

**ACTIVE AND HEALTHY SCHOOLS PILOT PROGRAM IN TWO PRIVATE
MISSOURI K-8 GRADE ELEMENTARY SCHOOLS**

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The undersigned, appointed by the dean of the Graduate School, have examined the thesis entitled

**ACTIVE AND HEALTHY SCHOOLS PILOT PROGRAM IN TWO
PRIVATE MISSOURI K-8 GRADE ELEMENTARY SCHOOLS**

presented by Jessica Kovarik,

a candidate for the degree of master of science,

and hereby certify that, in their opinion, it is worthy of acceptance.

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DEDICATION

For my family. My family has been exceptionally encouraging throughout this whole process, always giving me support, which I know I am grateful and lucky to have had during this experience. My family support includes my parents, who would directly ask how my progress was going or would sometimes tell mention my grandparents were wondering on my progress. Which then leads to my grandparents, who would take every opportunity to ask me or my folks how my progress was going or somehow work my thesis into a conversation (and of course my parents would casually tell me when I called, “hey, you know, your grandparents were asking about your thesis the other day...”). I also had aunts and uncles keeping track of which kid (or aunt or uncle) finished their master’s work first and let me know where in line I stood. And lastly, there’s Jason, who cut his Leadville celebration short so we could drive from Colorado to Missouri in one day for me to begin this project. I appreciated everyone’s unique way of checking my progress and supporting me; but no worries now: it’s done.

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ACTIVE AND HEALTHY SCHOOLS PILOT PROGRAM IN TWO PRIVATE MISSOURI K-8 GRADE ELEMENTARY SCHOOLS

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ABSTRACT

Introduction. Overweight and obesity are chronic conditions that increase individuals risk for additional chronic diseases that include diabetes, cardiovascular disease, asthma, and type 2 diabetes. In 2009, 15.8 percent of ninth to twelfth graders were overweight and 12 percent were obese. During that same year in Missouri, 14 percent of ninth to twelfth graders were overweight, while 28 percent of youth surveyed considered themselves obese. Children with high body mass indexes (BMIs) often become overweight and obese as adults. The increased rates of overweight and obesity in children are not caused by any one factor but rather the interaction of behavioral factors such as reduced physical activity and increased energy intake, or an energy imbalance between energy output and energy input. Since youth spend a large amount of their day at school, developing interventions which target physical activity and nutrition behaviors through school environmental changes is warranted. Thus, Active and Healthy Schools (AHS) was developed by Dr. Bob Pangrazi for use in Arizona schools. This program has been effective in increasing physical activity and increase positive nutrition behaviors in the Arizona schools, but has not been tested in other areas.

Purpose. The primary purpose of this study was to determine the efficacy of the AHS program on Midwest schools, more specifically two inner-city St. Louis, MO schools on changing the physical activity and nutrition behaviors of students in fifth through eighth grades. Specifically, this study will examine the efficacy of AHS to increase physical activity time and steps while decreasing total screen time; increase healthy food choices; and improve knowledge about physical activity and nutrition among students at these two schools.

Methods. Students from two Midwest private schools in fifth, sixth, seventh, and eighth grades participated in this two-year study. The Control School (CS) did not receive AHS the first year, but implemented AHS the second year. The Treatment School (TS) received the program both years. Staff were educated on how to implement the program, and a Program Manager was assigned at each school (the physical education teacher) and this person was the point of contact for the school and researchers. When AHS was implemented at a school, Program Managers learned how to zone playgrounds, which were renamed to "Activity Zones," staff were educated on ways to include activity breaks into their classroom, and cafeteria faculty and all staff were educated on ways to create a positive nutrition environment. During pre and post AHS data collection periods, students wore pedometers to collect physical activity time and step counts. Students also filled out data collection logs capturing total screen time each day during data collection. In addition, the Children's Attraction to Physical Activity (CAPA) questionnaire was

administered and students completed the 2009 Behavioral Youth Risk Surveillance Survey (BYRSS) nutrition questions to measure food and drink consumption.

Results. AHS increased physical activity time at school for CS ($p=0.001$). Activity time during school increased 9.55 minutes, or 33.45% at CS. After school, CS students increased at home physical activity time 2.96 minutes, or 6.77%. At CS, fifth graders' physical activity time increased compared to sixth and eighth graders. At TS, physical activity time at school increased 10.80 minutes, or 37.63% while at home, students increased physical activity time by 3.65 minutes, or 8.54% after treatment. AHS was successful at decreasing screen time at TS ($p=0.001$) by 9.23%, which equated to a 8.25 minute decrease in screen time post AHS. When comparing between grade physical activity time, fifth graders had a greater increase in physical activity time compared to sixth and eighth grades and an increase in physical activity time at home when compared to seventh and eighth grades. No between grade differences were seen at TS. No significant between sex differences in physical activity were seen at either school; however at TS boys had greater physical activity time compared to girls. CS had an increase in 100% fruit juice consumption ($p=0.026$) and a trend towards increased non-salad vegetables ($p=0.063$) post AHS. Unexpectedly, soda pop consumption increased at CS after AHS ($p=0.028$). At TS, there was a trend towards a significant increase in fruit consumption post AHS ($p=0.088$).

Conclusion. AHS appears to be successful at increasing time Midwest students in an inner-city private school spend being physically active both during the school day and at home based on the increase in PA time at CS, especially for fifth graders, and due to visible changes in PA time at both schools. In addition, there were visible changes in step counts, decreased screen time, and increased fruit, vegetable and dairy consumption, suggesting AHS met program goals. As expected based on previous literature, boys were more physically activity compared to girls, based on physical activity time at school and home. Thus, school-wide environmental changes such as zoning playgrounds and adding classroom activity breaks should be incorporated into the school day to increase physical activity to help youth meet physical activity recommendations. Follow-up studies should focus on investigating ways to decrease soda pop consumption and to determine if sex-specific and/or grade-specific interventions are needed to reach specific students.

INTRODUCTION

Overweight and obesity are chronic conditions affecting over 60 percent of the United States (1). This is particularly alarming in the Midwest. For example, the Centers for Disease Control (CDC) reported 35 percent of Missourians are overweight and 30.5 percent are obese as of 2009 (1). Obese individuals are at risk for many chronic diseases such as diabetes, cardiovascular disease, asthma, type 2 diabetes, arthritis; psychological disorders such as depression; certain types of cancer such as colon, kidney and endometrial; and death (2).

Adults are not the only ones at risk for overweight and obesity; children are also at risk for overweight and obesity as well as the chronic diseases related to those conditions. In 2009, the Youth Risk Behavioral Surveillance Survey (YRBSS) reported 12 percent of ninth to twelfth grade students were obese and 15.8 percent were overweight (3). In Missouri, 14 percent of youth in grades nine through twelve were overweight, although 28 percent of the surveyed youth described themselves as overweight, according to the Missouri Youth Risk Behavior Survey (4). There is an increase in the number of children developing chronic diseases such as type 2 diabetes, which was once thought of as an adult disease (2). Overweight and obese children also have cardiovascular disease risk factors, such as elevated lipid concentrations, high cholesterol, and high blood pressure (2, 5).

Further, research has shown children with high body mass indexes (BMI) often become overweight and obese adults (6, 7), which supports the idea that behavioral factors are large contributors to adult overweight and obesity. Specifically, Guo and Chumlea found that the chance for childhood obesity persisting into adulthood increase

from 20 percent at four years of age to 80 percent by adolescence (8). Guo also found children who are physically active are more likely to remain physically active through adolescence, and are more likely to be active as adults (7). Another researcher, Malina, found that once a child becomes inactive and/or overweight, their chance of becoming an inactive and/or overweight adult significantly increases (9). As the examples demonstrate, it is important to teach children how to make smart food and physical activity choices early in life, while behaviors can still easily and effectively be changed.

Obesity factors. The increased rates of overweight and obesity in children are not caused by any one factor but rather the interaction of behavioral factors such as reduced physical activity and increased energy intake, or an energy imbalance between energy output and energy input (10).

Nutrition choices. Energy intake describes the amount of energy in the form of calories a person consumes. Energy intake factors that have changed among children and adolescents include consumption of larger portion sizes of food and beverages, increased eating away from home, increased consumption of energy-dense snack foods, and drinking beverages with added sugar. These factors are all thought to contribute to excess energy intake (11). Surprisingly, according to the National Health and Nutrition Examination Surveys (NHANES), the average energy intake of children has changed little. For example, children ages 6 to 11 consumed 65 more calories in 1999-2000 compared to 1976-1980 NHANES data. Boys ages 12 to 19 had a decrease in calories over that same time period, while the average caloric intake for girls ages 12 to 19 increased. It is important to note that overweight is increasing in both boys and girls in ages 6 to 11 and 12 to 19 years of age despite the relatively consistent energy intake (12).

Although increased energy intake is a contributor to the rise in childhood overweight and obesity, the NHANES data supports the idea that decreased physical activity does play a larger role.

Physical activity. The 2005 Dietary Guidelines for Americans state that children should get at least 60 minutes of moderate physical activity most days of the week (2). Physical activity plays a role in body weight, blood pressure, and bone strength, making it just as important for children and adolescents as it is for adults (13). According to the Missouri Youth Risk Behavior Survey, more than two thirds of Missouri youth do not participate in government recommended amounts of moderate physical activity (4). As children age, they become less physically active with girls typically being less active as they age versus boys (2).

Sedentary behaviors such as watching television, playing video games, and using the computer and Internet, often called “screen time,” are replacing physical activity. On average 43 percent of adolescents watch more than two hours of television per day (2). In fact, one study found that children and adolescents spend over three hours a day watching television, videos, DVDs, and movies (14). The 2009 YRBSS report found almost 25 percent of youth reported using the computer for non-school related activities for three or more hours a day and almost 33 percent of youth reported watching television for three or more hours a day (3). Other studies have shown a positive association between time spent viewing television and an increased prevalence of obesity among children (15, 16, 17).

Reduced physical activity seems to play a larger role in overweight and obesity than increased energy intake (18), making physical activity a key player in preventing

overweight and obesity in children. Even with physical inactivity being a key factor in overweight and obesity, there are reports that children may be spending less time engaged in physical activity during school and more time focused on studies (10). Reducing physical activity time may do more than just contribute to overweight and obesity; it may also negatively influence academic achievement and cognitive development. In fact, physical activity has been linked to improved cognition and academic achievement. The CDC reviewed 50 studies and found a total of 251 associations between physical activity and academic performance (19). The review examined school-based physical education studies, recess studies, classroom physical activity studies, and extracurricular physical activity studies.

School-based obesity interventions. In a systematic review of seventeen multicomponent interventions with overweight middle school adolescents, Kelly and Melnyk (20) concluded that a structured program targeting nutrition, physical education, and behavioral skills is the most effective program in reducing risk factors of overweight/obesity and cardiovascular disease. They also noted most intervention programs were too short in duration and suggested long-term interventions would also be more effective. Another review, by Zenzen and Kridli (21) concluded an effective school-based intervention would include dietary, physical activity, healthy lifestyle education, and parental involvement and should be implemented at the earliest grade level possible and carried on through high school graduation. Of the sixteen studies reviewed by Zenzen and Kridli, only nine programs had all four components. Of those nine, many studied children outside the United States, only studied girls, targeted specific

communities such as rural schools, or only focused on one grade level or grade level group.

Since children are at school many hours and also eat there, it is a valuable place to instigate change around physical activity and nutritional choices. Typically, schools have relied on Physical Education (PE) to get kids moving and keep them lean and fit. For the last 50 years, it appears PE has not been able to provide the physical activity benefits children need, as more and more kids are overweight. Unless the problem is approached from multiple angles, youth overweight and obesity will likely to worsen. One possible solution that shows promise are multi-faceted and structured school-based physical activity and nutrition programs that help change the culture of a school to appreciate these things.

