Combating obesity through technology and school based interventions

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Combating obesity through technology and school based interventions

by

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A thesis submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

Major: Nutritional Sciences

Program of Study Committee:
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CHAPTER I – INTRODUCTION

Overweight and obesity is a worldwide health concern that affects people of all ages and socioeconomic groups. Globally, an estimated 42 million children under the age of five are overweight. Additionally, 1 billion adults are overweight with at least 300 million of them being obese (World Health Organization [WHO], 2011a). Ninety-seven million of those overweight and obese adults reside in the United States (Blackwell, 2002).

According to the Centers for Disease Control and Prevention (CDC) (2010), overweight and obesity have been on the rise since the 1980’s. From that time the number of overweight children in the United States doubled whereas the number of overweight adolescents tripled (WHO, 2011b; U.S. Department of Health and Human Services [HHS], 2007). As of 2008 it was estimated that 34 percent of the nation’s children and adolescents ages 2-19 years were overweight while 17 percent were obese, as reported from the National Health and Nutrition Examination Survey (NHANES) (Ogden et al., 2010a). The over arching cause for this rise in overweight and obesity is due to an energy imbalance. This is the result of either an excess in calories consumed, a lack of regular physical activity, or both (CDC, 2010).

To track such weight changes internationally and over time a standard benchmark is used. The standard benchmark for assessing body fatness in children, adolescents and adults is an individual’s body mass index (BMI), which is defined as the weight in kilograms divided by height in meters squared (kg/m²) (WHO, 2011c). For adults, a BMI greater than 25 kg/m² is defined as overweight and a BMI of over 30 kg/m² is considered obese (CDC, 2010; WHO, 2011c). Child and adolescent BMI, on the other hand, is measured and then plotted on the CDC growth charts, taking into account the age and
sex of the child. For children and adolescents aged 2-19 years overweight is defined as a BMI at or above the 85\textsuperscript{th} percentile while obesity is defined as a BMI at or above the 95\textsuperscript{th} percentile (CDC, 2009a).

Assessing BMI not only provides information about an individuals’ total body fatness but it may also provide information about an individuals’ risk of developing chronic disease. As BMI increases, the risk for some diseases also increases, including high blood pressure, high cholesterol, cardiovascular disease, type 2 diabetes, some cancers, osteoarthritis, and stroke (Daniels et al., 2005). However, small amounts of weight loss (10-20 pounds) can help lower the risk of developing these conditions and increase longevity (United States Department of Agriculture [USDA], 2008).

Therefore, since small amounts of weight loss can improve an individual’s life span and since obesity has reached epidemic proportions it is our goal as scientists to understand obesity and develop new ways to combat or prevent it. Although there are a multitude of reasons for the rise in overweight and obesity such as lack of sleep, genetics, medication, etc., these areas have not been as extensively explored (McAllister et al., 2009). For that reason, the main focus of this thesis is to explore four primary contributors to overweight: screen time, diet, exercise and environment. In the extended literature review, each contributor will be examined.
CHAPTER II – EXTENDED LITERATURE REVIEW

Background of Overweight and Obesity

Since the 1960’s epidemiological studies have been conducted on Americans’ weight, major disease and health conditions using the first nationally representative U.S. health examination survey. This examination is known as the National Health and Nutrition Examination Survey (NHANES), which is considered to be the largest and longest-running national source of objectively measured health and nutrition data (National Center for Health Statistics, 1965). Since the beginning of the National Health and Nutrition Examination Survey a relationship between obesity and chronic disease had been seen. By the 1970’s the John E. Fogarty International Center at the National Institutes of Health (NIH) held a conference about this relation to make it known that overweight and obesity had become a public health problem (Bray, 1975).

As reported from the NHANES the prevalence of overweight men and women (BMI >25) of all ages and racial/ethnic groups increased from 30.5 to 32.0 percent from 1960-1994 (Flegal et al., 1998). In 2008 overweight adults 20 years and older increased once again to 34.0 percent. In women, rates of obesity also rose from 33.4 percent in 1999 to 35.5 percent in 2008 (Ogden et al., 2010b).

Not only is overweight and obesity affecting adults of all ages and ethnic groups but also children. The NHANES reported that 17 percent of boys and girls ages 2 to 19 were overweight in 2003-2004. From 2003-2006, 11.3 percent of children and adolescents (2 to 19 years) were at or above the 97th percentile, 16.3 percent were at or above the 95th percentile, and 31.9 percent were at or above the 85th percentile for BMI-for-age growth charts (Ogden et al., 2006; Ogden, Carroll and Flegal, 2008). Such results are consistent with previous results where obesity rose among preschool children.
aged 2-5 from 5.0 to 10.4 percent, from 6.5 to 19.6 percent among 6-11 year olds, and 5.0 to 18.1 percent among 12-19 year olds from the 1976-1980 to 2007-2008 data collection (Ogden et al., 2010b).

Disparities between Ethnic Groups

In the United States there are sex, ethnic, and socioeconomic disparities in the prevalence of obesity (Ogden et al., 2006). As early as age 6, sex and ethnic disparities begin to emerge. As children age these disparities become even more evident, especially among females (Ogden et al., 2008). One such contributor to this rise in female disparities and obesity is television watching.

