacy. By interventions that lower perceptions of exertion, self-efficacy and a better sense of PA competence may be achieved. With the same sample of adolescents, Robbins, Pis, Pender, and Kazanis (2004b) published another

study that examined the relationships between exercise self-efficacy, enjoyment, and feeling states among adolescents. It was found that enjoyment of PA was positively correlated with enjoyment of the treadmill activity ( $r = 0.476$ ). Peak maximal oxygen uptake ( $VO_2$ ) was positively correlated ( $r = 0.635$ ) with post-activity self-efficacy. Nurses should strive to assist adolescents to reduce negative feelings during PA and encourage enjoyment during PA.

### *Physical Activity and Health Concerns*

#### *Physical Activity and the Overweight/Obesity Influence*

The dramatic and substantial epidemic increase of overweight children and childhood obesity has been well documented for years. The definition of overweight and obesity in youth is more complex than in adults. In adults, the definitions are based completely on BMI. However, with youth, there are issues of body proportions, early and later maturation, and biological differences between populations (Wang, 2004). There has not been a clearly, agreed upon scientific definition of overweight and obesity in children (Flegal, Tabak, & Ogden, 2006; Luciano, Livieri, DiPietro, Bergamaschi, & Maffeis, 2003). The CDC (2007) defined overweight in children and adolescents as BMI at or above the 85<sup>th</sup> percentile of the BMI chart for the appropriate gender. Flegal, Tabak, and Ogden (2006) pointed out that BMI is intended to be used as a screening tool and to assess public health surveillance, not as a diagnostic tool.

Cole, Bellizzi, Flegal, and Dietz (2000) published a research project with the purpose of establishing a standard international definition for child overweight and obesity for the world. It was an international survey of six large cross-sectional studies from Brazil, Great Britain, Hong, Kong, the Netherlands, Singapore and the United States

(U.S). BMI was measured in 97,876 males and 94,851 females from birth to 25-years of age. Then, cut off points were devised from the centile curves proportionate to 25 for overweight and 30 for obese in adults. Although the cut off points might be helpful when used on similar populations to those studied, they might not be applicable to other biological populations. For example, would this definition be applicable with the Vietnamese population, who generally is petite and of much lower body weight than the populations used in this study.

Wang (2004) argued that BMI is probably the best measure available to assess obesity. The advantages to BMI is that it is easy to use, has a low cost, and a strong association with body fat and chronic health risks have been found. A disadvantage that Wang postulated is that the international BMI cutoffs published are not relative for all persons and that population-specific standards would better control for biological differences between populations. Lucinao, Livieri, Di Pietro, Bergamaschi and Maffeis (2003) discussed triceps skinfold, an easy and inexpensive way to define obesity. Children with triceps higher than the 85<sup>th</sup> percentile for age and gender were defined as obese. Wang advocated future research to develop better classifications of childhood obesity.

*Prevalence of Overweight/Obesity.* The Bogalusa Study was a longitudinal study to examine the secular trends in weight and obesity among 5 to 24-year-olds (Freedman, Srinivasan, Valdez, Williamson, & Berenson, 1997). Significant increases in weight and skinfold thickness were found in subjects during the study period. From 1973 to 1994, the prevalence of overweight (85th percentile of BMI) increased at about twofold. Strengths of this study were objective measures of height, weight, subscapular and triceps

skinfolds, and the sample size of 26,371 five-to 24-year-olds. Tracking the prevalence of overweight from 1973 to 1994 in this longitudinal design was also a strength of the study.

Strauss and Pollack (2001) investigated the changes in the prevalence of children being overweight from 1986 to 1998 in a longitudinal, cohort study. In 1998, it was found that 21.5% of African American children (120% increase), 21.8% of Hispanic children (120% increase) and 12.3% (50% increase) of White children were overweight (Strauss & Pollack, 2001). Evaluating the prevalence and reporting in terms of races is beneficial for school nurses to take note of the significant need to focus interventions with African American and Hispanic children.

Flegal, Carroll, Ogden, and Johnson (2002) examined the prevalence of obesity among 4,115 US adults, 1999-2000 as part of the National Health and Nutrition Examination Survey (NHANES). BMI was the measure used to determine the prevalence. Overweight was considered 25 BMI or above and obesity was considered 30 BMI or above. The age-adjusted prevalence of obesity went from 22.9% in 1988-1994 to 30.5% in 1999-2000. The prevalence of overweight during the same time period went from 55.9% to 64.5%. This trend in adults was documented along with the increasing trend in children and adolescents.

Treuth, Hou, Young, and Maynard, (2005) studied the association between overweight and PA or sedentary time measured by accelerometry in 99 boys and 130 girls, aged 7 to 19 years old. An association was found for greater fat mass and percentage fat among inactive girls, but not in boys. Although the study design was cross-sectional, therefore a causal relationship cannot be implied, there does seem to be an

association between inactivity and greater adiposity. However, the use of accelerometry, because it is an objective measure did strengthen the findings.

The reality of preventing and treating overweight and obesity in children and adolescents is that it is a complex issue that doesn't occur as a result of one cause and will probably require multiple strategies to treat. Because many chronic health problems are the result of being overweight, a variety of interventions of urgent nature to address this problem are needed. It is imperative for school nurses to address the serious health problem of overweight and obesity that is contributed to by a lack of PA.

#### *Physical Activity and Cardiovascular Disease*

The association between PA and cardiovascular risks for disease have been well documented in the literature. Berenson et al., (1998) studied cardiovascular risk factors and atherosclerosis in children and youth adults on post-mortem examination in a sample of 204 youth and young adults aged 2 to 39 years of age. A positive correlation was found between the extent of fatty streaks and fibrous plaques in the aorta and coronary arteries and age. In subjects that health data while alive were available, systolic and diastolic blood pressure, BMI, serum total cholesterol, triglycerides, low density lipoproteins (LDL) cholesterol, HDL cholesterol, were strongly associated with aorta and coronary artery lesions ( $r = 0.70$ ). These findings support the concept that cardiovascular risk factors start early in life. Therefore, interventions must start early in life to achieve the most benefit.

Garcia-Artero et al., (2007) studied PA and physical fitness related to lipid-metabolic cardiovascular risk index in 2,859 adolescents in Spain. The measures used were questionnaires to self-report PA, the Course-Navette aerobic capacity test, manual

dynamometry, the long jump test and flexed arm hand test and a serum lipid-metabolic index and aerobic capacity in adolescent males. In females, greater muscle strength was related to an optimal lipid metabolic index. These findings support the notion that physical fitness is related to metabolic cardiovascular risk, not PA, although it is notable that questionnaires (subjective measure) were used. More research is needed on this specific area to clarify the differences between physical fitness and PA as health promotion behaviors.

Andersen et al., (2006) examined PA and cardiovascular risk in 1,732 youth, aged 9 and 15-years. Cardiovascular disease risk decreased as PA increased. These findings suggested that PA levels should be higher than the current international guidelines of one hour/day of moderate intensity to give optimal decrease in cardiovascular risk factors. A strength of this research was random sampling and use of objective measures to assess for risk factors.

Guillaume, Lapidus, Bjorntorp, and Lambert (1997) studied PA and cardiovascular risks in 1,028 Belgium children. Boys were found to be more active in sport activities than girls. BMI was related to days per week of television watching by boys. Factors that contributed to obesity may be different in girls and boys was one implication of the study.

The reported research supports the belief that a lack of PA is a cardiovascular risk factor. Although the concept is more complex, involving not only PA, but other factors that have been documented. For example, a lack of PA, overweight or obesity, elevated blood pressure, elevated LDL cholesterol and low HDL cholesterol levels are often associated with each other. All of these measures are benefited with sufficient PA. A

priority approach is to prevent obesity in childhood. Increasing PA and decreasing calorie consumption is needed in children. Obesity in youth needs early recognition and aggressive management (Steinberger & Daniels, 2003).

#### *Physical Activity and Blood Pressure*

Blood pressures and PA levels have been found to be associated. As boys age through adolescence, their systolic blood pressure was found to increase, but diastolic blood pressures rarely increased (Dasgupta et al, 2006; Paradis et al, 2004). Systolic and diastolic blood pressure has been found to be positively related to BMI (Muntner, He, Cutler, Wildman, & Whelton, 2004; Paradis et al, 2004; Ribeiro et al, 2003; Srinivasan, Myers, & Berenson, 2006). In a study by Mirza et al. (2004), the prevalence of overweight and clinical comorbidities in 309 Hispanic youth, ages 6-18 years-old, thirty-eight percent of subjects were found to be overweight as defined by a BMI of over 95 percentile. Overweight youth were found to have significantly higher systolic blood pressures than non-overweight youth (11.4 +/-1.3 vs. 104.5 +/- 0.9 mm Hg,  $\rho < 0.0001$ ). Mirza et al. also found a negative correlation in youth that participated in one or more sports team and overweight ( $\rho = 0.02$ ). The prevalence of overweight in this study was twice that of the American national average as found in national surveys.

Blood pressure is associated with the level of physical fitness in children. Wilson, Gaffney, Laird, and Fixler (1985) found that boys who had elevated blood pressures, also had increased supine and recovery heart rates, normal fitness levels and normal range BMI. The girls who had elevated blood pressures had increased heart rates, decreased fitness levels and BMI levels indicative of obesity. Hofman, Walter, Connelly, and Vaughan studied the association between physical fitness and blood pressure in fourth

grade children (1987). Blood pressure (both systolic and diastolic) readings were the highest in children with poor physical fitness. It was also found that children with declines in physical fitness had the largest increases in blood pressure.

McMurray, Harrell, Bangdiwala et al. (2002) studied the effect of increasing aerobics in school physical education programs, improving knowledge about weight control and blood pressure on blood pressures of 1,140 adolescent participants. The control group had significantly increased systolic and diastolic blood pressures but the BMI did not significantly change.

#### *Physical Activity and Diabetes*

Decades ago, type 2 diabetes mellitus was thought of as a disease of middle to older-aged adults (Botero & Wolfsdorf, 2005). The incidence of type 2 diabetes in adolescents has been increasing at an alarming rate around the globe (Vivian, 2006) and has become a serious problem in the United States (Duncan, 2006). The SEARCH for Diabetes in Youth in the United States writing group (2006) reported a prevalence of 1.82 cases per 1,000 youth in the United States (U.S.). Another publication by The Writing Group for the SEARCH for Diabetes in Youth in the United States (2007) reported that in children less than 10 years of age, diabetes mellitus, type 1 was the most common type of diabetes and was most common in non Hispanic Whites. The highest rates of type 2 diabetes mellitus were found in adolescent minority populations. A majority of children and adolescents with type 2 diabetes are in the 10 to 19 year old group, obese and have metabolic syndrome.