One school-based program that has all four components (dietary, physical activity, healthy lifestyle education and parental involvement) of an effective program and shows promise as a sustainable intervention is the Active and Healthy School Program (AHS). AHS was originally developed by Dr. Bob Pangrazi at Arizona State University. The program is based on the premise that meaningful change will come from providing children accurate information with which to make healthy choices while also changing their surrounding environment to support healthier choices. Children are educated on what healthy choices are, and the altered environment helps make those choices easier. Unfortunately the AHS program has not been thoroughly researched. To our knowledge, no study has systematically investigated the efficacy of this program.

Pilot data collected in Missouri (unpublished) investigating AHS found increased physical activity, improved knowledge about physical activity, as well as improved

nutritional habits and knowledge. In addition, positive associations between physical activity and academic achievement were present. Specifically, we compared a form of physical activity to cognitive skills, attitudes and academic behavior. Although the results of the current pilot data are positive, additional research is necessary in order to determine the efficacy of the AHS program on these measures.

Therefore, the purpose of this study is to determine the efficacy of the AHS program in two private inner-city schools in Missouri. Specifically, this study will examine the efficacy of AHS to increase physical activity time and steps while decreasing total screen time; increase healthy food choices; and improve knowledge about physical activity and nutrition among students at these two schools.

EXTENDED LITERATURE REVIEW

SCHOOL-BASED ENVIRONMENTS AN INTERVENTION SHOULD TARGET TO INCREASE PHYSICAL ACTIVITY AND IMPROVE NUTRITION CHOICES

School-based physical education. The Centers for Disease Control (CDC) encouraged schools and physical education teachers should consider increasing the amount of time students spend in physical education or adding components to physical education to increase the quality of physical education class in their review (1). In fact, physical education class is one way students can reach the recommended sixty minutes of physical activity per day (19).

Recess. In their report, the CDC looked at eight research papers that studied the relationship between recess and academic performance at elementary schools. All eight found at least one positive association between recess and indicators of cognitive skills, attitudes and academic behavior. No study found a negative association. According to the CDC's review, there are positive associations between recess and indicators of cognitive skills, attitudes and academic behavior with no negative associations reported (19).

Classroom physical activity. Short activity breaks of five to twenty minute breaks during class and other strategies to incorporate more physical activity within learning activities have positive associations with indicators of cognition, attitudes and academic achievement (19). None of the studies in the CDC review found negative associations between activity breaks or increased physical activity within the school day and the cognitive and academic indicators (19).

Some specific examples of positive associations with physical activity and cognitive function were shown in a meta-analysis conducted by Sibley et al., where a positive correlation between physical activity and seven categories of cognitive performance indicators (22) were found and a study by Buck which found physical activity was positively associated with measures of cognitive function among preadolescent children (23). In addition, Sattelmair and Ratey discuss the importance of physically active play and cognition, citing there is increasing evidence that physical activity helps to increase learning, memory, concentration and mood, which are all factors that play a role in student achievement (24). Specifically, one study they reviewed by Hillman, showed physical activity helps to stimulate new neuron growth, which is a region of the brain primarily involved in learning and memory (25).

When children are engaged in physical strenuous play, defined physical activity, social interaction and novel and/or intellectual stimuli in an enriched environment, it can contribute to healthy cognitive development (26, 27, 28). Panksepp reports that play facilitates healthy cognitive development, reduces Attention Deficit Hyperactive Disorder (ADHD) symptoms and aids in the development of behavioral inhibition. Sattelmair and Ratey write that school is a good setting for an enriched environment because recess and physical education allow and encourage children to be active and to play (24). Of course, reducing physical activity time will also reduce the opportunities for children to be physically active and to engage in physically active play.

Regarding academic achievement, there is a direct correlation between achievement and physical activity (24). Two examples follow. First, the California Department of Education performed a cross-sectional study in 2002 which showed a

strong association between physical fitness and academic performance (29). Second, in a small follow up study, Castelli, also found similar results to the CDE 2002 study (30).

Almost half of the literature reviewed by the CDC showed no significant affect of physical activity on academic performance (19) and CDC referenced the finding of Hillman in his 2008 review that empathized there is no need to decrease physical education or physically active time within schools (25). As Hillman summarized, at the very least time spent in physical education does not hinder academic performance and may in fact lead to an improvement in performance (25).

Thus, the literature suggests that decreasing physical activity levels not only contributes to increased overweight, obesity and therefore the development of chronic diseases, but also can negatively impact learning and cognitive development in children. With so many benefits of physical activity, children need to increase their physical activity levels. Since previous literature has also suggested childhood is the appropriate time to positively influence the behavior of children in an environment that they spend a large amount of time in, it is no wonder there have been school-based intervention approaches to increasing physical activity during the school day.

Previous research shows that intervention programs at schools can increase physical activity time and levels of children (31, 32). For example, Promoting Lifestyle Activity for Youth (PLAY), implemented by the Arizona Department of Health Services, increased the physical activity level of fourth grade students (33). In this study, girls' physical activity level increased more than boys' showing that programs such as this one may be extremely beneficial for girls, who as previously mentioned, tend to be less physically active than boys. In addition, Carrel has found that school-based interventions

are successful in improving cardiovascular fitness, decreasing percent body fat and decreasing fasting insulin levels (34).

Nutrition choices. Energy intake describes the amount of energy in the form of calories a person consumes. Energy intake factors that have changed among children and adolescents include consumption of larger portion sizes of food and beverages, increased eating away from home, increased consumption of energy-dense snack foods and drinking beverages with added sugar. These factors are all thought to contribute to excess energy intake (35).

Like physical activity, nutrition choices not only play a role in overweight and obesity, but also in academic achievement.

As studies have shown, nutrition plays a role in learning. For instance, there is evidence that children who do not eat breakfast, have lower reading and math scores (36). Hungry children tend to be more hyperactive, have difficulties concentrating and may have behavioral problems (37). In fact, children who eat breakfast at school were shown to perform better on tests than students who skipped breakfast or even at breakfast at home, showing the closer nutrition intake occurs to learning and test-taking time, the greater the benefit on standardized tests (38). Children with hunger are more likely to be absent or tardy (39).

Education about the importance of good nutrition choices is also needed to ensure children consume the food they need. For example, girls often skip breakfast because they falsely believe breakfast will make them fat and are worried about weight gain (40). In reality, studies have shown that those who eat breakfast are more likely to be a healthy weight (41).

The National School Lunch Program (NSLP), which provides low-cost meals for qualified schools, recently underwent changes when it asked the IOM to help update the guidelines for the program in 2008. These guidelines were designed so the regulations regarding school meals more closely resembled newer dietary guidelines (42). These new guidelines make small changes, such as only offering low-fat milk, at least half the offered grains must be whole grains, increasing the required offerings of fruits and vegetables, and there are now guidelines to address sodium levels of meals. This is one way schools that participate in federal programs such as NSLP are able to provide healthier nutrition choices to their students.

Although previous research suggests genetics may also influence a child's weight (43, 44), the rising rates of overweight and obesity over the last three decades most likely outpaced the genetic changes in the human population. Thus it seems reduced physical activity and excess energy intake are likely the larger contributing factors to the rising rates of childhood overweight and obesity (45).

Preventing childhood obesity. Thus to influence the behaviors of children, interventions must target children in their environments. Environments which influence children include the home, friends, school and community. As children spend a large portion of their waking hours at school, the school should be a target of early childhood interventions to teach children about good physical activity and nutrition choices. In fact, some schools have begun implementing programs to increase students' physical activity levels and improve nutrition choices (45). Many states also have implemented statewide school health policies, aimed at improving the health of the children by changing school food offerings, etc.

SCHOOL-BASED ENVIRONMENTS AHS AFFECTS

Targeting the school environment. As obesity is one of the leading causes of death, it is no wonder poor diet and physical inactivity are now national concerns (46). Childhood overweight and obesity in America received national attention in February 2010 when First Lady Michelle Obama issued a challenge to the entire nation to solve childhood obesity (47), by promoting an initiative called *Let's Move!* By targeting all environments that influence childhood obesity, including the school, *Let's Move!* strives to end childhood obesity within one generation so children today become adults of a healthy weight by encouraging schools to become more active schools, thus allowing children to engage in the recommended sixty minutes of physical activity each day.

The Dietary Guidelines Advisory Committee on the Dietary Guidelines for Americans (DGAC) also supports changing the school environment. Ways in which schools can help combat childhood overweight and obesity include improving food choices sold and served in schools in order to meet the recommendations of the IOM report on school meals. Schools can also increase health, nutrition and physical education programs and provide better quality recess time. Another way schools can help support children's healthy nutrition choices is by removing sugar-sweetened beverages and high-calorie snack foods from schools and places where school children gather (42).

As a result, it seemed fitting to select a school-based intervention that addressed both ways to increase children – and staff's – physical activity levels and nutrition choices. The program chosen was Active and Healthy Schools (AHS) and it was piloted in two private K-8 elementary schools in the St. Louis, Missouri area. There are many

ways AHS fits with the ways mentioned in this report to increase physical activity and nutrition choices suggested by the *Let's Move!* initiative, the CDC and the DGAC for schools to become more active. These suggestions include maintaining strong physical education programs that allow students to be moderately to vigorously active (also called moderate and vigorous physical activity time or MVPA) for at least fifty percent of the time. The AHS program tracks MVPA time with supplied MVPA pedometers, so children know how much MVPA time they engaged in. Another recommendation is to provide activities and specific skills so students are active outside of physical education time. With AHS, students are able to take the skills they learn in gym class and incorporate them into activities on the Activity Zone. A walking club is also promoted in schools participating in AHS. Classroom activity breaks are integrated into classroom teaching time and the playground is zoned to help students get the recommended sixty minutes of activity each day. Another important part of AHS is changing the school culture, which can only be accomplished when principals, teachers and staff and parents are involved. This idea is echoed by *Let's Move!* In fact, the AHS program already promotes many of the same ideas *Let's Move!* suggests to make schools a healthy worksite. For example, staff participate in the activity breaks and are encouraged to make healthy lunch selections like their students and thus the teachers are healthy role models for their students. It is only with the help of all these people that children can learn the importance of a healthy active lifestyle.

Although not specifically addressed in the *Let's Move!* initiative, but mentioned in the DGAC report is screen time is reducing screen time. The DGAC report recommends removing televisions from children's bedrooms and increasing awareness and promoting

actions that will help reduce screen time, which is another goal of AHS. In AHS, screen time is tracked, because the goal is screen time will be reduced when children are more physical activity time. An additional area AHS seems to target based on preliminary data from Pangrazi is improved academic achievement and behavioral issues. This makes sense based on the previous CDC review and other research which described the correlation between physical activity and cognitive and academic skills.

President Barack Obama created the new President's Council on Fitness, Sports and Nutrition to expand the scope of the original Present's Council on Physical Fitness to now include a focus on fitness, healthy eating and active lifestyles. The Council promotes the schools to participate in the President's Challenge Physical Activity and Fitness Awards program, which is also a component of AHS (48).

Thus, increasing physical activity during the school day and increasing children's knowledge of healthier food choices are important factors to focus on to help reduce and prevent overweight and obesity in children. As a result, University of Missouri Extension decided to pilot AHS.

The AHS program goals rest on two key premises. First, because children are at school many hours and also eat there, it is a valuable place to instigate change concerning physical activity and nutrition choices. As already described above, the current literature supports this idea. Second, lasting changes in behavior do not occur because children are told to do something; rather, meaningful change comes from providing children with accurate information so they can make choices regarding their behavior. This information about behavior change, coupled with a changed school environment provides the support children need to continue making the better choice. Thus, the healthy choice

becomes the easy choice while at school, and when it becomes a habit, also outside the school.

Another advantage of the AHS program is its sustainability. Once the pilot funds are gone, the two schools will still have the equipment and knowledge to continue implementing this program. In fact, sustainability of AHS really depends on the school policies developed as a result of having AHS at a school.

Furthermore, we hypothesize AHS will influence students' out-of-school choices, leading to an increase in afterschool, as well as weekend, activity time. Specifically, each school's post-test scores on the food and drink survey and CAPA will be greater than pre-test food and drink survey and CAPA scores. In addition, after participating in AHS, IHM will have increased food and drink survey scores, greater CAPA scores and more activity time vs screen time mean minutes per day.

METHODS

Subjects. Students in grades fifth, sixth, seventh and eighth from two schools, Control School (CS) and Treatment School (TS) participated in this pilot study. Students from both schools were matched for student population size, socioeconomic status (SES), ethnicity, and facilities.

Design. Treatment School received and implemented the AHS program for two years. Data was collected pre and post program in September and May, respectively, for two consecutive years. During year one, CS did not receive AHS training, AHS materials, or the AHS program. Students at CS school were tested on all outcome measures during September and May. In year two, both TS and CS received the AHS program (see Figure 1).

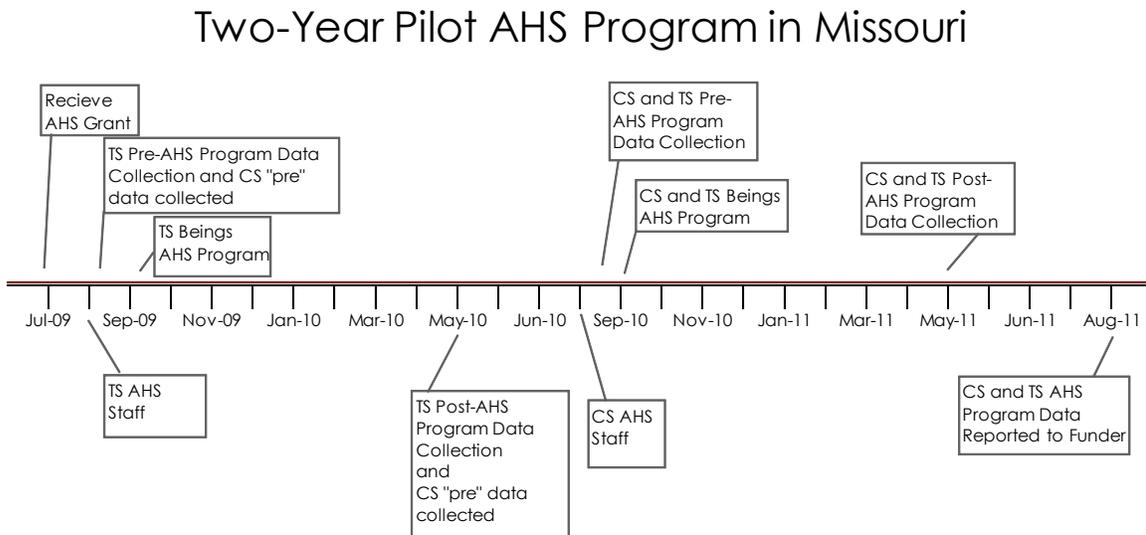


Figure 1. Timeline of AHS Pilot implantation.

AHS Program Activities. In August of 2010, a one-day training occurred for the faculty and staff of TS. Specifically, teachers learned what their roles are in the AHS

program. Teachers learned how to implement classroom activity breaks and how to use pedometers. Teachers also learned how to encourage discussion about physical activity and nutrition amongst students, and learned how to make healthier celebratory food choices, and acquired new ideas for incorporating activity and nutrition into their curriculum. Program Leaders were trained on data collection methods, in addition on how to zone playgrounds and display AHS signage. Lastly, all staff learned what they can do to become more physically active and improve their nutrition choices, such as start walking clubs and influence changes in school cafeteria offerings (see Table 2).

At this time TS also received their playground equipment, AHS materials and training book as well as the data collection tools. Control School did not receive training during this time; however they received the data collection tools, pedometers, and surveys and directions on how to collect the data. Before data collection began in the fall, parental notes were sent home to both schools allowing parents the right to prevent their students from participating in data collection. University of Missouri IRB has reviewed this research and has granted a waiver of consent.

After the pre program data was collected, TS began implementing AHS. When AHS was implemented, specific activities and changes took place in the school. To increase physical activity, the playground was zoned so all students are active. The AHS playground materials included items such as jogging signs, playground activity cards, balls, cones, volleyball nets, bean bags, and other necessary equipment for the suggested zone activities. The playground was renamed to “Activity Zone” and recess was called “Activity Time.” Point of Decision Prompts, part of the AHS materials, were placed throughout the school reminding students about physical activity choices. After the AHS

training, teachers were able to integrate three to five minute physical activity breaks during class teaching time using the provided activity cards. Letters went home to parents explaining healthier celebratory food options and non-food options such as toys that can be sent to school parities to decrease unhealthy celebratory foods in the school. Healthier dietary selections were available in the school cafeteria, and to encourage better nutrition choices, students were rewarded for healthy choices with fruit and vegetable stickers. For the 2009-2010 year TS participated in the National School Lunch Program (NSLP) for the first time. In order to participate in this program, certain nutrition guidelines must be followed. Based on information discussed during the training, the NSLP seemed to offer more nutritious lunch choices than the previously catered lunches. As a result, no other cafeteria changes were discussed. For students or faculty who bring brown lunches, educational materials were sent home with all students to encourage simple changes to improve the nutritional quality of the brown bag lunch. There were also Point of Decision prompts encouraging better nutrition choices placed throughout the school. Other AHS activities included physical activity and nutrition discussion themes that will be shared over the intercom or by classroom teachers.

During the second year, the overall protocol remained the same; however, CS implemented the AHS program after completing the pre program data collection. New for the second year, CS had a salad bar available each day for students to select their own vegetables (required two vegetable selections). The salad bar was the only option on Fridays for lunch. Lunch at CS continued to be catered by the same company as during the first year of the program.

Table 1. AHS activities

AHS Activities	
AHS Program Manager	Playground Equipment
Zoned Playground	Classroom Activity Cards
AHS Staff Training (AHS manual, surveys, newsletters, handouts, incentives, etc)	Walking Trial Signs
Point of Decision Signs (physical activity and nutrition)	AHS Family Activity Day

Physical activity. Pedometers (Walf4Life™ model Duo BB02) were used to measure students’ physical activity change (steps, activity time and moderate to vigorous physical activity). Fifth, sixth, seventh, and eighth grade students recorded activity time and steps, both at school and at home, for five consecutive school days and recorded total activity time and steps per day for one weekend (both Saturday and Sunday) following the consecutive schools days. During the consecutive school days and weekend activity time being recorded, students in all grades also recorded Screen Time (including television, computer and video game use) in minutes to investigate the change in screen time. All time was recorded in minutes. Time was rounded down to the nearest minute when the pedometer displayed time is 29 seconds or lower and rounded up when it reads 30 seconds or higher. Each student recorded activity time, steps, and screen time on one form. These forms were filled out twice during the school day: in the morning during the first period and in the afternoon in the last period. On the weekends, the students filled these data collection forms out once a day.

The Children’s Attraction to Physical Activity (CAPA) inventory was used to measure children’s attraction to physical activity. The CAPA is a validated measure of children’s attraction to physical activity (49) and was administered by AHS Program

Leaders (on-site manager) during physical education class. University of Missouri researchers were present for the completion of the CAPA for both pre- and post- program data collection.

Nutrition Behavior. Youth Risk Behavior Surveillance Survey (YRBSS) Dietary Behavior questions were used to assess dietary behaviors such as fruit, vegetable, soda or pop and milk consumption. The YRBSS survey was given during physical education class by the AHS Program Leaders on the same day as the CAPA. University of Missouri researchers were present for the completion YBRS nutrition questions in for both pre- and post- program data collection.

Data analysis. Paired-sample t-tests were used to compare pre and post Screen Time, Physical Activity Steps, Physical Activity Time, CAPA scores, and Nutrition data (100% fruit juice, fruit, green salad, potatoes, carrots, non-salad vegetables, glasses or milk, and soda pop consumption) for both schools. One-way ANOVA tests were used to analyze changes between grades within each school. Post-hoc pairwise comparisons determined where differences occur between grades. Lastly, independent t-tests were used to show changes between sexes within each school as well as differences between the Treatment and Control school for pre and post data, as well as for pre vs post changes. All data was analyzed using SPSS.

Data from year one included missing and incomplete data (results and discussion presented in Appendix B). Results from year one did not show a statistical significance between TS and CS, therefore it was concluded AHS did not impact TS. Thus, in year two, both schools were considered as receiving AHS for the first time. As a result, only data from year two will be presented in the following sections.

RESULTS

Data collected from students in fifth, sixth, seventh, and eighth grades from CS and TS are presented below. Data shown includes changes from pre to post AHS implementation in both schools for the second year. Variables studied include screen time, step counts at school and home, activity time at school and home, changes in attitudes regarding physical activity [CAPA], and food choices. Table 2 shows number of completed surveys by school.

Table 2. Control school sample sizes for outcomes.

	Control school	Intervention school
Questionnaire	<i>n</i>	<i>n</i>
Screen time	47	67
Physical activity (school steps)	40	^a
Physical activity (home steps)	40	^a
Physical activity (school time)	71	79
Physical activity (home time)	71	79
CAPA	45	54
100% fruit juice consumption	64	72
Fruit consumption	64	72
Green salad consumption	64	72
Potato consumption	64	72
Carrot consumption	64	72
Other vegetables consumption	64	72
Glass of milk consumption	64	72
Soda pop drink consumption	64	72

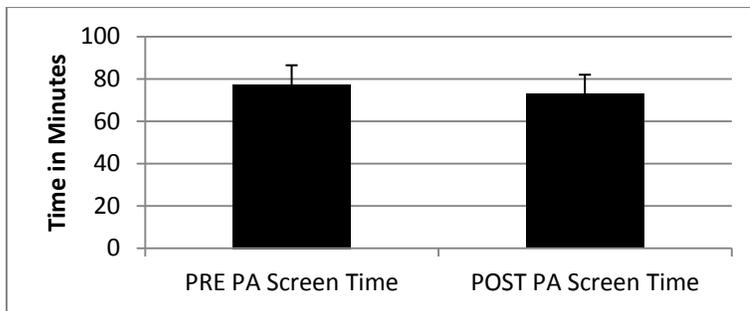
^aNo pre step count data (at home or school), was collected for the treatment school.

Control school pre and post. Pre and post paired samples for all Screen Time, Physical Activity Steps, Physical Activity Time, CAPA scores, and Nutrition scores, from CS are shown in Figures 2-6, respectively.

Specifically, Screen Time changed 4.46 minutes from 77.44 to 72.98 minutes after AHS implantation. Physical Activity Steps changed 3.7% at schools and 15% at home, which was not significant. School time physical activity increased 9.55 minutes ($p=0.001$), while at home physical activity time changed by 3 minutes, which was not significant. CAPA scores remained unchanged at 44.93 pre AHS and 44.91 after AHS.

There was an increase in 100% fruit juice consumption by 22.01% after AHS implantation ($p=0.026$). Consumption of non-salad vegetables after AHS was trending towards significance at $p=0.063$ and a change in consumption by 16.63%. Other nutrient-dense food consumption remained unchanged. Soda pop consumption increased by 21.36% from pre to post AHS.