Another cross-sectional study by Li, Ford, Mokdad and Cook (2006) examined trends in waist circumference and waist-height ratio in U.S. adolescents. Li, Ford,

Mokdad and Cook cited a previous lack of waist-height ratio tracking among U.S. children and adolescents. Part of the impetus for this study was that abdominal obesity might be a better predictor than general obesity for the risk of cardiovascular disease and type 2 diabetes mellitus. Although they identify NHANES data were what was used in the study, the authors do not give exact sample size, but subjects were ages 2 to 19 years old. The prevalence of abdominal obesity increased 65.4 percent for boys and 69.4 percent for girls between 1988-1994 and 1999-2004. The authors reported wanting to continue to track this data for its predictive values.

Prevention methods of obesity need to be stressed and implemented to reverse the alarming increases in the prevalence of type 2 diabetes in adolescents (Botero & Wolfsdorf, 2005). Multiple risk factors play a part in the rising incidence of type 2 diabetes and the lack of PA is one identified factor. Interventions to promote PA in youth may help stop the rising rates of type 2 diabetes.

#### *Motivators and Barriers to Physical Activity*

Parental influence is a variable that has been studied in relation to PA. Raudsepp (2006) found that parental support is positively related to self-reports of adolescent PA. Davison, Cutting, and Birch (2003) examined 9 year-old girls and their parents and found that girls reported a significantly higher level of PA when at least one parent reported high levels of support when compared to no parental support. A strong relationship was found between children's perceptions of parent support, and parent reports of support for PA and organized PA for children (Heitzler, Martin, Duke, & Huhman, 2006). Trost et al., (2003) evaluated a conceptual model of parental influences on youth PA and found parental support to be a good fit. A consistent research finding is that parental influence is

a strong correlate to PA in children and adolescents. This should be considered when planning interventions to promote PA in adolescents.

Haverly and Davison (2005) studied factors that motivated adolescents to be physically active in 92 girls and 110 boys. Personal fulfillment was the strongest motivator for PA reported by teens. Weight control was the second strongest motivator, followed by peer motivation and then parent motivation.

Barriers to PA in 236 adolescents were studied by Tappe, Duda, and Ehmwald (1989). Measures used were self-reports and survey. Common barriers to PA included lack of time, weather, school and homework and no interest in exercise. These findings should be considered when planning to reduce barriers to exercise with high school students.

Vu, Murrie, Gonzalez and Jobe (2006) listened to boys and girls talk about girls' PA behavior using a qualitative design of focus groups and semi-structured interviews. Peer influence emerged as a strong influence. Both genders spoke about physically active girls as "tomboys" or "too aggressive." Girls said that boys could be either a barrier or a motivator to PA. Nurses should consider the strong influence of peers as motivators and barriers when planning interventions to promote PA.

Van Daalen (2005) used feminist qualitative inquiry in a pilot study to explore why girls' enrollment in physical education was dwindling once the compulsory credits were achieved in five adolescent girls aged 15 to 17-years-old. Qualitative interviews were tape-recorded and then each participant was given her transcript and invited to change, add or delete any content. Twenty-two separate, yet interrelated, feelings and emotions related to physical education experiences emerged. Commonly identified

feelings and emotions were body image, athletic ability, peers, teachers, sexism, inequity, and sexual harassment, sexuality, homophobia, competition, evaluation, and degradation. School nurses should collaborate with physical education teachers to advocate curriculum and its methods to build body-esteem, self-esteem, female friendship and solidarity.

Allison, Dwyer, and Makin (1999) studied perceived barriers to PA in 1,041 Toronto high school students. Three major barriers reported were time constraints due to school work, other interests, and family activities. A study published by the CDC (2003) asked parents what they thought barriers were for their children via random-digit telephone surveys. Transportation problems, lack of opportunities to participate in physical activities in their area, expense, parents' lack of time, and concerns about neighborhood safety were the common reports of barriers (CDC, 2003). Expense of physical leisure activities was reported more often as a barrier ( $p < 0.05$ ) by Black and Hispanic parents than by White parents. The barrier of neighborhood safety was present more for girls (17.6%) than boys (14.6%). The concerns of neighborhood safety was reported more often by Hispanic parents (41.2%) than by non-Hispanic White (8.5%) and non-Hispanic Black (13.3%) parents. These barriers are worthy of noting when planning interventions for teens.

A cohort study of 201 high school girls in the Minneapolis/St. Paul area investigated factors associated with changes in PA in adolescent girls at risk for sedentary lifestyles and obesity (Neumark-Sztainer, Story, Hannan, Tharp, & Rex, 2003). The study was a convenience sample that included random selection into three intervention and three control groups. The two strongest factors found to have the most change in PA were time constraints and support from parents, peers, and teachers. Time constraints were

inversely associated with levels of PA where support from others was positively associated with increasing PA (Neumark-Sztainer, Story, Hannan, Tharp, & Rex, 2003). Strengths of this study were the three intervention and three control groups into which participants were randomized. The convenience sample was a weakness of the study.

Robbins, Pender, and Kazanis (2003) studied perceived barriers to PA in 77 ethnically diverse girls, ages 11 to 14. A Likert-type survey with 23 items was used to gather data. Top barriers in a study of 77 ethnically diverse girls, ages 11- to 14-years-old were self-consciousness about looks during exercise and lack of motivation to be active (Robbins, Pender, & Kazanis, 2003). A strength of this study was the diverse ethnic group of girls that were surveyed. Nurses should use these findings when planning interventions for promote PA in teenage girls.

#### *Instruments to Measure Physical Activity*

There are numerous ways to measure PA. Each technique has its own advantages and disadvantages. This section of the paper will review the literature on selected measures of PA and related measures.

#### *Subjective Measures of Physical Activity*

PA logs, diaries, questionnaires and interviews are the major types of subjective measures of PA. Advantages of these measures is that they are easy to do and of low cost. Disadvantages of subjective self-reports are that they are time-consuming, may have constraints with languages and may be unreliable at measuring the frequency, duration, and intensity of PA (Steele et al., 2003). Occupational, household activities, and leisure physical activities may be left out of self-reports from teenagers. Low literacy levels may also affect the ability to self-report activities.

McMurray et al., (2004) studied test-retest reliability, convergent validity, and overall feasibility/usability of activity-based versus time-based PA surveys and Actigraph accelerometer for the same time periods in 206 female and 114 male adolescents. The time-based survey was found to take about 3 minutes longer to fill out. Two day test-retest reliability was similar between the activity-based and time-based surveys ( $r = 0.676$  and  $0.667$ ). Girls ( $r = 0.713$ ) had a higher reliability on the activity-based survey than boys ( $r = 0.568$ ). It was concluded that self-reports should be supplemented with an objective measure of PA.

Anderson, Hagstromer, and Yngve (2005) evaluated the validity of the Previous Day PA Recall (PDPAR) and a PA diary in adolescents by comparing the diary to two accelerometer intensity classifications. The PDPAR and accelerometers were worn by 47 boys and 53 girls in the 8<sup>th</sup> grade for four consecutive days. The Pearson's correlation coefficient was 0.41 to 0.44 for the relationship between the diary and accelerometer (calculated with three formulas for cutoffs and raw data). The diaries overestimated time, but the PDPAR required activities to be recorded in 30 minute time blocks even when the PA was only for 10 minutes. This is a consideration to be aware of when using the PDPAR.

Matthews et al., (2005) developed and tested two different short telephone activity recall (STAR) questionnaires. One instrument with open-ended questions and the other with closed-ended questionnaires to measure self-reports of moderate and vigorous PA over a week were employed. The self-report instrument and criterion measures for moderate-intensity PA correlations were between 0.30 and 0.40. The self-report instruments and the 24 hour PA recalls for moderate or vigorous PA were between 60

and 70 percent. Matthews et al. reported that the instruments generally captured levels of moderate to vigorous activity, although substantial classification errors in individual measurement were present.

Treuth, Hou, Young, and Maynard (2005b) studied validity and reliability of the Fels PA questionnaire (PAQ) for children in 130 girls and 99 boys aged 7 to 19 years of age over 6 days. When the Fels PAQ was given two different times to check reliability, it was  $r = 0.48$  to  $0.76$ . When the Fels PAQ was compared to Actiwatch to check validity, it was rated by the researchers to be acceptable ( $r = 0.34$ ).

Ainsworth et al. (2000) compared three measures of time spent in PA in 38 men and 45 women. The three measures tested were a CSA accelerometer, a 48-item PA log for 21 days, and a weekly telephone survey. Ainsworth et al., (2000) found correlations between the CSA and PA logs to be  $r = 0.22$  to  $0.36$ . Correlations between weekly telephone surveys and PA logs were  $r = 0.26$  to  $0.54$  for moderate PA and walking. The results were consistent with previous studies. The measures do not always show similar estimates between the levels of PA.

The PACE + Adolescent PA measure is a single, self-report tool developed (Miller, 2002) to assess PA levels in adolescents based on recommendations of a total of 60 minutes of activity per day. Prochaska, Sallis and Long (2001) conducted several studies to study the PACE + Adolescent tool as a reliable and valid tool to use when screening PA in adolescents. One study had 250 participants with a mean age of 15 years and 56 percent female and the second study had 57 participants with a mean age of 14 years and 65 percent female. Study three had 148 participants with a mean age of 12 and

65 percent female. The measure was found to be reliable with intraclass correlation ( $r = 0.77$ ) and correlated to accelerometry data ( $r = 0.40$ ).

### *Objective Measures of Physical Activity*

Various types of motion detectors have been invented and investigated to measure PA in an objective method. Pedometers and accelerometers will be discussed in this next section. BMI, another objective measure, was previously discussed.

*Pedometers.* A pedometer is a small device that counts each step a person takes. Most are worn on the belt or clothing at the waist. Some pedometers also measure distance and some measure energy expenditure (Crouter, Schneider, Karabulut, & Bassett, 2003). Many pedometers are electronic and most are about the size of a deck of cards.

Jago et al., (2006) studied pedometer reliability, validity and daily activity targets among seventy-eight 10-to-15-year-old boy scouts. In order to test the pedometer reliability based on BMI, the youths were split into two groups: one less than 85<sup>th</sup> percentile BMI and one over 85<sup>th</sup> percentile BMI. The boys wore 3 identical pedometers (New Lifestyles Digiwalker SW-200) and a CSA accelerometer. Reliability was  $r = 0.51$  to  $0.92$  for intra-class correlations of groups less than 85 percentile BMI and over 85 percentile BMI. Pedometer and CSA accelerometer counts had a  $0.60$  correlation. BMI was not a factor in how reliable the pedometers were. The pedometers had a moderate to high reliability with all participant BMI sizes. The pedometer when compared to the CSA accelerometer had a moderate level of accuracy. The findings of this study are helpful to those who want to measure PA and use a pedometer instead of an accelerometer. The convenience sample of boy scouts was a weakness of the study, because one cannot assume reliability would be comparable in all adolescents.