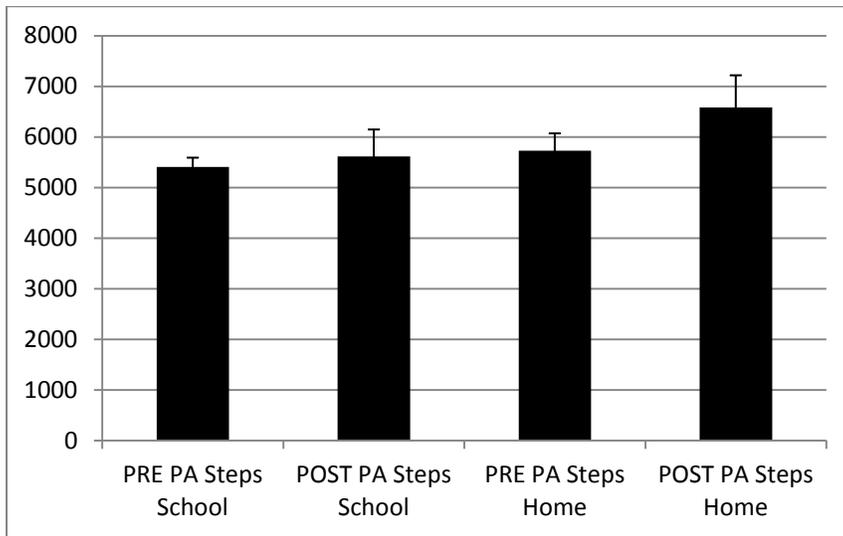
Figure 2. Control school Screen Time minutes.



* $p<0.05$, † $p<0.01$

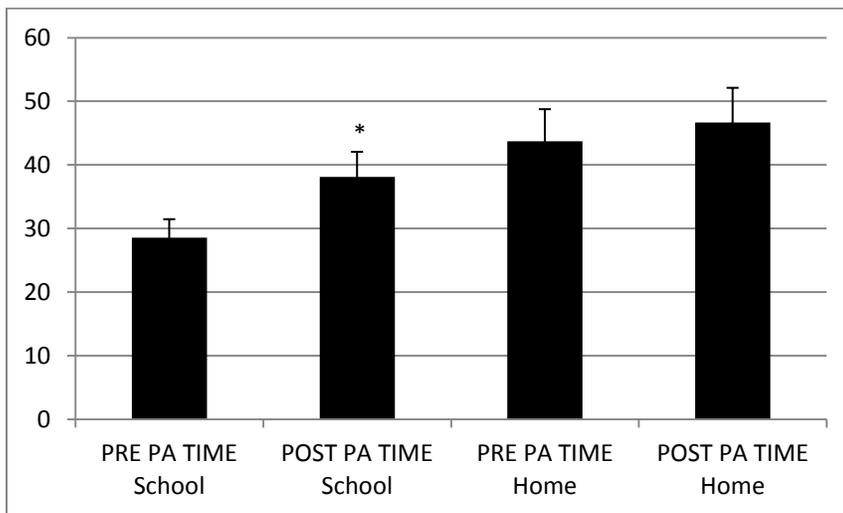
Time measured through self-reporting screen time logs.

Figure 3. Control school Physical Activity (PA) Steps.



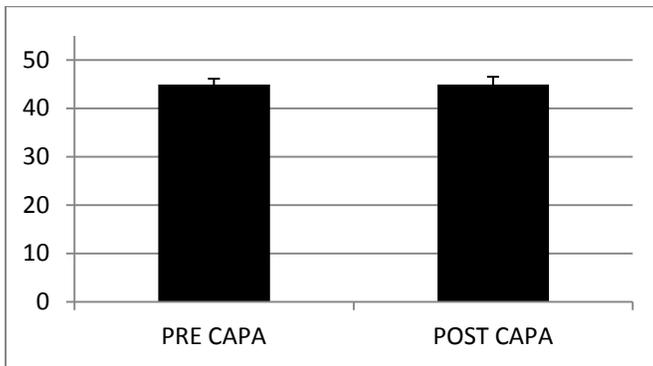
* $p < 0.05$, † $p < 0.01$
Pedometry log data.

Figure 4. Control school Physical Activity (PA) Time.



* $p < 0.05$, † $p < 0.01$
Pedometry log data.

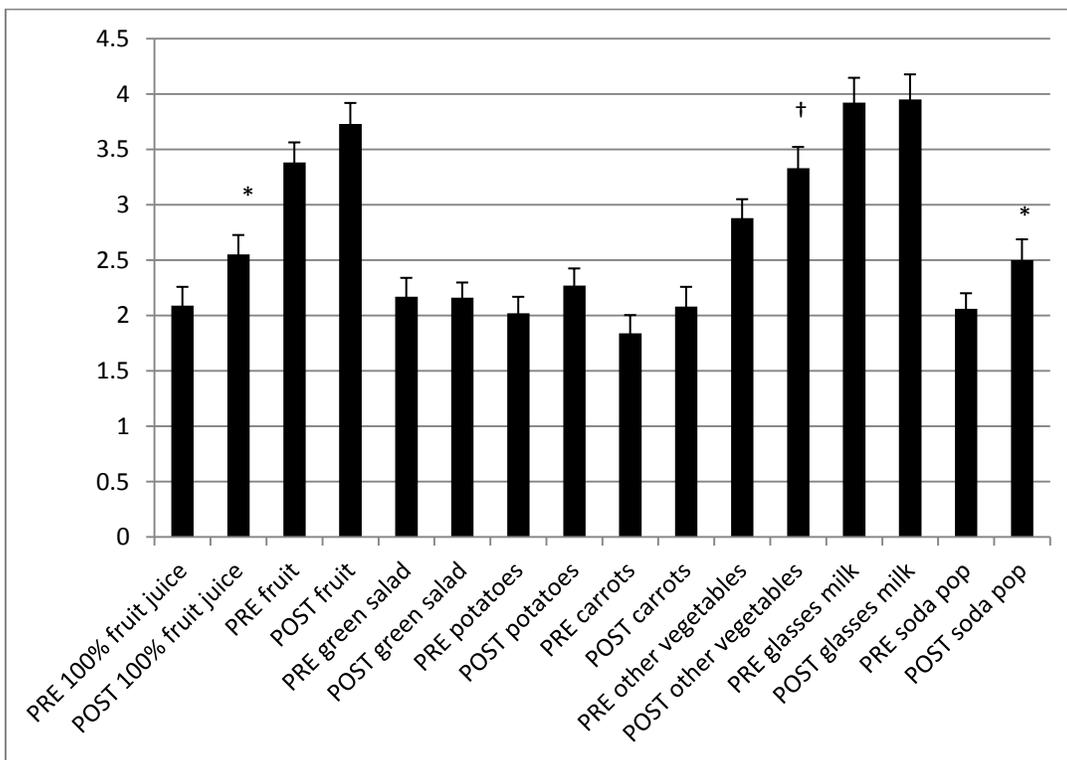
Figure 5. Control school Children's Attraction to Physical Activity (CAPA) scores.



*p<0.05, †p<0.01

Based on responses to CAPA questionnaire.

Figure 6. Control school Nutrition scores.



*p<0.05, †p<0.01

Responses to 2009 BYRSS nutrition questions.

Control school between grades. Table 3 represents post-hoc comparisons between fifth grade and other grades for measures exhibiting a main effect, or change between grades, after analysis by one-way ANOVA. Between fifth and seventh grades, there was a trends towards significant in milk consumption after AHS (p=0.062). For soda pop consumption, there was a significant different between fifth and sixth grades (p=0.055) and between sixth and seventh grades (p=0.026). There were trends towards significance in soda pop consumption between fifth and eighth grades (p=0.093) and between seventh and eighth grades (p=0.069).

Table 3. Control School post-hoc pairwise comparison for measures between fifth grade and other grades exhibiting a main effect.

Measure	Grade Compared	Grades Compared		Mean Difference	Std. Error
		Grade	To		
PA Time School (minutes)	5	6	6	64.40*	26.43*
		7	7	38.78	25.40
		8	8	68.38*	27.71*
PA Time Home (minutes)	5	6	6	67.17	39.61
		7	7	94.10*	38.05*
		8	8	94.12*	41.52*
Fruit consumed	5	6	6	2.49*	0.69*
		7	7	2.49*	0.66*
		8	8	1.52	0.76*
Other vegetables consumed	5	6	6	1.94*	0.75*
		7	7	1.37†	0.72†
		8	8	1.89*	0.83*
Glass of milk consumed	5	6	6	1.46	0.75*
		7	7	0.18	0.72
		8	8	1.41†	0.83†

*p<0.05, †p<0.01

Control school between sexes. Boys' CAPA scores changed more verses girls' scores post AHS ($p=0.076$). Independent t-tests showed at baseline, boys had greater Physical Activity Steps at school, increased green salad consumption, and increased carrot consumption compared to girls in the CS ($p=0.008$, $p=0.036$, and $p=0.017$, respectively). There was a trend towards a significant change in girls verses boys in consumption of non-salad vegetables ($p=0.096$). Post intervention, boys consumed greater number glass milk ($p=0.087$) and soda pop consumption ($p=0.064$) when compared to girls.

Treatment school pre and post. Pre and post paired samples for all Screen Time, Physical Activity Steps, Physical Activity Time, CAPA scores, and Nutrition scores, from TS are shown in Figures 7-10, respectively. No pre intervention step counts were collected from TS, thus no step count data will be presented for TS.

Screen Time decreased 8.25 minutes, which was a 9.22% decline after AHS ($p=0.001$). Physical Activity time at school changed 37.63%, or 10.80 minutes. Physical Activity Time at home changed 8.54% or 3.65 minutes post AHS. CAPA scores decreased 13.40% ($p=0.003$). There were not significant between sex or between grade differences changes in physical activity from pre to post AHS implementation at TS.

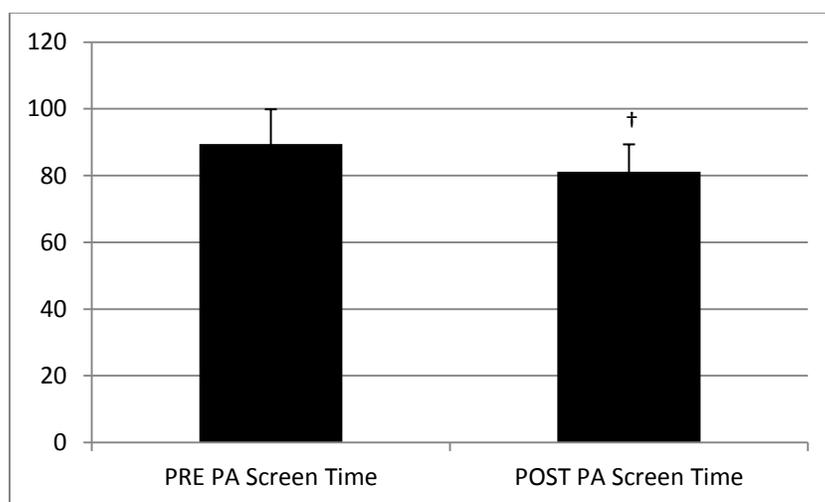
Fruit consumption changed 7.65%, which was trending towards significance ($p=0.088$). Consumption of other nutrient-dense foods post AHS remained unchanged. Soda pop consumption changed by 7.89%; however this change was not significant.

Between grades, there were significant differences between fifth grade and sixth, seventh, and eighth grades for changes in physical activity time at school ($p=0.034$, $p=0.023$, and $p=0.006$, respectively). Changes in at home physical activity time was also

significant between fifth grades and sixth, seventh, and eighth grades ($p=0.032$, $p=0.000$, and $p=0.014$, respectively). Lastly, there were also significant differences between fifth grades and sixth, seventh, and eighth grades for changes in CAPA scores ($p=0.009$, $p=0.003$, and $p=0.001$, respectively).

At baseline, there as a trend towards a difference in boys' vs girls' screen time ($p=0.092$). Also at baseline, there as a significant difference in at school physical activity time and at home physical activity time ($p=0.019$ and $p=0.015$, respectively). Post AHS, the difference in at school and home physical activity time was also significantly different between boys and girls ($p=0.05$ and $p=0.004$, respectively). There was a significant change in boys' verses girls' CAPA scores ($p=0.02$). There were no other significant changes pre to post AHS between sex differences. Pre AHS, there were also significant differences between 100% fruit juice consumption, green salad, and non-salad vegetables ($p=0.058$, $p=0.022$, and $p=0.074$, respectively). There were no post AHS differences.

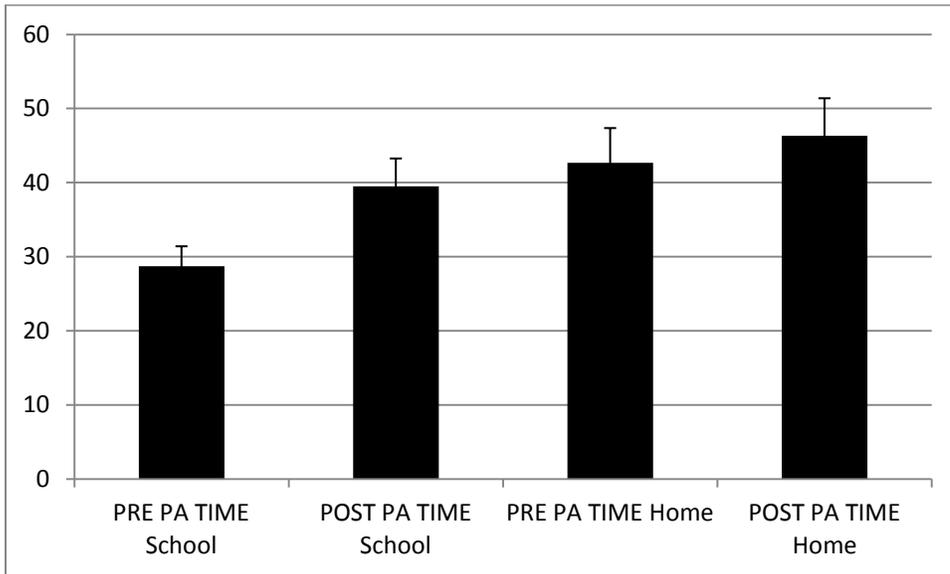
Figure 7. Treatment school Screen Time in minutes.



* $p<0.05$, † $p<0.01$

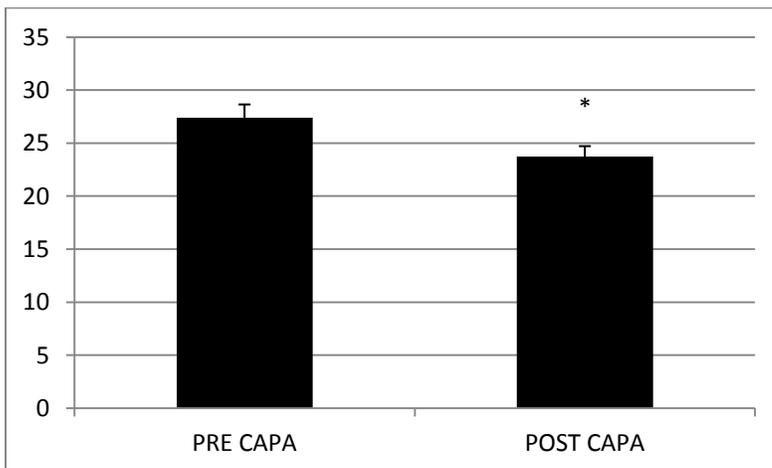
Time measured through self-reporting screen time logs.

Figure 8. Treatment school Physical Activity (PA) Time in minutes.



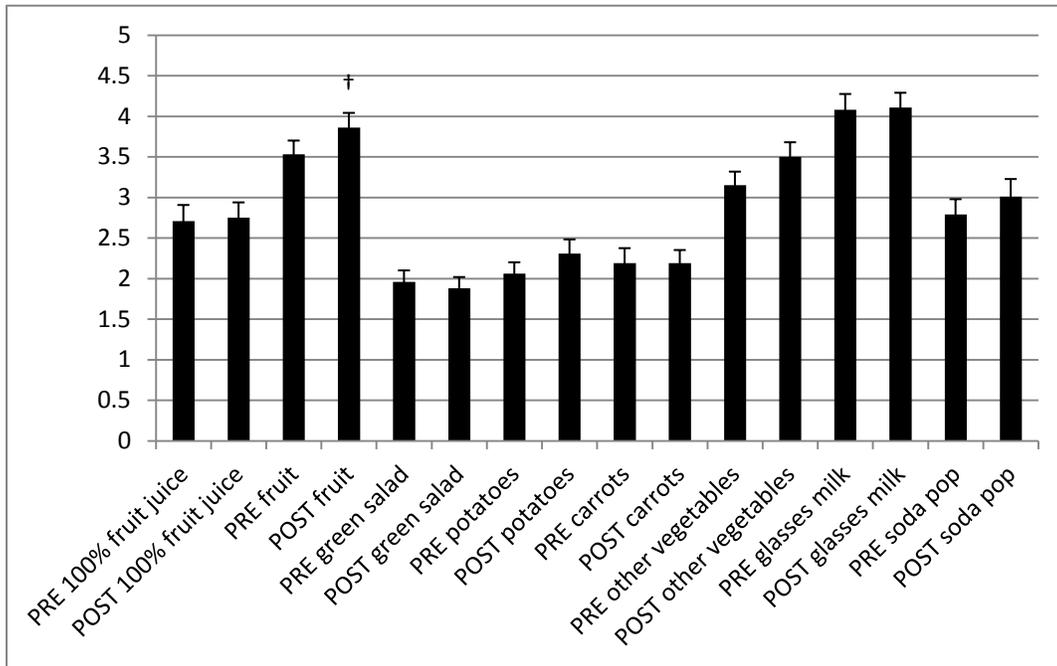
*p<0.05, †p<0.01
Pedometry log data.

Figure 9. Treatment school pre and post Children's Attraction to Physical Activity scores.



*p<0.05, †p<0.01
Based on responses to CAPA questionnaire.

Figure 10. Treatment school pre and post Nutrition scores.



*p<0.05, †p<0.01
Responses to 2009 BYRSS nutrition questions.

Control vs. intervention school. CS exhibited greater PA Steps at Home and School compared to TS (p=0.001) and greater CAPA scores (p=0.001) at baseline vs. TS; however CS had lower 100% fruit juice consumption and soda pop consumption (p=0.016 and p=0.002, respectively) at baseline vs. TS.

CS also exhibited greater CAPA scores post-study vs. TS (p=0.001).

Comparing CS to TS post-study, there was a smaller reduction in CAPA scores ($p=0.0063$) from pre- to post-study. Lastly, there was an increase from pre- to post-study comparing CS to TS for 100% fruit juice consumption ($p=0.001$).

DISCUSSION

The Active and Healthy Schools program was implemented at two private inner-city St. Louis, Missouri schools to provide students with a school environment that increases physical activity and improves nutrition choices. Overall, AHS accomplished the goal of changing the school environment to encourage students to be more physically active during the school day, as evident by the increase in Physical Activity Time at school for CS. Screen Time was also decreased, as evident by the decrease at TS. Not all nutrition behaviors were positively influenced by AHS.

In 2010, only 15.3 percent of children (6-18 y) nationwide were physically active for 60 minutes or more each day (51). According to the Missouri Youth Risk Behavior Survey, more than two thirds of Missouri youth do not participate in government recommended amounts of moderate physical activity (4).

One goal of AHS was to increase physical activity time at school and at home. Encouragingly, there were visible increases in physical activity time at both schools after AHS. Specifically, time spent in PA during the school day, as measured by pedometry, increased at CS. At CS, average total time in PA increased from 28.5 minutes to 38.1 minutes following intervention. According to a review, most school-based interventions focus on increasing total during school activity time with an intervention consisting of 30-45 minutes of moderate to vigorous activity (13). The Institute of Medicine (IOM) recommends 60 minutes of physical activity per school day for students in kindergarten through twelfth grade. Thus, students in the pilot schools are meeting nearly half the IOM's physical activity recommendations per school day (51).

Although AHS did not increase activity time to levels provided by other school-based interventions, components of AHS can lead to increased activity time at school. Possible reasons for the observed increased physical activity time include zoning the playground. This allowed students to quickly find equipment and select an activity to be engaged in during recess. In addition, students learned the activities offered in the zones during physical education class, meaning students did not have to learn the activities during recess. These two events may have helped increased physical activity time during the school day (at TS). This increase in physical activity time is consistent with previous research (52). In addition, increased activity time at school suggests classroom teachers were using the classroom activity breaks. When used throughout the day, these short bursts of activity can contribute to increasing students' overall activity time, as research shows (53, 54, 55). Unfortunately, no data were collected on the frequency and duration of activity breaks during this study. In addition, this study's data includes recess, physical education class, activity breaks, and all other physical activity in PA time; future studies should separate PA time to determine where increases in PA time occurred.

When comparing PA time at school between grades, fifth graders at CS had a significantly greater increase than sixth and eighth graders. This could be due to the fact the activity break cards used by AHS were designed for fifth and sixth grades; however the difference between PA time at school was not significantly different between fifth and seventh graders. Thus, future interventions should use grade-specific activity break materials in an attempt to eliminate between grade differences, like programs such as Take 10! (56).

Fifth grade had significantly greater PA time at home compared to seventh and eighth grades, but not compared to sixth grade. These differences are unexplainable in this study, and future studies should look into school-sponsored after-school activities available for different grades or popular non-school related events that each grade may be more likely to play.

As expected based on previous literature, boys' total physical activity time was greater than girls at both pre and post intervention, at CS (52, 57). Specifically, after AHS, boys' total physical activity time for both school and home was 93.9 minutes, while girls were active a total of 76.9 minutes. Unexpectedly, at TS, girls had higher physical activity times at both home and school. Combined school and home times post-AHS for boys and girls were 66.1 and 109.8 minutes respectively. The large difference is surprising and unexplained, especially considering past researchers have found step counts to be similar amongst boys and girls in the spring time (58). Future studies should assess girls' access to after school activities in an attempt to explain differences in TS boys and girls total physical activity times.

Physical activity was also measured using pedometer step counts at CS only. AHS led to visible increases step counts both at school and at home for CS; however, this increase was neither statistically significant nor trending towards significance. There were no differences in step counts between grades at CS. When comparing boys to girls, boys had higher step counts at baseline for CS which is consistent with other work (52, 59, 60). No statistical difference in steps was observed after implementation of AHS for boys, girls, or the combination. The lack of significance compared to activity time is likely due to larger standard deviations with steps due to stride length differences.

Activity time negates stride length differences, and since SDs are much smaller for activity time, the smaller SD makes the mean(s) more representative. For example, CS post school steps has a SD of ± 3375.9 steps, while CS post physical school activity time has a SD of only ± 33.4 minutes. Due to the high level of inter-individual variance between steps shown by large SDs, especially of children of varying ages, many researchers are using physical activity time as the only objective measure of physical activity change (59).

Many researchers are also using accelerometers to measure physical activity time, speed, and intensity (61). Thus, adding these tools may result in more sensitive measurements that will show more specific increases in physical activity of future AHS studies.

In summary, AHS can increase total physical activity time during the school day, as shown at CS. Pre-AHS, average combined school and home activity time was 72.2 minutes and 71.3 minutes for CS and TS, respectively. Post-AHS, total activity time changed to 84.7 minutes and 85.8 minutes for CS and TS, respectively. Thus, AHS helped these students continue to surpass the federal guidelines for daily physical activity.

It appears AHS was successful at decreasing screen time, as evident by the decrease in Screen Time at TS. The 2009 YRBSS report found almost 33 percent of youth watch television for more than three hours per day and 25 percent of youth use the computer for more than three hours per day for non-school related activities (3).