Schneider, Crouter, Lukajic, and Bassett (2003) tested the reliability of 10 pedometers for measuring steps over a 400-meter walk. The brands and models that were tested were: Freestyle Pacer Pro (FR), Kenz Lifecorder (KZ), New Lifestyles NL\_2000 (NL), Omron HJ-105 (OM), Oregon Scientific PE316CA (OR), Sportline 330 (SL330), and 345 (SL345), Walk4Life LS 2525 (WL), Yamax Skeltone EM-180 (SK), and the Yamax Digi-Walker SW-701 (DW) in a sample of 10 males (mean age 34.7) and 10 females (mean age 43.1). The most accurate pedometer models in counting steps were the Kenz Lifecorder, New Lifestyles, and Yamax SW-701. The least accurate at counting steps were the Sportline 330 and Omron HJ-105. The Cronbach alpha reliability within a single model was above 0.80 for all the pedometers except the Sportline 330. The Kenz Lifecorder, New Lifestyles NL-2000, Omron HJ-105 and Yamax Digi-Walker SW-701 were found to have intramodel reliability of 0.99 or above. When doing research, these are valuable findings to be aware of so that one can use a reliable pedometer. Although the sample size was small in this study, each participant wore four different pedometers simultaneously and the range in BMI of the subjects were 19.8 to 33.6. Replicating this study in the adolescent population would yield valuable information to researchers wanting to choose a reliable pedometer for research use with teens.

Next, Crouter, Schneider, Karabulut, and Bassett (2003) examined the validity of 10 electronic pedometers for measuring steps, distance, and energy cost in ten subjects with a mean age of 33-years-old. When the subjects wore a pedometer on the right and left side, the correlation co-efficients were above 0.81 for all except the Oregon Scientific pedometer ( $r = 0.76$ ). Most of the pedometers underestimated steps at 54 meters multiplied by minute<sup>-1</sup>, but were accurate at higher speeds. At slower speeds, distances

were overestimated and at faster speeds, distances were underestimated by the pedometers. The pedometers varied at displaying kilocalories. Overall, there was uncertainty about whether net or gross kilocalories were being displayed. Seven of the eight pedometers were accurate at +/- 30% at all speeds with an assumption that the pedometers were displaying gross kilocalories. Although this study was done with adult subjects, it is valuable information to know that pedometers are reliable for counting steps but probably not for assessing distances and kilocalories. Replication of this study in the adolescent population would yield beneficial data on the reliability of pedometers in teens.

In a study done by Swartz et al., (2003) the accuracy of electronic pedometers in adults with variations in BMI was studied in 25 adults. The category of BMI did not affect the ability of the pedometer to count steps at any walking speed. It was found that pedometer placement did make a difference at a slower walking rate of 54 meter times 1 minute because pedometers underestimated actual steps by front (20%), side (33%), and back (26%) when compared with hand-tally counts. At faster rates of 80 meter multiplied by 1 minute, there was no significant difference between the placement of pedometer counts and hand-tally counts. BMI was not found to make a difference in the ability of pedometers to count steps accurately. At slower rates, the pedometers underestimated the steps but at faster rates, the steps counted by the pedometers were not significantly different from the manual counts. This study could be replicated in adolescents to examine the accuracy of electronic pedometers in adolescents with varied BMI.

Rowlands and Eston (2005) compared accelerometer and pedometer measures of PA in thirty-four 8 to 10 year old boys and girls. Pedometers were found to provide a

reasonable estimation via counts of steps when activity level intensity is not possible to measure.

*Accelerometers.* Accelerometers are approximately the size of a deck of cards, battery-operated, electronic devices that measure accelerations of PA to determine light, moderate, or vigorous PA. Features and use vary a bit from one brand and style to another, but most estimate energy expenditure after programmed for age, height, weight, and gender of wearer. Most are worn at the waist level, but depending on the brand, they may also be worn at the wrist or ankle. Most accelerometers allow to data to be downloaded to a personal computer (PC) for analysis, thus they are often used in PA research. Cost varies from uniaxial accelerometers at \$90.00 to \$1500.00 and multiaxial accelerometers from \$150.00 to \$2600.00 (Steele et al, 2003). The main difference between uniaxial accelerometers and triaxial or multiaxial accelerometers is ability to measure. Uniaxial accelerometers record vertical motion only, so are unable to measure PA with static trunk movement such as rowing or cycling (Freedson & Miller, 2000) whereas triaxial or multiaxial are more sensitive to measuring all movements as well as energy expenditure.

Crouter, Churilla, and Bassett (2006) studied the validity of energy expenditure using the 1) Actigraph, 2) Actical, and 3) AMP-331 accelerometers and found the equations significantly underestimated time spent in vigorous PA. When predicting energy expenditure of time spent in light, moderate and vigorous PA, more than one measure should be used (Crouter, Churilla & Bassett). Pober, Staudenmayer, Raphael, and Freedson (2006) developed and tested a hidden Markov model in an attempt to better process accelerometer data and found the hidden Markov model approach to correctly

estimate the intensity of the activity 99 percent of the time. The Tritac-R3D accelerometer was highly correlated with doubly-labeled water ( $r = 0.81$ ) (Ramiriz-Marrero, Smith, Sherman, & Kirby, 2005).

Predictive validity in children and adolescents has been studied on three previously published ActiGraph energy expenditure studies by Trost, Way and Okely (2006). In four activity trials, none of the three equations accurately predicted energy expenditure. However, the equations were useful in estimating participation in moderate to vigorous PA.

Computer Science and Applications, Inc. (CSA) accelerometers have data acquisition capabilities through the use of computer microchip technology of particular value to researchers because objective data can be downloaded to personal computers for analysis. Schmidt, Freedson, and Chasan-Taber (2003) compared CSA accelerometry and a self-reported PA log and found that correlations between CSA and the PA logs ranged from  $r = .45$  to 0.86. The correlations were found to be higher in women with BMI below 25 when compared with women with BMI above 25.

*Combinations of Measures.* Matthews, Ainsworth, Thompson, and Bassett (2002) studied how many days of measure will provide the highest reliability with the CSA accelerometer measure in 92 healthy adults. To obtain 80% reliability of the CSA accelerometer, at least 3 to 4 days of measurement was required. Seven days of monitoring PA provided the most reliable measures. Trost, Pate, Freedson, Sallis, and Taylor (2000) examined the minimal days needed to assess PA levels to establish reliable data in children and adolescents. In children, a 4- to 5-day long monitoring of PA yielded a high reliability (Spearman-Brown reliability of 0.80). Adolescents needed a longer

monitoring period of 8 to 9 days to achieve a high reliability (Spearman-Brown  $r = 0.80$ ). Children were found to have higher levels of vigorous PA on the weekends, whereas adolescents were found to have lower levels of vigorous PA on the weekends. Trost, Pate, Freedson, Sallis, and Taylor concluded that reliable estimates of physical activities for children and adolescents require a 7-day monitoring protocol.

#### Intervention Research To Promote Physical Activity in Adolescents

Robbins, Gretebeck, Kazanis, and Pender (2006) studied the feasibility of "Girls on the Move," an individually tailored computerized PA intervention program and nurse counseling in 77 racially diverse sedentary girls in 6th, 7th, and 8th grade in two different middle schools. No differences were found between the experimental and control groups in self-reported PA. The intervention group was found to have greater social support than the control group. One strength of this study was that it was a randomized, controlled study and sampled racially diverse sedentary girls in sixth, seventh, and eighth grade. It would be interesting to track these girls and evaluate any impact this study made on trends of PA levels later in adolescence. Interventions in the future could use this method for enhancing social support for PA.

Gidding et al., (2006) studied the effects of PA on BP, LDL, and BMI in 663 eight- to ten-year-olds and three years later ended with 623 (94%) youths. It was found that for every 100 estimated-metabolic-equivalent hours of PA, a decrease of 1.15 mmHg of systolic blood pressure was present. A 1.28 mg/dL decreased in low-density lipoprotein was also evident for every 100 estimated-metabolic equivalent hours of PA. Implication of the study were that long-term active participation in PA is helpful in lower systolic blood pressure and low-density lipoprotein and may also reduce BMI.

The relationship between changes in PA, sedentary behavior, physical self-perceptions and global self-worth in 8 to 12 year-old overweight/obese children were studied by Goldfield et al., (2007). Participants wore accelerometers every day for eight weeks. Sedentary behavior was quantified by self-report. It was found that increases in PA were associated with physical self-perceptions. Reductions in sedentary activities (watching television) were associated with increased physical and global self-worth. A strength of this study was the objective measures of accelerometers. The association of increased self-worth with increased PA and decreased sedentary behaviors was also an interesting value to consider when planning an intervention program.

Young, Phillips, Yu, and Haythornthwaite (2006) examined the effects of a life skills intervention for increasing PA in 221 ninth-grade girls. In this randomized controlled trial, subjects were randomized to an 8-month intervention group (conducted in a special physical education class) or a control group (standard physical education class). No significant between-groups differences were found for mean daily energy expenditure or intensity levels of activity. The significant differences between groups were found in the amount of television watching as the intervention group time decreased from 22.3 percent to 17.0 percent. The control group amount of time watching television did not change. Cardiorespiratory fitness improved in both groups. It is possible that the Hawthorne effect could be the reason for the improvement in cardiorespiratory fitness and no differences between groups in levels of intensity because both groups knew of the study in progress.

McMurry et al., (2002) examined a school-based intervention that reduced body fat and blood pressure in 1,140 early adolescents over an eight-week intervention time.

Subjects were randomized into four groups. One group was a control group, and the three intervention groups were: exercise only, combined exercise and education, and education only. The control group had higher systolic and diastolic blood pressures than the intervention groups. The exercise intervention groups had less of an increase in the sum of skinfold thickness than the education only or control groups. BMI did not change at a significant level between groups. Had the time frame been longer than eight weeks, the results might have been different. The four different groups was a strength of the design for any researcher to consider for future research.

Beaudoin, Fernandez, Wall and Farley (2007) evaluated a mass media campaign in New Orleans to promote walking and healthy eating. The media was focused on low-income, African-Americans in New Orleans. In 2004, baseline telephone surveys were conducted and then evaluation surveys were done in 2005. In the measures of eating fruits and vegetables and walking, the subjects had a significant increase in recall. Attitudes toward walking and increases in self-reported walking was found. The self-report measures are a weakness of this evaluation, but the random-digit-dial selection of subjects and the focus on African Americans were strengths.

Of these intervention projects reviewed, time is a factor to consider. The eight-month study done by Young, Phillips, Yu, and Haythornthwaite (2006) was an interesting time length because it might have had more of an enduring impact than the shorter studies. Blood pressure was an important measure in these intervention studies. Even in the studies with shorter time frames, blood pressure decrease was a positive outcome. The reductions in LDL were also of great health benefit because they lower cardiovascular disease risk.