According to a report published by the CDC, media use among children, especially watching television, has been associated with decreased time spent in physical activity; increased energy intake via mindless eating while watching television; children who are

more likely to make unhealthy food choices based on television commercials for such foods; and lower metabolic rate (10). The average time (in minutes), students engaged in Screen Time changed by 4.5 minutes in CS and 7 minutes in TS. The decrease was only significant in TS ($p=0.001$). It is interesting that the amount screen time decreases is similar to the amount of time at home activity increases, thus suggesting students may replace screen time at home with increased physical activity. As more technologies become available, students will likely spend even more time engaged in screen time activities such as television, video games, texting, and online-learning. In future studies or programs designed to increase physical activity, emphasizing novel ways to increase activity while engaged in screen time-activities might be valuable. For example, adults are encouraged to stand or walk while working at treadmill desks. Fitness centers and workout rooms are typically equipped with televisions and some even have the internet available for exercisers to enjoy while being active. In addition, there are a variety of Smartphone applications for tracking exercise, which help adults (and children) better engage and adhere to exercise programs. Similarly, perhaps future youth studies should focus on novel ideas to incorporate physical activity into screen time, instead of trying to eliminate it altogether.

Children's attitudes, beliefs, and knowledge about physical activity determine how motivated children will be to engage in physical activity. The CAPA likert scale is one validated tool used to determine children's interest and attitudes towards physical activity (49), with a higher score indicating a higher attraction to physical activity, and therefore a student more likely to engage in physical activity. Higher CAPA scores indicate a child is more attracted to PA. Surprisingly, not only did CS students' CAPA

scores not improve after AHS, but CAPA scores at TS significantly decreased (score decreased from 27.4 to 23.7; $p = .003$). It is interesting to note however, that the mean CS CAPA score was 44.93 before AHS, while the mean TS CAPA score was only 27.39. Therefore, it could be possible that students already had strong attitudes towards physical activity at CS and that programs such as AHS would not further increase attitudes. Previous literature has shown CAPA scores can vary greatly between schools. For example, another school-based intervention program called TAKE 10! had CAPA scores ranging from 15 to 60 amongst students grades 3-5 (62). Furthermore, researchers have showed no significant changes in pre vs post CAPA surveys in a treatment group vs control group, thus yet again showing that CAPA may not always be able to measure changes physical activity (2002).

When comparing boys' and girls' CAPA scores, it was expected that boys would have higher CAPA scores when compared to girls based on previous literature (56, 62). Specifically, Barry et al. found overall boys' CAPA scores were 48.1 and girls' CAPA scores were 45.8, a significant difference ($p = .003$) for 3-5 graders. In the current study, CS boys had higher CAPA scores than girls at both baseline and after AHS. The change in CAPA scores between boys and girls was not significant; however it is interesting to note that although TS CAPA scores decreased, boys' CAPA scores actually changed less than girls' in TS when comparing pre vs post data.

Fifth graders in TS were the only students that showed a statistical difference between other grades; however, these differences were negative. Interestingly this decrease in CAPA scores parallels this group's decrease in Physical Activity Time at School and Home.

The reason CAPA scores significantly decreased at TS could include children being exposed to the survey multiple times and answering differently after AHS due to a better understanding of how to complete the questionnaire. Thus, the decrease in CAPA scores may not mean that the students' attitudes towards physical activity changed, but rather how they answered the questionnaire changed.

Overweight and obesity are a multifaceted disease, of which nutrition plays a role. Nutrient dense foods, which are typically lower in calories, are often times replaced by foods high in calories and low in leader nutrients, such as calcium, vitamin A and C, and iron. By using the BYRSS nutrition questions, consumption of fruit, fruit juice, vegetables, dairy, and soda pop were measured. Monitoring intake of these foods can help indicate if changes in nutrients such as calories, fiber, nutrient-dense foods, and calcium changed. After implementing AHS, CS students exhibited a statistically significance increase in 100% fruit juice consumption ($p=0.026$) and a trend towards a significant increase in non-salad vegetables post intervention ($p=0.063$), while students in TS showed a trend towards a significant increase in fruit consumption ($p=0.088$). Although the rest of the nutrition changes tracked remained unchanged after AHS at both schools, most of the post values were visibly higher after implementation suggesting students may have selected 100% fruit juice, fruits, vegetables, and milk more frequently after AHS.

Fifth graders at CS had a significantly greater increase consumption of fruit and other vegetables compared to sixth, seventh, and eighth grades; and consumption of milk compared to sixth and eighth grades. Seventh grade at CS also showed a significant increase in milk consumption when compared to grades six and eight. Reasons for

differences between fifth grade and other grades are unclear. Previous literature rarely breaks age groups studied into sub-groups, thus it is recommended to only focus on differences between sexes rather than grades (56, 58, 61). Like with activity breaks, using grade-specific nutrition messages from University of Missouri Extension's Show-Me Nutrition curricula may help decrease between grade differences in nutrition changes.

Although not expected, soft drink consumption visibly increased after implementation of AHS in both schools, but this increase was only significant in CS. This might be explained by an increased number of end-of-the year celebrations and increased sports activity that is typical towards the end of the year. However, no data were collected investigating this theory. Future studies might include this. Although CS boys' consumption of soda pop increased more than girls post AHS, boys also drank more milk than girls post intervention. So although their consumption of soda pop increased, boys also increased more milk at the end of AHS. The observed differences between boys and girls may be in the way boys and girls respond to nutrition intervention strategies. Literature suggests that boys and girls may need different strategies to changes nutritional choices in adolescents (61). NYPANS 2010 found males more likely to consume sweetened beverages, such as energy drinks, soda pop, non-fruit juices, and sports drinks, than girls (50). These data further support the notion of focusing on sex-differences in learning and behavior change when implementing physical activity and nutrition school-based programs.

Nutrition parameters did not completely change in expected ways; however this could be due to the larger emphasis on changing the physical activity environment. AHS provides more specific information on zoning the playground and provides classroom

activity break cards; however it does not provide a comprehensive nutrition component. Nutrition information from the University of Missouri Extension was provided to classroom teachers, additional online resources were made available to teachers, and staff learned ways to promote healthy foods at school events; however, anecdotal evidence suggests that teachers felt a need for more structured guidelines on changing the nutrition environment at the school. Additionally, a logical focus for schools attempting to improve nutrition would be to start with training the food service staff on how to prepare healthier foods. Students can't make healthy choices if they are not an option. In the current pilot, food service staff did not go through an official training. It should be noted that the AHS Program Guide, which each AHS Manager received, does provide many ideas and suggestions that each school could have chosen to implement. Therefore, although limited nutritional changes resulted from the AHS pilot, it is possible that the schools will use the AHS materials to make additional changes to their school environment such that they can improve the nutrition choices of their students.

Lastly, it is worth noting that other studies have shown positive nutrition changes from selected interventions (63); however, researchers are not always able to determine why the intervention was successful. Thus, although not all nutrition behaviors significantly improved, this does not mean the intervention was unsuccessful. Rather, AHS could be beneficial at improving nutrition behaviors in ways not yet determined or simply not yet detectable.

Limitations and sources of error. One limitation was the self-reporting of pedometer data. Ideally researchers would be on-site to open sealed pedometers and record steps and physical activity time for each student. In this current study, pedometers

were not sealed, and the students recorded these data. Classroom teachers prompted students to do this each day during a data collection period; however missing data was still present. Previous research has shown that reactivity to unsealed pedometers does not exist in children (64), suggesting that pedometers do not have to be sealed to detect significant changes in PA time or steps. Nevertheless, it is unclear if the youth in this study suffered from reactivity, or awareness of their physical activity being monitored. Though, students aged 13-18 are within the age range most associated with the greatest decline in PA (65, 66). Thus, changes in PA may actually represent more significant increases than statically shown.

The lack of significant results at TS may be explained by the school receiving in AHS the first year. In fact, due to this exposure, the second year of AHS may have resulted in increases in outcomes; however due to the previous year's changes, the results were not significant. Thus, continuing to evaluate the effectiveness of AHS from the first year of baseline data to future years of AHS may show more positive outcomes due to AHS implementation than was possible in this short study.

Although not a limitation, it is worth noting the original survey designated to evaluate nutrition behavior changes pre and post intervention, the ChEAT questionnaire, was determined not to be appropriate for this study. The ChEAT nutrition survey had been validated and used in previous AHS research studies; however the principal at the TS was concerned some questions may suggest to students that certain attitudes towards food were acceptable. More specifically, the principal was concerned that questions about body image, eating habits, portioning food, etc, may in fact lead to eating disorders. Thus, the BYRSS nutrition questions were used instead. This tool had not been validated

for the purpose of being used to assess AHS's influence on nutrition behaviors, and as a result, may have impacted the ability of the survey to fully detect changes in nutrition behaviors in the current study. It should be noted the BYRSS questions were able to assess changes in consumption of specific foods and beverages, just not the changes in behavior, thoughts, or feelings associated with those changes in intake.

A final nutrition limitation was the inability to capture changes in the number of unhealthy celebratory food brought into the school. The AHS curriculum includes a newsletter for parents offering suggestions for healthier celebratory foods. Previous AHS research indicates a decrease in the number of these unhealthy party foods. Future research should include a measure of unhealthy celebratory foods.

Future studies: improving AHS. Physical activity has been shown to improve academic achievement, especially in areas such as mathematics and reading (67). School based programs similar to AHS exist such as Physical Activity Across the Curriculum (PAAC) and have demonstrated an improved academic performance effect (55). To date, no research has investigated the efficacy of AHS on academic improvement. Future AHS studies should specifically focus on how the incorporation of subject-related classroom activity breaks may help improve cognition, behavior, and academic performance.

Another area to include in future school-intervention programs is increased parental support. Specifically, Haernes et al found that with monthly newsletters sent home to parents, there was greater affects of the program outside of the school environment (63). In addition, Lubans (2009) found that with increased parental communication, through, physical activity and selected nutrition behaviors were increased from that added social support (61). Thus, future interventions should consider

more frequent contact with parents, and consider different modes of communication, such as printed and electronic materials.

Lubans (2009) also found that when specific program goals were identified and students were exposed to these goals, the goals of the program are more likely to be met (61). AHS placed a great emphasis on zoning the playground and increasing time being active on the playground and in the classroom. As a result, physical activity time increased. There was little emphasis placed on specific nutrition changes. Thus, if the schools set specific goals they want to have AHS change, for example aim for consuming three servings of dairy per day or zero soda pop consumption during the week, this would increase the likelihood students will then show an increase in consumption of nutrient-dense foods.

These specific messages could be taken from other programs, such as 5210 Let's Go (68). For example, 5210 Let's Go promotes 5 or more fruits and vegetables, 2 hours or less recreational screen time, 1 hour or more of physical activity, and 0 sugary drinks per day. A program such as this would specifically address many of the nutrition choices this study aimed to investigate, and that the BYRSS questions surveyed, and therefore would be expected to positive changes in those areas. Future interventions using AHS may want to consider incorporating nutrition components from other programs such as 5210 Let's Go in order to better influence nutrition choices.

Future studies: evaluation of AHS. It may be worth further investigations to more accurately determine differences in physical activity time and nutrition choices between grades. If certain grades appear to be more easily influenced by interventions such as AHS, then grade-specific programs could be developed. For example, it appears

fifth graders seem to have responded better to AHS; thus perhaps AHS is better suited for students in grade five, whereas students traditionally in middle and junior high schools would respond better to a different intervention program. Future studies could also incorporate specific nutrition messages into the program and select nutrition surveys and questionnaires that specifically address those messages. For example, the BYRSS nutrition questions would be an appropriate tool to measure a program such as 5210 Let's Go, because the program specifically promotes consuming fruits and vegetables and also specifically addresses sugary drinks, all of which the BYRSS nutrition questions also address.