### Conclusion of the Literature Review

Youth in the United States and across the globe continue to engage in low levels of PA and excessive sedentary behavior. It has been well documented in the literature that PA promotes health and well-being while sedentary behavior is linked with health problems. Some of the main points that evolved from this review of the literature include the tendency for adolescent boys to have higher systolic blood pressures than girls (Dasgupta et al., 2006; Paradis et al, 2004), for African American and Hispanic children to have increased their prevalence of obesity at alarming rates (Strauss & Pollack, 2001) and the distinct gender differences between girls and boys (Guillaume, Lapidus, Bjorntorp, & Lambert, 1997). Girls tended to have less PA than boys and a greater fat mass and percentage fat has been found among inactive girls (Treuth, Hou, Young & Maynard, 2005). Interventions to promote PA in youth are urgently needed to slow and reverse sedentary activity levels and thus serious health concerns that result.

### Theoretical Framework of Empowerment

Empowerment has been defined as a way that persons achieve control over their own lives by active participation (Rappaport, 1981). Empowerment acknowledges that adolescents have the power to positively develop themselves (To, 2007). The concept of youth empowerment described by Chinman and Linney (1998) in their model incorporated youths and adults in meaningful interactions. Youths are able to bond with adults and receive positive reinforcements and recognition. The basic premise of youth empowerment is facilitating a positive environment in which young people can be guided with an opportunity to grow and develop (To, 2007).

Soloman (1976) first published about empowerment in the use of working with low-income black communities in the United States. The cognitive model of empowerment was developed by Thomas and Velthouse (1990). Empowerment was described as a type of motivation. People complete certain tasks such as choice, competence, impact and meaning and these parts result in motivation.

Vander Henst (1997) pointed out that empowerment may be viewed as a process or outcome. Outcomes that may result were identified as self-efficacy, perceived control, or improved health and well-being. Mandel and Qazilbash (2005) advocated the involvement of youth empowerment in health services and policy. Psychological empowerment was defined as a motivational process by Conger and Kanungo (1988). When conceptualized as a process, people have opportunities to shape their own lives through choices and decision making (Zimmerman, 1995). In addition, Zimmerman argued that empowering processes result in empowered outcomes.

Williamson (2007) studied home health care nurses' perceptions of empowerment in doing their job. Qualitative (interview and observation) and quantitative methods (Psychological Empowerment Instrument) were used to study perceptions in fifteen nurse participants. The perceptions of the participants described empowerment as the use of choice, meaningfulness and competence in their work.

Leach (2007) advocated that working with instead of against human nature may be the best approach to reach a competent community. Every person is equipped with intellect, will, and imagination. Developing these capabilities in humans to enhance their own abilities can lead to empowerment.

Powers et al. (2001) studied adolescent self-determination in twenty teens aged 12 to 18 years old using an experimental design. The intervention included coaching the adolescents on self-determination skills to achieve personal goals. It was found that the treatment group participants scored significantly greater enhancement in psychological adjustment, empowerment, and level of accomplishment than adolescents in the control group. Additional research is warranted as the sample size was small.

A four-year longitudinal qualitative study was employed by Cargo, Grams, Ottoson, Ward, and Green (2003) to develop a theoretical framework of youth empowerment. Individual and group interviews, documents, and observations were used to gather data. The constant comparative method and theoretical sampling was used to analyze the data. As power for decision-making, communication, and action was given to youth, positive changes in youth development was observed. The concept of empowerment emerged as a transactional process but also resulted in outcomes such as engaging and maintaining youth participation.

Cargo et al. (2003) described the transactional partnering process between adults and youth. Cargo et al explained that adults create an empowering environment by creating a welcoming social climate and enabling youth. The welcoming social climate provides opportunities for youth to voice ideas, make decisions and take action in a believing, respectful, encouraging and caring atmosphere. Youth are enabled through facilitating, teaching, mentoring, and providing feedback.

The youth sub-processes included youth participants being engaged, youth potential actualized, youth-controlled process and cultivation of constructive change by youth. Consciousness of the topic is raised by the engaged youth, followed by

competence, confidence and esteem. Learning takes place from taking responsibility, confronting challenges, and improving quality of life. Youth development occurs as success is achieved and change is socially integrated (Cargo et al., 2003).

This framework fit well with the project. Telling adolescents to have 60 minutes of PA a day will not work efficiently. Teenagers need to have a respectful adult who believes in them to create an educational climate where information is provided and students are provoked into engaging discussions about what they think and want in life. By confronting their own perceptions about unhealthy and healthy choices in life and what they ultimately are empowered to decide, they will control their actions. An educational session about the benefits of PA led by a School Nurse using youth empowerment is one delivery method that is worthy of study.

#### *Empowering Youth to Promote Physical Activity*

Empowerment is a concept that focuses on the individual to take control of his or her own life (Rappaport, 1981; Tones, 1991). In this project, planned strategies were used to encourage adolescents to make personal choices in their life concerning physical activity. Facilitating empowerment in others is consistent with increasing internal control, a key factor in assisting adolescents to make healthy choices. In life there are always alternatives and the individual is the one to make life choices (Hopson & Scally, 1981; Brown & Piper, 1995). Therefore, the interventions used were to provide opportunities for students to think about choices they will make.

#### *Peer Leader Assistance*

Peer leaders have been advocated in health promotion education based in the school settings for drug abuse prevention (Mohai, 1991), tobacco prevention education

(Valente, Hoffman, Ritt-Olson, et al., 2004), unhealthy behaviors, such as alcohol use (Brown, 2004) and obesity prevention (Stock et al., 2007). Stock et al., did a prospective pilot study in the school setting with 232 youth that involved older youth serving as peer leaders with younger elementary age students to promote healthy lifestyles, specifically healthy eating, physical activity, and a healthy body image. The treatment group with peer leaders was compared to the control group without peer leaders and it was found that the younger intervention students increased healthy living knowledge, behaviors, and attitude scores. BMI and weight increased less in the intervention students 4<sup>th</sup> through 7<sup>th</sup> grade than the control students.

Valente, Hoffman, Ritt-Olson, et al., (2003) examined group assignment strategies on peer-led tobacco prevention programs in schools in 84 sixth grade classrooms in 16 schools. Three conditions—random, teacher, and network were used in this study. The random condition was driven by student opinion. The teacher condition was dependent on teacher knowledge. The network condition used student opinion and computer algorithm to match leaders with groups. Students in the network condition gave more favorable evaluations of the prevention program and had improved attitudes, improved self-efficacy, and decreased intention to smoke. One should note that only short-term surveys were used, so long-term effects are unknown. In addition, behaviors were not measured, only student attitudes. Another consideration was that student peers may have picked their friends to be leaders, and then reported more positive outcomes in the evaluation process, because the leader was their friend. Further study is warranted to explore the significance of peer-led tobacco prevention programs in schools.

In another study by Valente, Unger, Ritt-Olson, et al., (2006) the effects of three leader and group selection methods within two different tobacco prevention programs were compared. Students were randomly assigned to control and experimental groups. It was found that when peers led the tobacco prevention group, peer leaders were more persuasive than adult leaders. Who led the groups was found to be more important than the curriculum type.

### Summary

Today's youth have increasing rates of overweight/obesity, type 2 diabetes and sedentary behavior. It is documented, not only in the U.S., but in other countries across the world. It has been consistently found in the studies reviewed that adolescent boys have more PA than adolescent girls (Ammouri, Kaur, Neuberger, Gajewski et al., 2007; Heath, Pratt, Warren, & Kann, 1994 ; Santos, Page, Cooper, Ribeiro, & Meto, 2009). Adolescents from lower socioeconomic status have been found to be more inactive than adolescents with higher socioeconomic status (Hanson & Chen, 2006; Mo, Turner, Krewski & Mo, 2005). Older female adolescents were found to report the lowest levels of PA (Ammouri, Jaur, Neuberger, Gajewski et al., 2007). Higher BMIs and greater fat mass has been found among inactive girls (Treuth, Hou, Young & Maynard, 2005).

A relationship between blood pressure and PA levels have been found. PA has been found to decrease blood pressure (Ishikawa-Takata, Ohta, & Tanaka, 2003). Furthermore, a positive relationship has been found between blood pressure and BMI (Muntner, He, Cutler, Wildman, & Whelton, 2004; Paradis et al, 2004; Ribeiro et al, 2003; Srinivasan, Myers, & Berenson, 2006). Physical activity is beneficial to the health of youth .

Neumark-Sztainer, Story, Hannan, Tharp, and Rex (2003) found that peer support is a common motivator for PA in adolescents. Other researchers have found peer motivation to be an effective motivator for PA (Haverly and Davison, 2005). These findings from research can be applied by the school nurse to develop a plan with other school officials for promoting physical activity in youth. Interventions must be implemented and tested for success in promoting an increase in physical activity in youth. The theoretical framework of empowerment and the incorporation of peer leaders to plan and provide educational for youth are worthy of empirical examination.

### CHAPTER III: METHODS AND PROCEDURES

The research design and procedures used in this study are described in this chapter. The variables are identified and the sample and setting is presented. Ethical considerations, demographics, measures used, statistical tests and methodological limitations are explained.

#### Research Design

A true experimental design with a repeated measure and one intervention was employed in the study. Polit and Beck (2008) described a true experimental design as one that is characterized by manipulation, control, and randomization. The manipulation or intervention was an educational lesson (see Appendix A) led by the school nurse and assisted by a student peer on the health benefits of PA in adolescents. The current recommendation of 60 minutes of PA per day, combined of moderate to vigorous PA was taught. The focus of the intervention was the benefits of either delaying the onset of hypertension or controlling blood pressure and cardiac events by having regular physical activity. An adolescent peer leader in the school assisted with the teaching sessions. This intervention was based on evidence described in Chapter II.

The peer leader assisted with lessons focused on the benefits of PA and discussion provoking exercises. The lessons and exercises were based on published research in the use of peer leaders in health promotion education for adolescents. The framework from Princeton's Center for Leadership Training (Powell) was informally adapted to prepare the peer leader in this project. The peer leader was coached on how to offer factual information and then asked the teens questions that promoted discussion. The school nurse developed and led lessons with the peer leader's assistance. The peer leader was a

positive role model that also shared how she incorporated physical activity into her daily life as a teenager. All project coordination and follow-up was completed by the school nurse.

Randomization was achieved with the groups. There was one control group and one intervention group. One group was at one high school and one group was located at another high school in the same city. This was to control for contamination from the students talking with each other. A coin flip determined which school was the control group and which school was the treatment group.

#### *Dependent and Independent Variables*

The independent variable was the educational intervention on the benefits of PA. The dependent variables were blood pressure, pulse, height, weight, BMI, and PA levels reported on the PACE + Adolescent tool (See Appendix B). A PACE 1 and PACE 2 is recorded on the PACE + Adolescent tool (Prochaska, Sallis & Long, 2001). PACE 1 refers to the usual amount of physical activity the adolescent has per week and PACE 2 refers to the actual amount of physical activity in the past week.

#### *Sample and Setting*

The population sampled was ninth grade students, aged 14 to 15, enrolled in a physical education course in the fall of 2008 at two public high schools in the same city of the Midwestern U.S. Approximately 500 ninth grade students were enrolled in physical education at these two high schools in the fall of 2008. A convenience sample of participants was recruited by inviting all ninth graders enrolled in physical education at the two high schools to join the study. Forty-three participants and their parents/legal guardians completed the consent process. Twenty adolescents were initially in the control

group and 23 in the treatment group, but 9 participants in the control group were lost to attrition. All 23 participants that started in the treatment group completed the study.

The reason that students in the physical education course were invited to participate in the study was because some of the curricular content in the ninth grade physical education course was similar to the educational intervention in this study. Therefore, students that were not enrolled in the course would not be receiving the healthy lifestyles content and this could have skewed the data. So, to control for this variable, all students had to be enrolled in the physical education course to be in the study. That way, the participants were all receiving the same curricular content on healthy lifestyles. Also, it was planned that all participants had the same physical education course because one semester in ninth grade they do not have physical education, but one semester they do. By requiring participants to be in the physical education course during the data collection period, the study controlled for the effects that physical activity or no physical activity may have had on physical measures.

#### Ethical Considerations

Institutional Review Board (IRB) full review approvals at College of Saint Mary and the public school district were obtained before the study began. Strict adherence to IRB approvals were followed to protect the rights of participants. Signed consent was obtained from parents/guardians (See Appendix D) and adolescents (See Appendix E) before the study began. Any participant who developed a medical concern during the study was required to have a physician statement stating they were able to continue in the study. This was the case with one participant, but physician approval was obtained and therefore, the adolescent continued in the study.

### Demographics

The total number of participants that completed the study was 32. Gender was equally divided with 16 males and 16 females. The mean average age of participants was 14.125 years. Race frequencies were 23 Caucasian, 4 Hispanic, 4 Black, and 1 Asian. There were 2 males and 7 females in the control group. The control group included seven 14-year-olds and two 15-year-olds. The control group frequencies for race were 3 Caucasian, 2 Hispanic, 2 Black, and 1 Asian. Gender in the intervention group was 9 females and 14 males. The intervention group had twenty-one 14-year-olds and two 15-year-olds. The intervention group had 20 Caucasian, 1 Hispanic, 2 Black, and no Asian participants.

### Questionnaire

PA levels were measured through use of the PACE + Adolescent Tool (See Appendix B). The PACE + Adolescent Tool is a questionnaire with 2 questions. The first question asks the adolescent what is the usual amount of days per week that 60 minutes each day of physical activity had been reached. The second question asks in the past 7 days, how many days has the adolescent had at least 60 minutes of physical activity. The tool was easy to complete and can be done within a few minutes. Prochaska, Sallis, and Long (2001) studied the PACE + Adolescent measure of PA with the purpose of finding a valid and reliable screening measure to be used with teenagers. The PACE + Adolescent tool is referred to as the PACE + Adolescent tool when speaking to the whole tool in general, but when speaking specifically about the items on the tool, they will be referred to as PACE 1 (usual physical activity level) and PACE 2 (actual physical activity level) for the remainder of the document. Validity was found through accelerometry data

and the measure was found to be reliable ( $r = 0.77$ ). The definitions of PA were directly on the tool for participants to review when completing the measure. Adolescent participants were told on the tool not to count physical activity in physical education class (a stipulation of the tool and how reliability and validity with the tool has been calculated).

### Physical Measures

The physical measures in this study were blood pressure, pulse, height, weight, and BMI. Blood pressures were recorded and analyzed as systolic and diastolic measures for statistical operations. The measures were done over a twelve-week time period. There were two pre-measures and these were labeled pre A and pre B. The two post-measures were labeled post C and post D. Pre A measures were done week one of the study, pre B measures were done week three, the intervention was completed week five, post C measures were done week nine, and post D measures were done week twelve.

### Instruments and Data Collection Procedures

The blood pressure measurement for pediatrics standardization protocol published by the Utah Department of Health (2005) was followed in the study. The measurement included the standardization of personnel and equipment, calibration, and included the protocol for blood pressure measurement as recommended by the American Heart Association. The same exact new models of equipment to measure (Welch Allyn Brand DuraShock-Latex-Free Sphygmomanometers, size adult regular and adult large) were purchased through monies for a funded Sigma Theta Tau Research Grant for both high schools. Therefore, the variance of equipment variable was controlled.

Blood pressure and resting pulse were assessed in the right arm after a 5 minute rest period, with a 300mmHg portable aneroid blood pressure system, meaning the barometer does not use a column of fluid. A pin-stop action facilitates visual calibration and accuracy check. For participants with an arm circumference that was less than 13 inches, a regular size cuff was used. For participants with an arm circumference that was greater than 13 inches, a large size cuff was used (Kmom, 2003; Utah Department of Health, 2005). The adult large size cuff was also a 300mmHg portable aneroid blood pressure system with a pin-stop action for visual calibration and accuracy check.

Participants sat in a chair and rested for 5 minutes. The correct sized cuff was used according to the blood pressure measurement protocol and their blood pressures were measured in their right arm. Radial pulse was counted for a full minute. One minute later, a second blood pressure was measured for each participant. The first and second blood pressures were then averaged together. All measures were recorded on the data collection worksheet (See Appendix C).

Participants' heights were measured in inches with shoes off and participants standing straight up with head level and back against a measuring tape on wall. No hats were worn. Participants' weights were measured with no coats, backpacks, purses, jackets, or shoes using a digital scale that was zeroed and calibrated. Weights were recorded in pounds and to one fourth of a pound. Each participant's BMI adjusted for age was calculated per CDC BMI calculations that included date of birth, sex, and date of measure in the formula. Heights and weights were recorded on the data collection worksheet (see Appendix C).

### *Null Hypotheses*

The first null hypothesis was: subjects receiving the educational intervention will have no change in blood pressures between pre-intervention and post-intervention measures. The second null hypothesis was: there will be no difference in measures of blood pressures between the intervention group and the control group. The third null hypothesis was: there will be no differences in measures of pulse, height, weight, and BMI between the intervention group and the control group. The fourth null hypothesis was: there will be no relationship between the pre A SBP and PACE 2 measures. The fifth null hypothesis was: there will be no relationship between the pre A DBP and PACE 2 measures. The sixth null hypothesis was: there will be no relationship between the post D SBP and PACE 2 measures. The seventh null hypothesis was: there will be no relationship between the post D DBP and PACE 2 measures.

### *Level of Data*

The level of data used for all the measures was ratio because there is an absolute zero. Blood pressure, pulse, height, weight, BMI, and values from the PACE + Adolescent tool were all ratio level. The variables of gender, age, race, and athletic participation were analyzed as nominal variables because of the categorical nature of these data.

### *Statistical Tests*

#### *Descriptive Statistics*

Descriptive statistics were used including frequency distributions and graphical representations of data. Demographic information on participants, such as age, sex, race,

and athletic participation was analyzed using descriptive statistics. These variables were nominal level because they were categorical and have no associated numerical value.

### *T test Statistics*

The statistical test that was used was the paired student *t*-test. The student *t*-test is used for dependent group means such as pre-intervention and post-intervention scores at the interval or ratio level when there are two groups (Polit & Beck, 2008). The matched pair *t*-test was used to compare the means of the pre- and post-measure means.

*Assumptions of the t-Test.* The following were assumptions of the *t*-test:

1. The two values that make up the paired *t*-test must be correlated, such as before and after measurements (Polit & Beck, 2008). This is present in this study because there were two pre-treatment measures and two post-treatment measures.

2. The paired *t*-test determines if there is a significant difference between two measures, such as a pre-treatment and post-treatment (Schott, 1990).

3. The sample need not be a random sample, as long as the sample is not biased (Shott, 1990).

### *Correlational Statistics*

The Pearson product-moment correlation coefficient was used to analyze for relationships between variables. The Pearson Correlation can determine values between –1.00 and +1.00 (Rosenthal & Rosnow, 1991). A value of –1.00 indicates a perfect negative relationship exists, whereas a +1.00 is a perfect positive correlation between the variables (Graziano & Paulin, 2000).

*Assumptions of the Pearson product-moment correlation coefficient.*

1. To use a Pearson product-moment correlation coefficient, both variables must be at least at the interval level (Graziano & Raulin, 2000). The variables of SBP, DBP, height, weight, BMI, PACE 1 and PACE 2 are measures at the ratio level, and have an absolute true zero so this was appropriate use of the statistical test on these variables.

2. The Pearson product-moment correlation coefficient will index the degree of relationship between variables (Graziano & Raulin, 2000). This was appropriate for the study as the investigator was assessing for relationship, not cause and effect when using this statistical test.

*Data Management and Analysis*

A worksheet to organize all data collection for all four repeated measures for each participant (See Appendix C) was employed. The worksheet was not identified with each participant's name, but an identification number was used known only to the researcher. The primary investigator had a sheet that identified the name to the number but it was kept in a locking file cabinet that was in the primary investigator's locked office and kept strictly confidential. This was necessary so that any abnormal measurements, for example elevated blood pressure readings, could be identified to the individual by the primary investigator so that Lincoln Public Schools, Health Services Protocol for referral of an abnormal finding to the parent/guardian, could be followed. Only the primary investigator (also the school nurse) and her research assistants were able to access identification numbers to names and all this information was kept confidential. No abnormal BP or pulses meeting abnormal protocol for referral were found in any participants, so no referrals were needed.

Statistical Packages for Social Sciences (SPSS) was used to analyze the data in January of 2009. Means and paired *t*-tests were analyzed for differences between groups and correlational statistics were used. A consultation with a statistician was completed to verify the correct application of statistical formulas.

#### Methodological Limitations

Several methodological limitations existed in this study. The sample size was one limitation because it was small and this eliminated certain statistical analysis formulas from being used. Another limitation of the methodology was the 12-week time frame for the study. A longer time frame may have provided different findings. The use of the PACE + Adolescent tool, although found to be reliable (Prochaska, Sallis, & Long 2001) was a subjective, self-reported measure.

#### Summary

A true experimental design with repeated measures was used in this study. The sample was 32 midwestern adolescents enrolled in a physical education course during the fall of 2008. Internal review board approval was obtained from the College of Saint Mary and the Midwestern public school district at which the study was conducted. All participants and their parent/guardian completed the informed consent process to be included in the study. The sample size was a limitation in the study. A data worksheet was compiled for each subject to organize the repeated measures (See Appendix C). No abnormal blood pressures or pulses were found that required a referral to the parent from the school nurse. The design of the study was developed to examine for any effects that a school nurse led educational intervention may have on participants' blood pressures or physical activity levels.

## CHAPTER IV: RESULTS

### Introduction

This chapter will discuss the statistical tests used to analyze the data, data results, and a summary of significant findings. The acceptance or rejection of each null hypothesis will be discussed and why it was accepted or rejected.