In addition to assessing if students increased or decreased their consumption of specific foods, it may be necessary to also study if the availability of these foods increased or decreased at school and home. This would be very interesting, especially with increased parental communication via newsletters and emails, as students typically have limited autonomy over dietary choices outside of school (61), so this would allow researchers to determine if students are able to help positively change the dietary choices in their homes. Additionally, this would also help assess how the schools respond to changing the nutrition environment students experience during the school day.

CONCLUSION

Obesity is a multi-faceted condition and AHS influences many of the contributing factors to childhood overweight and obesity. In summary, AHS is an effective school-based obesity intervention for increasing time during school students at inner-city Midwest schools spent being physical active, based on CS's results. In addition, there were visible increases in students' step counts and visible decreases in screen time at both

school, suggesting AHS is effective at improving students' knowledge about physical activity. AHS also seems effective at increasing healthy food choices students make, based on the visible increases in fruit, vegetable, and dairy consumption students at both schools showed; however AHS was not effective at meeting nutrition program goals of increased healthy food choices or increase in knowledge at nutrition when looking at changes in soda pop consumption. School-wide environmental changes such as zoning playgrounds and adding classroom activity breaks should be incorporated into the school day to increase physical activity to help youth meet physical activity recommendations. More intense and grade appropriate nutrition interventions are needed to decrease students' consumption of soda pop and increase consumption of nutrient-dense foods such as fruits, vegetables, and dairy choices.

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APPENDIX A: FIRST- YEAR DATA AND RESULTS

FIRST-YEAR AHS PILOT RESULTS AND DISCUSSION

For TS, there were fifty-five students who completed all the surveys. All data was normally distributed. The mean pre food survey score was 17.96, while the mean post food score was 16.49. When compared, the pre and post scores paired *t*-test was not significant for the entire school nor for the two-factor repeated measures of the food survey when controlled for sex of the students was considered. The mean pre CAPA score was 47.29 and the post CAPA score was 46.45. The *t*-test scores were not significant for the entire school nor when the two-factor repeated measures for sex was taken into consideration for the CAPA.

There were forty-five students who completed all the surveys at CS and at this school pre food mean survey score was 16.31, while the post food score was 17.14. These scores were not statistically significant for the entire student body nor when sex was taken into consideration as a two-factor repeated measure. The pre CAPA score was 48.31 and the post CAPA score was 47.40. The *t*-test scores were not statistically significant for the entire student body nor when sex was taken into consideration for either survey.

There was also no statistically significant difference between the pre and post scores between schools. Full results are displayed in Table 2.

Table 2. Statistical Significance of pre and post data from CS, TS and comparing CS to TS.

	CS	TS	Both
Food Survey	<i>t</i> -test $p = 0.137$	$p = 0.388$	$p = 0.560$
	repeat $p = 0.669$	$p = 0.557$	$P = 0.578$
CAPA	<i>t</i> -test $p = 0.445$	$p = 0.308$	$P = 0.288$
	repeat $p = 0.877$	$p = 0.357$	$p = 0.393$

$p < 0.05^*$, $p < 0.01^{**}$ repeat = two-factor repeated measures

DISCUSSION

After implementation of AHS at TS, it was predicted the food survey and CAPA scores would increase due to the program; however, the data does not support this hypothesis. Secondly, it was hypothesized that TS would have higher scores than the CS. The data collected does not support this hypothesis and there was no statistical significant differences between the schools' scores.

Although the data did not support the hypotheses, there are some explanations for this. First, there is a chance that the decrease shown in the scores from the pre to post surveys may have been due to familiarity with the survey and the program itself. For example, after exposure to AHS, students may have become more aware of the food groups and realized they were not eating as many healthy choices as they originally believed before the start of the program. This could have been true for both TS and CS.

Secondly, there may not have been an increase in attraction to physical activity due to the program not being implemented as intended. For instance, some teachers at TS reported not doing the classroom activity breaks throughout the entire school year. This

could have resulted in children not being more attracted, or interested, in physical activity.

Lastly, the lack of a difference in scores between schools could have been in part due to the above situation. If TS was not implementing AHS as designed, then both TS and CS could have had similar data because in reality neither school was receiving AHS. In fact, previous research has suggested that when a school-based program is removed, measurements return to baseline. If the post data collection occurred after TS teachers had stopped doing the classroom activity breaks and reinforcing nutrition behaviors, than the post data collection really captured data related to student behavior after the program was removed.

Steps, activity time and screen time were to be reported; however TS did not fill out the step survey. Many students incorrectly filled out one or both of these surveys. After data collection, the Program Manager at CS reported telling researchers she told students to make up their steps or activity time if they were not sure. Thus, this data was omitted from the results.

Future pilots of AHS should have protocols implemented to ensure the program is being consistently and continuously administered. Better school-wide training is also needed to ensure the entire school understands the data collection process and the importance of collecting the data for spreading AHS throughout the state of Missouri. At TS, the entire staff was part of the AHS training. At CS, only the principal and Program Leader were fully informed about the AHS program and what data would be collected during the first year. The researchers believe having the entire school staff involved in the AHS training at CS may have improved the data collected at CS. Lastly, reinforcing

the monthly themes or creating activity breaks that reinforce the classroom subjects and lessons may also improve scores on the food survey and CAPA, and thus should be included in future pilots of AHS in the state of Missouri.

APPENDIX B:
PARENT NEWSLETTERS (PEDOMETER NOTE; PARENT HEALTHY LUNCH AND
SNACK IDEAS)



The Missouri Active and Healthy School Program

Dear Parents:

Our school is developing an *Active and Healthy Program* for students. This program focuses on the school environment to encourage students to increase physical activity and make better food choices. The program changes the school environment in a way that encourages increased physical activity and good food choices.

As part of this program, we will gather information about your child that is related to his/her health. Your child will be given a pedometer to use at various times throughout the school year. Pedometers are small counters that are fastened to the waist. They count the number of steps accumulated each day so children can learn about their activity levels. This allows youngsters to set personal goals for activity that are meaningful and motivating to them. Other data to be collected includes height and weight measurements, as well as student attitudes toward

healthy eating habits and participation in physical activities. This information will be gathered using a written survey and not shared with other students or parents. If you have any questions about the program, please contact the physical education teacher at the number listed below.

We want you to know that we are working to assure that your child excels in academics while maintaining an optimal level of health. Certainly, good health and a high energy level contribute to academic success.

The participation of your child in the pedometer data collection and in the surveys is voluntary. If you should have questions please contact Dr. Steve Ball at 573-882-2334 and or the University of Missouri Campus Institutional Review Board 573-882-9585.

Sincerely,



The Missouri Active and Healthy School Program

Dear Parents:

Our school is participating in *The Missouri Active and Healthy School Program*. This program focuses on the school environment to encourage increased physical activity and better food choices. Some of the educational strategies in the *Missouri Active and Healthy School Program* include teaching our youth active games, offering them activity breaks throughout the day, and creating an activity zone. Healthy lunch choices will be rewarded, students will learn about good nutrition, and we will promote healthy snacks during school celebrations.

As part of this program, we will gather information about your child that is related to his/her health. Your child will be given a pedometer to use for the school year. Pedometers are small counters that are fastened to the waist. They count the number of steps accumulated each day so students can learn about their activity levels. This allows children to set personal goals for activity that are meaningful and motivating to them.

Other data to be collected includes height and weight measurements, as well as student attitudes toward healthy eating habits and participation in physical activities. This information will not be shared with other students or parents. If you have any questions about the program, please contact the *Active and Healthy School Program* coordinator at the school.

When you visit the school, you will notice a number of bulletin boards and signs that encourage active and healthy lifestyles. We want you to know that we are working to assure that your child excels in academics while maintaining an optimal level of health. Certainly, good health and a high energy level contribute to academic success.

The participation of your child in the pedometer data collection and in the surveys is voluntary. If you should have questions please contact Dr. Steve Ball at 573-882-2334 and or the University of Missouri Campus Institutional Review Board 573-882-9585.



In the *Missouri Healthy and Active School Program*, your child has worn a pedometer at school to help increase activity during the school day. Now the students are ready to wear their pedometers home from school to increase their activity time during the after school hours. Please help your child be responsible for wearing the pedometer at home and back to school each day.

At the end of the program, the pedometers must be returned to school.

Thank you for the time you give to your child.

UNIVERSITY OF MISSOURI
 **Extension**
an equal opportunity/ADA institution



In the *Missouri Healthy and Active School Program*, your child has worn a pedometer at school to help increase activity during the school day. Now the students are ready to wear their pedometers home from school to increase their activity time during the after school hours. Please help your child be responsible for wearing the pedometer at home and back to school each day.

At the end of the program, the pedometers must be returned to school.

Thank you for the time you give to your child.

UNIVERSITY OF MISSOURI
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The Missouri Active and Healthy School Program

Healthy snacks promote a healthy school environment

Food is often part of many people's celebrations and activities. As a Healthy and Active School, we want our celebrations and activities to reinforce what our students are learning about better food choices and physical activity. Since we consider celebrations part of the learning experience, we encourage non-food celebrations or healthy celebratory treats.

This newsletter has some suggestions for non-food celebrations, healthy snacks and celebratory foods.

Kids who are exposed to new and exciting foods in a fun and social setting are more likely to try something new.

*Check with the classroom teacher for food allergies before bringing items to school.



Combination foods

- Tortilla chips with salsa
- Mini pizzas: veggie, fruit, cheese, ham and pineapple
- Trail mix or cereal mix
- Quesadillas with cheese
- Pita chips with hummus
- Whole-wheat crackers with deli meat and cheese
- Pretzels dipped in dark chocolate
- Fruit and cheese kabobs
- Fig bars
- Angel food cake with fruit
- Jell-O Jigglers
- Pizza dippers: pizza toppings on bread cubes dipped into marinara and/or cheese sauce
- Ham or turkey with cheese sub

Non-food celebrations

- Donations for a canned foods drive
- Supplies for a specific project
- Ornaments
- Classroom decorations
- Items for a needy family
- Plant clippings for students to grow at home
- Key chains or lanyards
- Rubber bracelets
- CD or DVD related to classroom learning
- Stickers
- Donate a book to the library or for the classroom



Dairy



- Low-fat string cheese sticks
- Low-fat individual yogurts
- Skim or low-fat milk cartons — regular, chocolate or strawberry
- Cheese cubes
- Sliced cheese
- Low-fat pudding
- Frozen low-fat frozen pops
- Sherbert cups

Grains

- Rice cakes
- Whole-wheat crackers
- Whole-wheat, multigrain, spinach or tomato tortilla wraps
- Pitas or pita chips
- Tortilla chips
- Pretzels
- Plain or lightly salted popcorn
- Soy crisps
- Animal crackers
- Mini bagels

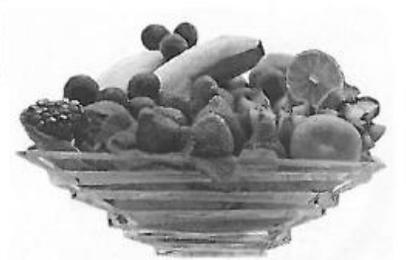


Proteins



- Nuts like almonds, walnuts, cashews and soy nuts
- Lean-sliced deli meat
- Black-bean dip
- Seeds like pumpkin and sunflower
- Nut butters like peanut, almond, soy

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Fruits

- Tropical fruit salad
- Dried fruit like apricots, pineapple, raisins, cranberries, dates
- 100 percent juice
- Fruit salsas
- Apple sauce
- Fruit cups
- Apple cider
- Frozen fruit pops
- Fresh fruit like watermelon slices, cantaloupe balls, grape clusters, strawberries



Vegetables

- Vegetable trays with low-fat dips (try adding Italian seasoning to low-fat plain sour cream or blending low-fat cottage cheese with taco seasoning)
- Vegetable or tomato juice
- Jicama sticks with hummus
- Carrot coins
- Kohlrabi slices with low-fat ranch dressing
- Zucchini or cucumber slices with plain low-fat yogurt
- Pepper strips with hummus
- Salsa



The Missouri Active and Healthy School Program

Sack lunches can be delicious and nutritious

Good nutrition is linked to better behavior and academic performance. As an Active and Healthy School, we are providing the best possible learning environment by supporting good food choices.