### Data Analysis

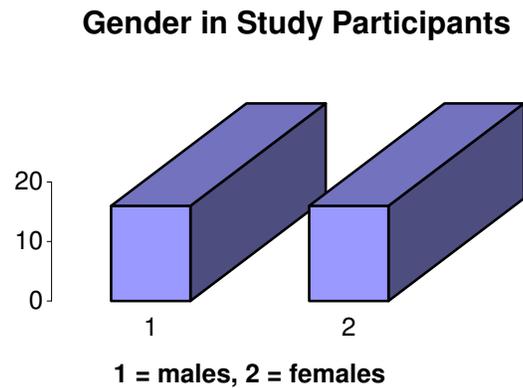
Data analysis for this study involved several steps. First, data were entered into SPSS. Then the data was proofed and edited until accuracy was assured. SPSS was used to analyze all data using descriptive statistics. The *t*-test was used to calculate paired sample differences of the mean, standard deviation, standard error of the mean and confidence interval of the differences. In addition, the paired differences *t*-test, degrees of freedom and 2-tailed significance was calculated. Correlations were also analyzed using SPSS.

### *Descriptive Statistics*

Frequencies and percentages analyzed in SPSS described the subjects.

#### *Description of Subjects*

Participants were 32 ninth grade adolescents. Gender was evenly split at 50% female and 50% male with 16 females and 16 males (See Figure 1). Race was divided as Caucasian at 71.9%, Hispanic at 12.5%, Black at 12.5%, and Asian at 3.1% (See Table 1). Student participants were ninth graders in a health and physical education class with 87.5% at age 14 and 12.5% at age 12.5. The mean age of participants was 14.125. There were 8 athletes (25%) and 24 non-athletes (75%) that participated.



*Figure 1.* Gender of Study Participants: 16 males and 16 females

Table 1.

*Frequency and Percent of Race in Study Participants*

Race	Frequency	Percent
Caucasian	23	71.9
Hispanic	4	12.5
Black	4	12.5
Asian	1	3.1

*t-Test Statistics*

Paired *t*-tests were used to compare the means of blood pressure, pulse, height, weight, BMI, and PACE scores. A statistically significant drop in the pre SBP (111) to the post SBP (101) was found (See Table 2) in the experimental group at a significance level of less than 0.05. The mean difference was 9.45 (S.D. 8.032; standard error of the mean 1.67489). No significant difference was found in the control group from pre- to post-SBP.

The pre DBP of 63 in the experimental group (standard deviation of 8.427; standard error of the mean 1.75725) dropped in the post-DBP measure to 56 (standard deviation of 6.8660; standard error of the mean of 1.43179), at a significance level of less than 0.05. The control group pre-DBP measure was 70 (standard deviation of 6.783; standard error of the mean 2.26095) whereas the control group post DBP was 69 (standard deviation of 5.742; standard error of the mean 1.91385). The control group had no significant difference.

Table 2.

*Mean Averages of BP and PACE Variables by Experimental Group and Control Group*

Variable	Experimental Group	Control Group
Pre SBP	111*	106
Pre DBP	63*	70
Post SBP	101*	112
Post DBP	56*	69
Pre PACE 1	4.8	3.3
Pre PACE 2	5.3	3.5
Post PACE 1	5.0	3.8
Post PACE 2	5.4	3.7

\* significant at the  $\alpha < 0.05$  level

The null hypothesis stated that subjects receiving the educational intervention will have no change in blood pressures between pre-intervention and post-intervention times. There was a significant difference between SBP and DBP from the pre-measure to the post-measure means. The  $t$  value derived for the experimental group SBP measure was 5.646 and this was significant at the less than 0.05 level. The  $t$  value for the experimental group DBP measure was 6.366 and this was significant at the less than 0.05 level. Therefore, the null hypothesis was rejected and was concluded that there was a

significant difference between the two measures of blood pressure in the group that had the educational intervention.

The second null hypothesis stated: there will be no difference in measures of blood pressures between the intervention group and the control group. Because there was statistical significance in the experimental group, but not the control group, the second null hypothesis was also rejected.

No significance was found in the pulses in the experimental or control group. There were no significant findings in the variables of weight, or BMI. Because the participants were youth and still growing, it was logical that their heights, weights, and BMIs would show a slight increase, although not statistically significant, as shown in Table 3. Therefore, the third null hypothesis: there will be no differences in measures of pulse, height, weight, and BMI between the intervention group and the control group was accepted.

Table 3.

*Mean Measures of Variables Comparing Pre and Post*

Variable	Pre	Post
SBP Average	109	104
DBP Average	65	60
Pulse Average	69	69
Height A/C	65.96	66.18
Weight A/C	139.89	142.83
BMI A/C	22.67	22.90
PACE 1 Average	4.44	4.69
PACE 2 Average	4.83	4.89

*Pearson Correlation*

No significant relationship was found between the pre A Average SBP and the pre A P2 PACE measures (See Table 4). The fourth null hypothesis: there will be no

Table 4.

*Bivariate Correlations of Blood Pressure and Physical Activity Measures*

Paired Variable Measure	N	Pearson Correlation	Significance
Pre A Average #1 & 2 SBP & Pre A P2 PACE	32	.079	.666
Pre A Average #1 & 2 DBP & Pre A P2 PACE	32	-.370	.037*
Post D Average #1 & 2 SBP & Post D P2 PACE	32	-.377	.033*
Post D Average 1 & 2 DBP & Post D P2 PACE	32	-.356	.045*

\* significant at the  $\alpha < 0.05$  level

relationship between the pre A SBP and PACE 2 measures was accepted (See Figure 2).

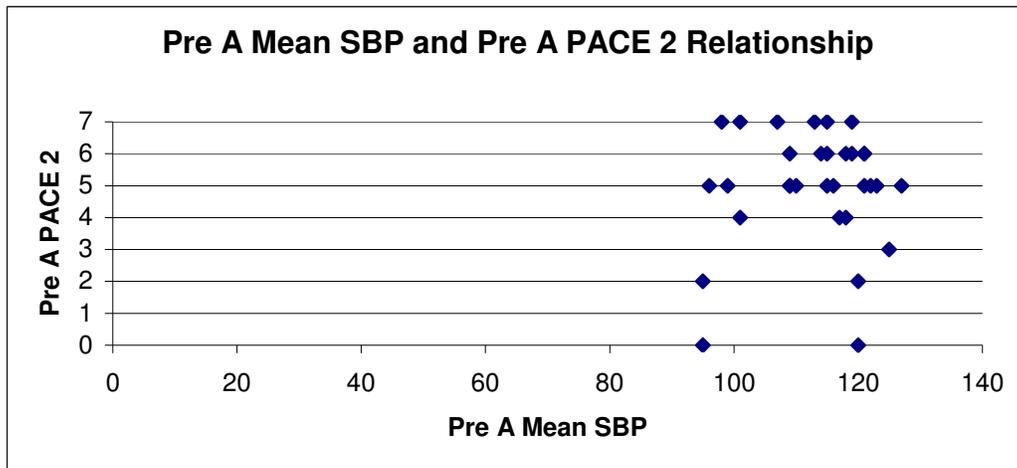
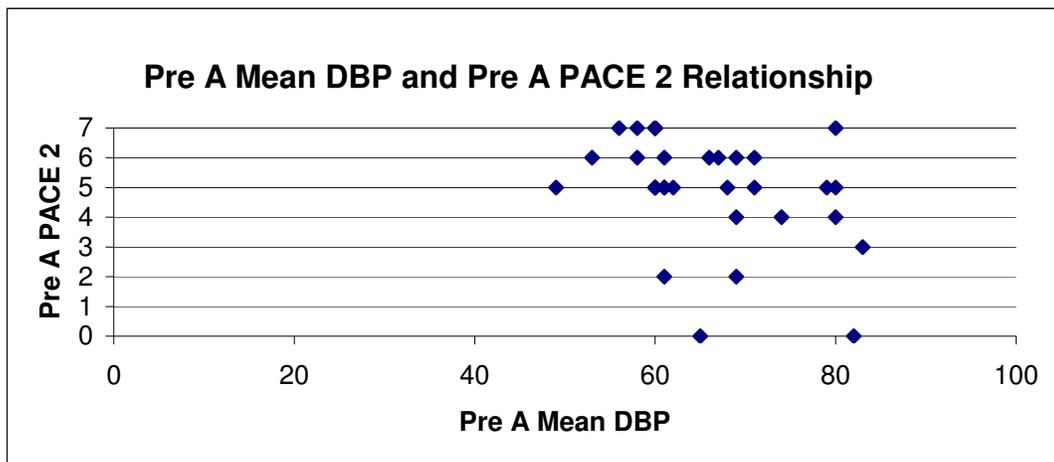


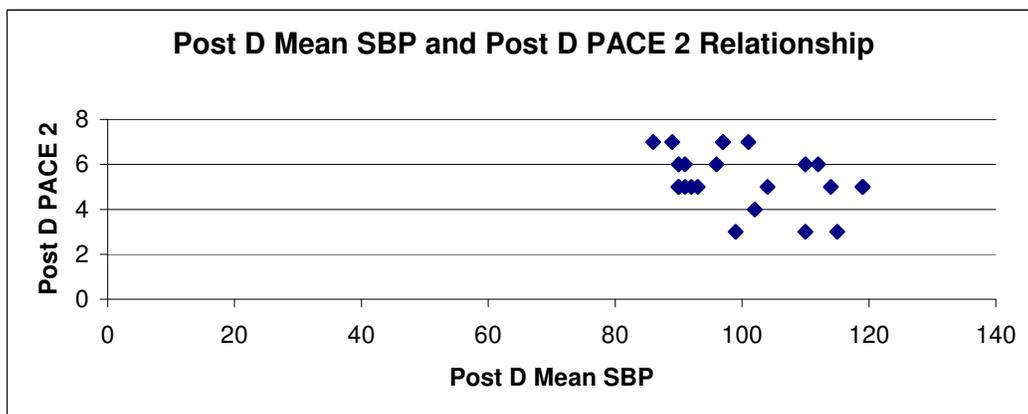
Figure 2. Scatterplot of Pre A Mean SBP and Pre A PACE 2 Relationship

The pre A Average DBP and pre A P2 PACE were found to have a negative correlation (Pearson Correlation  $r = -.370$ ;  $p = 0.037$ ) (See Figure 3). Therefore, the DBP decreased



*Figure 3.* Scatterplot of Pre A Mean DBP and Pre A PACE 2 Relationship when the P2 PACE level increased. The fifth null hypothesis: there will be no relationship between the pre A DBP and PACE 2 measures was rejected because of the negative correlation just described.

A negative relationship was found between the post D average SBP and the P2 PACE PA measure (Pearson Correlation  $r = -.377$ ;  $\rho = .033$ ) (See Figure 4). The sixth



*Figure 4.* Scatterplot of Post D Mean SBP and Post D PACE 2 Relationship null hypothesis: there will be no relationship between the post D SBP and PACE 2 measures was accordingly rejected because the  $\rho$  was .033 (less than .05). A negative

relationship between the post D Average DBP was found (Pearson Correlation  $r = -356$ ;  $\rho = 0.045$ ) (See Figure 5). This means the DBP decreased as the P2 PACE PA increased. The seventh null hypothesis: there will be no relationship between the post D DBP and PACE 2 measures was also rejected because the  $\rho$  was .045 (less than .05).

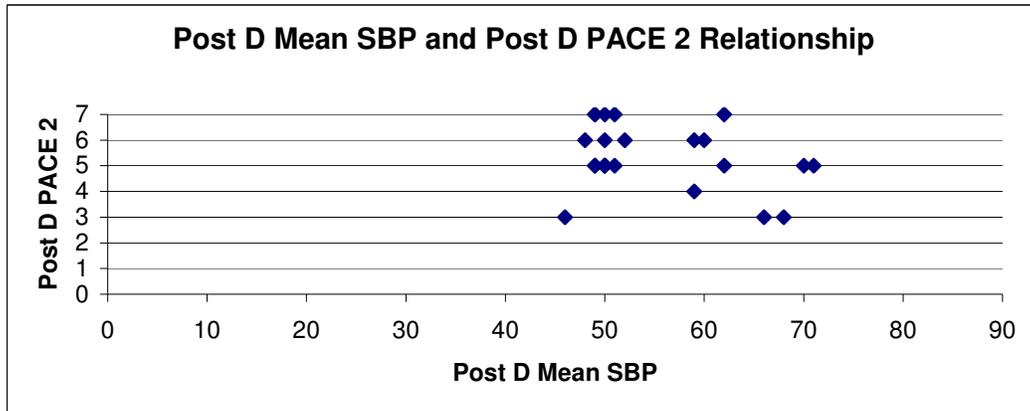


Figure 5. Scatterplot of Post D Mean DBP and Post D PACE 2 Relationship

### Results Summary

A true experimental design with repeated measures was used with two measures before the intervention and two measures after the school nurse led educational intervention. Significant differences were found in the intervention group from pre SBP and DBP to post SBP and DBP measures. It was found that the group that had the school nurse led educational intervention had a decrease in blood pressure.

## CHAPTER V: DISCUSSION AND SUMMARY

This chapter will discuss the purpose of this study, the true experimental research design, interpretation of results and correlation to the literature, correlation to the youth empowerment model, as well as implications for education and future research. This study aimed to better understand the effects a school nurse led educational intervention could have on participants' blood pressures and PA levels in adolescents.

### Research Questions

The first research question was “What effect does a school nurse led educational intervention on the benefits of physical activity have on blood pressure in adolescents?” The school nurse led intervention provided current information for adolescents in an environment that encouraged youth to take control of their lives with knowledge to develop themselves to have at least one hour of PA daily. In Chinman and Linney’s (1998) model of youth empowerment, adults and youth interact in a meaningful way to promote bonding, positive reinforcement, and recognition. This empowering environment for youth facilitates growth and development. The empowering environment, including a peer leader, was provided during the school nurse led educational intervention. A decrease in blood pressure was found to be statistically significant. The second research question was “What effect does a school nurse led educational intervention on the benefits of PA have on PA levels in adolescents”? Physical activity levels were found to decrease at a significant level in this study. The third research question was “What effect does a school nurse led educational intervention on benefits of PA have on the weight of adolescents”? No significant change in the weight of adolescents in this study was found. The fourth research question was “What effect does a school nurse led educational

intervention on benefits of PA have on the BMI of adolescents”? No effect on BMI in adolescents was found in this study. The fifth research question “What effect does a school nurse led educational intervention on benefits of PA have on the pulse rate of adolescents”? No significance was found in the pulse rate of adolescents after an educational intervention led by the school nurse.

### Interpretation

Hardy, Bass, and Booth (2007) found common sedentary behaviors among girls in early to middle adolescence were watching television, videos, and playing video games. This study focused on 14 and 15 year olds and the school nurse led educational intervention included limiting screen time (television, video games, computer) to two or less per day. Strong et al., (2005) advised 60 minutes each day of moderate to vigorous PA for adolescents. The intervention in this study followed this recommendation and advised at least 60 minutes of MVPA each day is best for health promotion.

A focus of the intervention was also to know your blood pressure readings and that PA decreases BP. Ishikawa-Takata, Ohta, and Tanaka found significant reductions in blood pressure related to PA. This is consistent with this study that found a negative relationship between BP and PA. This was using Pearson’s product moment correlations so cause cannot be assumed, but in the experimental group, BP decreased significantly as PA increased.

Based on the results of the study the school nurse led educational intervention did make a beneficial effect on blood pressure and physical activity levels. A peer leader also assisted with the educational intervention. During the educational intervention through the use of the empowerment framework, students were asked questions to help them

think and share ideas during the classroom session about the topic of physical activity. Pre- and post- measures were obtained. The experimental group showed a drop in blood pressures after the educational intervention. This was a favorable outcome and supported the conclusion that a school nurse led educational intervention was a worthwhile health promotion activity for school nurses.

This supports the use of the school nurse led educational intervention with adolescents to promote physical activity as having a positive effect on blood pressure. A relationship was found between SBP, DBP and physical activity levels, meaning blood pressure decreased as physical activity levels increased. Because this relationship was studied using correlation statistics, cause and effect cannot be assumed. A larger sample size would allow for alternate statistical formulas to be used that could test for cause and effect.

#### Youth Empowerment

Youth empowerment gives the power to positively develop oneself to adolescents (to, 2007). Control over one's life by active participation is empowerment (Rappaport, 1981). This study incorporated youth empowerment into the educational intervention by providing information and then doing activities for the youth to talk about how they can incorporate PA into their life or what they are already doing to have daily PA in their life. Instead of telling the students what to think, the intervention used activities to promote adolescents to think, discuss, and plan for incorporation into their lifestyle.

#### Limitations of this Study

There were several limitations in this study. One limitation of this study was the small sample size. Although the experimental group had no attrition loss, the control

group lost 9 participants over the twelve-week study. This limited the ability to do certain statistical calculations with the data and limited the generalizability of the findings. The time frame of twelve weeks may also have been a limitation, however, significant changes were found.

Responses to the PACE may limit validity of the data due to the self-report nature of the tool. As McMurray et al., (2008) found, overweight girls over-reported physical activity and this should be considered.

#### Strengths of this Study

A strength of this study was the even amount of males and females in the study. Another was the use of the objective measures: blood pressure, pulse, height, weight, and BMI. One similar finding in this study to other published research findings was the relationship that as physical activity levels increased, blood pressures decreased. Group randomization was a positive approach because it separated the experimental group from the control group, so there was contamination of the groups due to the adolescents talking about what was going on in their group. The true experimental design was also a strength of the study.

#### Recommendations for Practice

A school nurse led educational intervention is a worthy activity for a school nurse to participate in to promote healthy behaviors in the adolescent population. The use of a peer leader is also a worthwhile aspect. Stock et al. (2007) found that the use of peer leaders increased healthy living knowledge, behaviors, and attitude scores specific to healthy eating, physical activity and healthy body image. The experimental group in this study that had a peer leader had decreased blood pressure and increased physical activity

levels. Widespread involvement of the school environment and employees to promote physical activity is suggested. The findings from this study may be used to help guide school nursing practice. Because the results showed that a school nurse led education session increased PA levels in students, then this may become a more common intervention for school nurses.

#### Future Research

This study has vital implications for future research. SBP and DBP have been found to be positively related to BMI (Munter, He Cutler, Wildman & Whelton, 2004; Paradis et al., 2004; Ribeiro et al., 2003; Srivasan, Myers & Berenson, 2006). Future research could also examine the relationship between BP and BMI in midwestern adolescents.

Active involvement of school nurses in classroom education is a worthwhile activity to study. Replication of this study is necessary to design for focus on the peer assistance use with older adolescents. In addition, a more intense focus on the racial/ethnic and gender differences associated with physical activity and blood pressure in adolescents is worthy of further study. Studies that examine the promotion of physical activity by school nurses or other school agents and any age differences from early adolescent to the late adolescent years are warranted.

#### Summary

This investigation was conducted to determine the effect of a school nurse led educational intervention on blood pressure and physical activity levels of adolescents. The results reported were indicative that the educational intervention did have the effects of lowering blood pressure on the experimental group. This was not found in the control

group. In addition, a negative relationship between blood pressure and physical activity was found. That is, when blood pressure decreased, physical activity increased.

Further research is needed to examine interventions that promote PA in youth. Researchers must keep in mind the known findings that exist between populations, as well as the strengths and limitations of PA measures. Marketing campaigns must focus messages on specific populations that have found to be lacking in PA: girls, minority groups, teens belonging to a low socio-economic background, and youth that already have increased blood pressure, are overweight or have diabetes. Focused health education programs and PA programs must be developed and implemented to reach these specifically identified groups of youth. Longitudinal evaluation of the interventions is needed to determine long-term effects. Research that uses a design to study more about the use of peer leaders is worthy in health education.

Although there are inconsistencies in some of the research done on the specifics of PA in adolescents, the one strong consistent theme has been that there are health promotion and disease prevention benefits for adolescents to engage in daily PA. The school plays a key role in health education of the benefits from daily PA with students. School nurses that advocate for policy recommendations and implement evidence-based interventions to promote regular PA and decrease sedentary lifestyles make a meaningful difference in the lives of children and adolescents.

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Appendix A

The Effect of a School Nurse Led Education Intervention on  
Blood Pressure and PA Levels in Adolescents

Nancyruth Leibold

College of Saint Mary

Educational Intervention Lesson Plan

Objectives:

After active participation in this educational experience, the learner will:

1. Describe the benefits of PA.
2. Define moderate and vigorous level activity.
3. Describe chronic health problems that may be prevented by obtaining 60 minutes of PA per day.

Supplies/Equipment Needed: Projector and computer, Power point of Lesson, if desired

Board and white board markers, eraser

Teachers: Co-Led by School Nurse and Peer Leader

Climate: Set a climate in which students are free to share their opinions and make decisions.

Lesson Content:

I. General PA Introduction/Information

1. PA is beneficial for both male and female adolescents (CDC, 2007).
2. PA is helpful when strenuous and not strenuous (CDC, 2007).
3. The CDC (2007) reports that approximately half of American youths 12 to 21 years of age are not vigorously active on a regular basis.

4. More often, inactivity is reported by females, than by males.
5. As a teenager's age increases, their participation in PA decreases.
6. Interventions at school in physical education classes to increase PA have been shown to be effective (CDC, 2007).

## II. Benefits of PA

1. Blood pressure is reduced by PA.
  - a. The onset of high blood pressure (hypertension) is delayed by PA. Talk with students about hypertension. Have peer leader share any personal experiences about hypertension they have with students.
2. PA helps to reduce stress levels.
3. PA helps to reduce or maintain body weight.
4. PA decreases the incidence of obesity. Discuss with students the problems that obesity cause for persons.
5. PA lowers the risk of developing type 2 diabetes. Discuss with students that the incidence of type 2 diabetes risk in Lincoln-Lancaster County is one in three (national average is one in four) but that they can take action to reduce their risks of having diabetes. Be sure to explain the difference between type 1 and type 2 diabetes.
6. PA promotes healthy bones, muscles, and joints.
7. PA builds lean muscle.
8. PA can be fun.