In the classroom, students learn how to select food from different food groups to make better choices. In the

cafeteria, we encourage students to purchase or pack a healthy lunch. This guide is designed to help you and your student plan and pack a healthy lunch for days your child does not eat in the school cafeteria.

Although small, these changes will have a large impact on the health and learning of your child.



What is a healthy lunch?

A lunch should contain foods from a variety of food groups — include fruit, vegetables, dairy, meat and grains, like whole grains as often as possible.

Foods with different textures are also more

appealing and add variety. Pack colorful foods so the lunch is visually appealing and full of different nutrients.

Use these ideas or let your creativity flow to pack your own delicious and nutritious lunch.



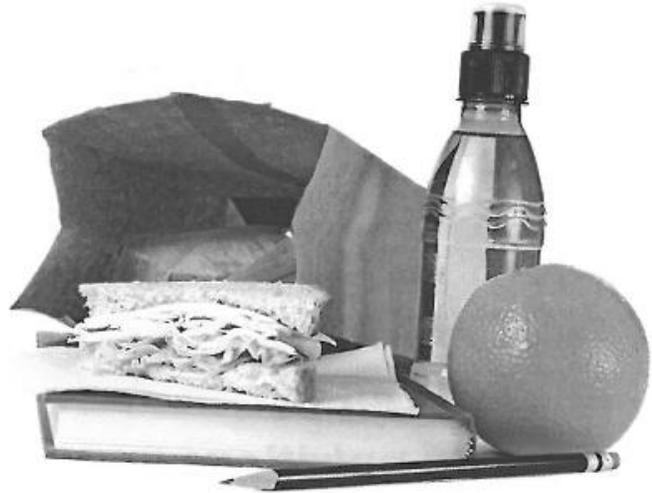
Sandwich ideas

- Try a new kind of bread: Whole wheat, multi-grain, onion, French, herb, cheese, bran, potato, oatmeal, rye, pumpemickel
- Try new shapes of bread: Pita (pocket), English muffin, bagel, tortilla, roll, rice cakes, biscuit, hamburger bun
- Try new toppings: lettuce leaves, spinach, salad greens, tomato slices, alfalfa sprouts, bean sprouts, cucumbers, bell peppers, onion slices, zucchini, sliced radishes, carrot coins, sliced apples, crushed pineapple, small-curd cottage cheese

Sack lunch ideas:

- Bagels and cream cheese, baby carrots, plum, oatmeal cookie and low-fat or skim milk
- Tomato tortilla wrap with sliced turkey, shredded cheese, yellow bell pepper strips, spinach and mustard with yogurt and 100 percent juice
- Peanut butter and banana sandwich on whole-wheat bread, a peach, baby carrots and low-fat yogurt
- Leftover pasta salad made with cheese cubes and chopped bell peppers, fruit cup packed in water and a vegetable juice drink
- Deli sandwich made on multi-grain bread with spinach, tomatoes, onions, cucumbers, carrots and mustard with grapes and low-fat or skim milk
- Leftover pizza, cherry tomatoes, raisins and low-fat or skim milk
- Romaine lettuce salad with strips of lean meat, cottage cheese with pineapple, animal crackers and 100 percent juice
- Tuna fish salad with crackers, unsweetened applesauce, broccoli florets and low-fat or skim milk
- Whole-wheat tortilla with hummus, lettuce, sliced tomatoes and black olives wrapped inside plus a carton of low-fat or skim milk and strawberries

*To keep milk cold, buy it at the cafeteria or pack in an insulated container.



Tip for making lunches more interesting:

- Get your child involved with shopping, selecting and preparing the lunch. The more they help, the more likely they are to eat the foods.
- While making lunch with your child, talk about good food choices and trying new foods. Lunch is more than eating — it is about learning healthy habits.
- Create lunches for special occasions. Try orange and black foods at Halloween (carrot sticks) or red and white foods on Valentines' Day (red grapes).
- Send notes, trinkets, stickers or school supplies with lunch.
- Cut sandwiches into fun shapes.
- Pack reusable straws and utensils in fun colors or crazy shapes.
- Cut, peel or slice food into finger-sized pieces so it is easy to eat.
- Have dips and a variety of textures to keep the lunch exciting.

Keep lunch safe:

Keep cold foods cold so they are safe to eat. Lunches with foods like meat, fish, poultry, dairy, mayonnaise and eggs need to be kept cold or at the temperature of a refrigerator. To keep foods cold:

- Use an insulated lunch bag with an ice pack or gel freezer pack.
- Use cold ingredients when making sandwiches.
- Chill containers before putting food in them. Try using a cold thermos for cold foods like milk or yogurt.
- Freeze food and drinks, like sandwiches, juice and similar foods before packing. These foods will be defrosted by lunch and help keep the other items cold.
- Keep the lunch bag out of direct sun. Encourage your child to put it inside in a place that is not warm or hot.

When possible, reuse lunch containers. This will help save time and money when packing and reduce waste.

APPENDIX C:
AHS SURVEYS (FOOD & DRINK SURVEY; CAPA; ACTIVITY TIME/STEP
COUNT/SCREEN TIME)



Name _____

Teacher _____ Grade _____

Activity Time and TV/Video Game/Computer Time

Date	Activity Time	Steps	Screen Time
_____	School Activity Time _____ min	School Steps _____	Day 1 Screen Time _____ min
	Home Activity Time _____ min	Home Steps _____	
-----	School Activity Time _____ min	School Steps _____	Day 2 Screen Time _____ min
	Home Activity Time _____ min	Home Steps _____	
-----	School Activity Time _____ min	School Steps _____	Day 3 Screen Time _____ min
	Home Activity Time _____ min	Home Steps _____	
-----	School Activity Time _____ min	School Steps _____	Day 4 Screen Time _____ min
	Home Activity Time _____ min	Home Steps _____	
-----	School Activity Time _____ min	School Steps _____	Day 5 Screen Time _____ min
	Home Activity Time _____ min	Home Steps _____	
-----	Weekend Activity Time _____ min	School Steps _____	Day 6 Screen Time _____ min
-----	Weekend Activity Time _____ min	Home Steps _____	Day 7 Screen Time _____ min

Note: Record minutes only – do not record seconds. If 30 seconds or more, round up to the nearest minute. If 29 seconds or less, round down.



AHS Food & Drink Survey

Name _____

Teacher _____ Grade ____

These questions ask about food you ate or drank during the past 7 days. Think about all the meals and snacks you had from the time you got up until you went to bed. Be sure to include food you ate at home, at school, at restaurants, or anywhere else.

1. During the past 7 days, how many times did you drink **100% fruit juices** such as orange juice, apple juice, or grape juice? (Do not count punch, Kool-Aid, sports drinks, or other fruit-flavored drinks.) Choose only one answer.

- | | |
|--|--|
| <input type="checkbox"/> I did not drink 100% fruit juice during the past 7 days | <input type="checkbox"/> 1 to 3 times during the past 7 days |
| <input type="checkbox"/> 4 to 6 times during the past 7 days | <input type="checkbox"/> 1 time per day |
| <input type="checkbox"/> 2 times per day | <input type="checkbox"/> 3 times per day |
| <input type="checkbox"/> 4 or more times per day | |

2. During the past 7 days, how many times did you eat **fruit**? (Do not count fruit juice.) Choose only one answer.

- | | |
|---|--|
| <input type="checkbox"/> I did not eat fruit during the past 7 days | <input type="checkbox"/> 1 to 3 times during the past 7 days |
| <input type="checkbox"/> 4 to 6 times during the past 7 days | <input type="checkbox"/> 1 time per day |
| <input type="checkbox"/> 2 times per day | <input type="checkbox"/> 3 times per day |
| <input type="checkbox"/> 4 or more times per day | |

3. During the past 7 days, how many times did you eat **green salad**? Choose only one answer.

- | | |
|---|--|
| <input type="checkbox"/> I did not eat green salad during the past 7 days | <input type="checkbox"/> 1 to 3 times during the past 7 days |
| <input type="checkbox"/> 4 to 6 times during the past 7 days | <input type="checkbox"/> 1 time per day |
| <input type="checkbox"/> 2 times per day | <input type="checkbox"/> 3 times per day |
| <input type="checkbox"/> 4 or more times per day | |

4. During the past 7 days, how many times did you eat **potatoes**? (Do not count french fries, fried potatoes, or potato chips.) Choose only one answer.

- | | |
|--|--|
| <input type="checkbox"/> I did not eat potatoes during the past 7 days | <input type="checkbox"/> 1 to 3 times during the past 7 days |
| <input type="checkbox"/> 4 to 6 times during the past 7 days | <input type="checkbox"/> 1 time per day |
| <input type="checkbox"/> 2 times per day | <input type="checkbox"/> 3 times per day |
| <input type="checkbox"/> 4 or more times per day | |

5. During the past 7 days, how many times did you eat **carrots**? Choose only one answer.

- | | |
|---|--|
| <input type="checkbox"/> I did not eat carrots during the past 7 days | <input type="checkbox"/> 1 to 3 times during the past 7 days |
| <input type="checkbox"/> 4 to 6 times during the past 7 days | <input type="checkbox"/> 1 time per day |
| <input type="checkbox"/> 2 times per day | <input type="checkbox"/> 3 times per day |
| <input type="checkbox"/> 4 or more times per day | |



AHS Food & Drink Survey

Name _____

Teacher _____ Grade ____

6. During the past 7 days, how many times did you eat **other vegetables**? (Do not count green salad, potatoes, or carrots.) Choose only one answer.

- | | |
|--|--|
| <input type="checkbox"/> I did not eat other vegetables during the past 7 days | <input type="checkbox"/> 1 to 3 times during the past 7 days |
| <input type="checkbox"/> 4 to 6 times during the past 7 days | <input type="checkbox"/> 1 time per day |
| <input type="checkbox"/> 2 times per day | <input type="checkbox"/> 3 times per day |
| <input type="checkbox"/> 4 or more times per day | |

7. During the past 7 days, how many **glasses of milk** did you drink? (Include the milk you drank in a glass or cup, from a carton, or with cereal. Count the half pint of milk served at school as equal to one glass.) Choose only one answer.

- | | |
|--|--|
| <input type="checkbox"/> I did not drink milk during the past 7 days | <input type="checkbox"/> 1 to 3 times during the past 7 days |
| <input type="checkbox"/> 4 to 6 times during the past 7 days | <input type="checkbox"/> 1 time per day |
| <input type="checkbox"/> 2 times per day | <input type="checkbox"/> 3 times per day |
| <input type="checkbox"/> 4 or more times per day | |

8. During the past 7 days, how many times did you drink a **can, bottle, or glass of soda or pop**, such as Coke, Pepsi, or Sprite? (Do not include diet soda or diet pop.) Choose only one answer.

- | | |
|---|--|
| <input type="checkbox"/> I did not drink soda or pop during the past 7 days | <input type="checkbox"/> 1 to 3 times during the past 7 days |
| <input type="checkbox"/> 4 to 6 times during the past 7 days | <input type="checkbox"/> 1 time per day |
| <input type="checkbox"/> 2 times per day | <input type="checkbox"/> 3 times per day |
| <input type="checkbox"/> 4 or more times per day | |