III. Have Leader Peer speak with students about their experiences with PA—purposes, values, feelings, meaning, etc.

IV. Self-Efficacy in PA has been found to be the most consistent factor related to adolescent's having PA. Confidence in one's ability to be physically active is what self-efficacy means. Teenagers should find a PA that they are comfortable doing. For some, that is swimming, or running, but for others that is walking or dancing. PA should be fun.

V. Have students talk about examples of PA that they enjoy. Write a list on board of responses.

VI. Define moderate and vigorous PA. Moderate level PA is defined by the CDC (2007) as a level of PA in which a person has increased breathing and heart rate, and perceived exertion. Activities that are consistent with moderate PA are walking briskly, dancing, mowing the lawn, or swimming. A vigorous level of PA is defined as activity that is associated with a challenge and significantly increased breathing and heart rate in which it is difficult to finish a sentence (CDC, 2007). Activities that are considered vigorous level are jogging, running, high-impact aerobic dancing, or swimming continuous laps.

VII. Now look at the list that the students made on the board and have them read the activities they enjoy and ask them if they are moderate or vigorous levels of PA.

VIII. Explain to students that PA can be done alone or with others. Ask students to brainstorm places and ways they can do PA and write this on board. (Examples, physical education class, varsity sports, cheerleading, dance class, aerobics, recreation centers, school activities.)

## Appendix B

## PACE+ ADOLESCENT PA MEASURE

**PA** is any activity that increases your heart rate and makes you get out of breath some of the time.

**PA** can be done in sports, playing with friends, or walking to school.

Some examples of **PA** are running, brisk walking, rollerblading, biking, dancing, skateboarding, swimming, soccer, basketball, football, & surfing.

Add up all the time you spend in PA each day (don't include your physical education or gym class).

**P1. Over the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day?**

0 days     
  1     
  2     
  3     
  4     
  5     
  6     
  7 days

**P2 Over a typical or usual week, on how many days are you physically active for a total of at least 60 minutes per day?**

0 days     
  1     
  2     
  3     
  4     
  5     
  6     
  7 days

Scoring:  $(P1 + P2) / 2 < 5 \Rightarrow$  not meeting PA guidelines





IRB#: 08-18

**THE EFFECT OF A SCHOOL NURSE LED EDUCATION TREATMENT  
ON BLOOD PRESSURE AND  
PA LEVELS IN ADOLESCENTS**

**Contact Person: Nancyruth Leibold**  
[nleibold@lps.org](mailto:nleibold@lps.org) (402) 466-0930

**Invitation**

You and your child are invited to take part in this research study. The information in this form is meant to help you decide whether or not to take part. If you have any questions, please ask.

**Why are you being asked to be in this research study?**

You and your child are being asked to be in this study because your student is a ninth grader at Lincoln Public Schools enrolled in a physical education course for the fall 2008 semester.

**What is the reason for doing this research study?**

The purpose of the study is to assess if a school nurse led educational intervention about the benefits of PA, especially blood pressure benefits will have any effect on participant's blood pressure and PA levels over a time period of 4 months.

**What will be done during this research study?**

Participants in this study will have their blood pressure, heart rate, weight, height measured and BMI calculated. Participants will complete a survey about their PA levels. Participants will receive an educational lesson on the benefits of PA.

**What are the possible risks of being in this research study?**

There are no known risks to you or your child from being in this research study.

**What are the possible benefits to you?**

You or your child may benefit from participating in this research study by learning how PA promotes health and decreases the risks of developing high blood pressure, type 2 diabetes and obesity.

**What are the possible benefits to other people?**

The possible benefits of this study to other people, might be the added information learned about the school nurse's role in adolescent education of healthy lifestyles.

**Participant's initials**\_\_\_\_\_

**What are the alternatives to being in this research study?**

Instead of being in this research study you and your child can choose not to participate.

**What will being in this research study cost you?**

There is no cost to you or your child to be in this research study.

**Will you be paid for being in this research study?**

You and your child will not be paid or compensated for being in this research study.

**What should you do if you have a problem during this research study?**

You and your child's welfare are the major concern of every member of the research team. If you or your child have a problem as a direct result of being in this study, you or your child should immediately contact one of the people listed at the end of this consent form.

**How will information about you be protected?**

Reasonable steps will be taken to protect your privacy, your child's privacy and the confidentiality of all study data.

Responses and physical measures are completely confidential. You and your child's name will not be put on data collection sheets or surveys. Instead a student identification number will be placed on the data collection sheets so the school nurse may make a parent/guardian referral if indicated by Lincoln Public Schools, Health Services policy. Should the school nurse identify an abnormal physical measure, such as blood pressure, the school nurse will contact the parent/guardian and follow Lincoln Public Schools referral guidelines.

The only persons who will have access to the research records are the study personnel, the Institutional Review Board (IRB), and any other person or agency required by law. The information from this study may be published in journals and presented at professional meetings, but your identity and your child's identity will be kept strictly confidential.

When the study findings are reported, your student will be identified as an adolescent in a Midwestern or Nebraskan high school. The findings will be reported as group findings and no reference will be made to any individuals in the study.

**What are your rights as a research participant?**

You and your child have rights as a research participant. These rights have been explained in this consent form and in *The Rights of Research Participants* that you have been given. If you have any questions concerning your rights, talk to the investigator or call the Institutional Review Board (IRB), at 402-399-2400.

**What will happen if you decide not to be in this research study or decide to stop participating once you start?**

You and your child can decide not to be in this research study, or you and your child can stop being in this research study ("withdraw") at any time before, during, or after the research begins.





IRB#: 08-18

**THE EFFECT OF A SCHOOL NURSE LED EDUCATION TREATMENT  
ON BLOOD PRESSURE AND  
PA LEVELS IN ADOLESCENTS**

Contact Person: Nancyruth Leibold

[nleibold@lps.org](mailto:nleibold@lps.org)

(402) 436-1305, extension 965028#

**Invitation**

You are invited to take part in this research study. The information in this form is meant to help you decide whether or not to take part. If you have any questions, please ask.

**Why are you being asked to be in this research study?**

You are being asked to be in this study because you are a ninth grader at Lincoln Public Schools enrolled in a physical education course for the fall 2008 semester.

**What is the reason for doing this research study?**

The purpose of the study is to assess if a school nurse led educational intervention about the benefits of PA, especially blood pressure benefits will have any effect on participant's blood pressure and PA levels over a time period of 4 months.

**What will be done during this research study?**

Participants in this study will have their blood pressure, heart rate, weight, height measured and BMI calculated. Participants will complete a survey about their PA levels. Participants will receive an educational lesson on the benefits of PA.

**What are the possible risks of being in this research study?**

There are no known risks to you from being in this research study.

**What are the possible benefits to you?**

You may benefit from participating in this research study by learning how PA promotes health and decreases the risks of developing high blood pressure, type 2 diabetes and obesity.

**What are the possible benefits to other people?**

The possible benefits of this study to other people, might be the added information learned about the school nurse's role in adolescent education of healthy lifestyles.

Participant's initials\_\_\_\_\_

Page 2 of 3

**What are the alternatives to being in this research study?**

Instead of being in this research study you can choose not to participate.

**What will being in this research study cost you?**

There is no cost to you to be in this research study.

**Will you be paid for being in this research study?**

You will not be paid or compensated for being in this research study.

**What should you do if you have a problem during this research study?**

Your welfare is the major concern of every member of the research team. If you have a problem as a direct result of being in this study, you should immediately contact one of the people listed at the end of this consent form.

**How will information about you be protected?**

Reasonable steps will be taken to protect your privacy, and the confidentiality of all study data. Responses and physical measures are completely confidential. Your name will not be put on data collection sheets or surveys. Instead a student identification number will be placed on the data collection sheets so the school nurse may make a parent/guardian referral if indicated by Lincoln Public Schools, Health Services policy. Should the school nurse identify an abnormal physical measure, such as blood pressure, the school nurse will contact the parent/guardian and follow Lincoln Public Schools referral guidelines.

The only persons who will have access to the research records are the study personnel, the Institutional Review Board (IRB), and any other person or agency required by law. The information from this study may be published in journals and presented at professional meetings, but your identity will be kept strictly confidential.

When the study findings are reported, you will be identified as an adolescent in a Midwestern or Nebraskan high school. The findings will be reported as group findings and no reference will be made to any individuals in the study.

**What are your rights as a research participant?**

You have rights as a research participant. These rights have been explained in this consent form and in *The Rights of Research Participants* that you have been given. If you have any questions concerning your rights, talk to the investigator or call the Institutional Review Board (IRB), at 402-399-2400.

**What will happen if you decide not to be in this research study or decide to stop participating once you start?**

You can decide not to be in this research study, or you can stop being in this research study ("withdraw") at any time before, during, or after the research begins. Deciding not to be in this



Appendix F



**AS A RESEARCH PARTICIPANT AT COLLEGE OF SAINT MARY  
YOU HAVE THE RIGHT:**

1. TO BE TOLD EVERYTHING YOU NEED TO KNOW ABOUT THE RESEARCH BEFORE YOU ARE ASKED TO DECIDE WHETHER OR NOT TO TAKE PART IN THE RESEARCH STUDY. The research will be explained to you in a way that assures you understand enough to decide whether or not to take part.
2. TO FREELY DECIDE WHETHER OR NOT TO TAKE PART IN THE RESEARCH.
3. TO DECIDE NOT TO BE IN THE RESEARCH, OR TO STOP PARTICIPATING IN THE RESEARCH AT ANY TIME. This will not affect your relationship with the investigator or College of Saint Mary.
4. TO ASK QUESTIONS ABOUT THE RESEARCH AT ANY TIME. The investigator will answer your questions honestly and completely.
5. TO KNOW THAT YOUR SAFETY AND WELFARE WILL ALWAYS COME FIRST. The investigator will display the highest possible degree of skill and care throughout this research. Any risks or discomforts will be minimized as much as possible.
6. TO PRIVACY AND CONFIDENTIALITY. The investigator will treat information about you carefully and will respect your privacy.
7. TO KEEP ALL THE LEGAL RIGHTS THAT YOU HAVE NOW. You are not giving up any of your legal rights by taking part in this research study.
8. TO BE TREATED WITH DIGNITY AND RESPECT AT ALL TIMES.

**THE INSTITUTIONAL REVIEW BOARD IS RESPONSIBLE FOR ASSURING THAT YOUR RIGHTS AND WELFARE ARE PROTECTED. IF YOU HAVE ANY QUESTIONS ABOUT YOUR RIGHTS, CONTACT THE INSTITUTIONAL REVIEW BOARD CHAIR AT (402) 399-2400.**

\*ADAPTED FROM THE UNIVERSITY OF NEBRASKA MEDICAL CENTER , IRB WITH PERMISSION