On average, girls watch less television than boys (21 vs. 25 h/wk) (Van den Bulck, 2004). When factoring in ethnic groups, non-Hispanic white children (37%) have been shown to watch the least amount of television followed by Mexican Americans (53%) and non-Hispanic black children (65%) (Crespo et al., 2001). Not only do African American children watch the greatest level of television, African American girls are more apt to have higher energy intakes from fat compared to other ethnic groups (Obarzanek et al., 1994; Matheson et al., 2004). Dietary fat intake of African American girls increases total daily energy intake on average from 398 to 700 kcal/day while watching television. This energy intake not only comes in the form of unhealthy snacking but also from weekend lunch and dinners where 20 (lunch) and 40-50 (dinner) percent of African American’s consume those meals in front of the television (Obarzanek et al., 1994; Matheson et al., 2004). Overall, screen time per week, percent of energy from fat, and total daily energy in girls of all ethnic groups is directly and independently related to BMI and skinfold thickness (Obarzanek et al., 1994).
Boys, on the other hand, watch the greatest amount of television and play the most sports (moderate to vigorous physical activity), videogames, and computer games compared to girls (Janz et al., 2002; Crespo et al., 2001). Even though males watch the greatest amount of television, especially African American and Hispanic boys, females consume the greatest amount of calories while watching TV. Boys are also more physically active with Caucasian boys being the most active with at least 3 bouts of vigorous physical activity per week followed by African Americans and Hispanics boys (Andersen et al., 1998; Laurson, Eisenmann and Moore, 2008a).

When it comes to adults, similar ethnic disparities are seen with non-Hispanic black (45.0%) and Mexican American (36.8%) adults having the highest rates of obesity among other ethnic groups (Ogden et al., 2006; Flegal et al., 2010). However, more than leisure television viewing has contributed to adult obesity. Employment, health condition, and type of snacks consumed are also factors in the amount of television viewed. For African American’s, non-employed adults, and adults who have a health condition such as diabetes, time spent watching television is likely to be greater than 2 hours per day as more time is spent within the home where energy-rich snacks are likely to be consumed while watching (Bowman, 2006).

These factors may also be related to the socioeconomic status of a family, which can influence the behavior of how much time adults and children spend watching television and their snacking behaviors. It has been shown that children from single parent homes and who have a low family income and less educated mothers are more likely to have the television on during meal times compared to families with two parents present in the home. In addition, those families who eat two or more meals in front of the television tend to consume 6 percent more red and processed meat, 5 percent more of their daily calories from pizza, salty snacks, and soda and 5 percent less of their total
calories from fruits and vegetables (Coon et al., 2001). In a study conducted by Epstein and colleagues, lower the socioeconomic status of a family was correlated with a greater change in a child’s zBMI when television, computer, DVD/VCR players, and video game unit use was decreased by 50 percent through TV Allowance attachments. These children’s zBMI changed from baseline to 6 months (P = 0.002), 12 months (P = 0.04), and 24 months (P = 0.05). This same study reported children from a higher socioeconomic status had no significant changes in their zBMI (Epstein et al., 2008).

As a result of sex, ethnic, and socioeconomic differences among the obese there are differences in the comorbidities associated with obesity. In general, obesity comorbidities (including diabetes, hypertension, high serum cholesterol and heart disease) increase with increasing BMI in all ages, sexes, ethnic and socioeconomic groups (Paeratakul et al., 2002). However, ethnicity and socioeconomic status may be a factor in obesity and obesity associated comorbidities. African American women are more prone to have significantly higher BMI, systolic blood pressure, diastolic blood pressure, and diabetes compared to Caucasian women. Obese Caucasian women tend to have a greater risk for coronary heart disease than African Americans. Fortunately, obese female African American’s increased high density lipoprotein-cholesterol (HDL-C) protects them from dyslipidemia (Nelson et al., 2002). African Americans also have the highest rates of hypertension and diabetes across all BMI categories whereas Hispanics have the lowest rates of hypertension and heart disease. Despite age, sex, ethnic group or socioeconomic status, all individuals are susceptible to the lifestyle that causes obesity and its associated diseases.
**Television Viewing and Increasing Disease Risk Among Children**

Not only has the rate of children who are overweight and obese been on the rise but so has the complexity of the disease. Overweight and obesity is a disease that is not only affected by many external factors but internal factors as well. Some of the external factors that contribute to the increase in body weight are an individual's environment, genetic make-up, socioeconomic status, medications, age, emotional factors, and type of job among others. For that reason obesity is known to be a multifactorial disease. However, after substantial research, the four primary external contributors to the rise in obesity are screen time, diet, exercise, and environment (television viewing being the major correlate).

For children, above the age of 2, the American Academy of Pediatrics recommends that no more than 2 hours per day of quality programming should be viewed (2001). Regardless of this recommendation, from 1988 to 1994 almost half of the children in the United States age 8 to 16 watched more than 2 hours of television per day. In 1990, 10 to 15 year olds averaged 4.8 hours per day, or 34 hours per week of television viewing. Thirty-three percent of youth average greater than 5 hours of television viewing per day with only 11 percent watching between 0 and 2 hours of television per day (Strasburger, 1993).

With the vast majority of children watching greater than the recommended amount of television (<2 hrs/d), by age 70 years they will have spent the equivalent of 7 to 10 years watching television (Strasburger, 1993). It is no surprise that the greatest number of hours spent watching television per day has been associated with an increased prevalence of obesity (Crespo et al., 2001). Such a relationship between amount of time spent watching television and body weight can be seen in a study conducted by Gortmaker and colleagues (1996) where 10 to 15 year olds averaging 5
hours or more of television viewing a day were 5.3 times more likely to be overweight compared to those who watched less than 2 hours of television per day. For each additional hour of television viewed greater than 2 hours of television viewing, odds of becoming overweight increased by 1.2 (Gormaker et al., 1996).

Consequently, not only does television viewing contribute to overweight and obesity among children but also it is positively associated with preventable comorbidities such as type 2 diabetes, hypertension, high serum cholesterol in children and heart disease among adults. Hu and colleagues (2003) reported for every 2 hours/day increase in television viewing the risk of obesity increased by 23 percent and type 2 diabetes by 14 percent among adult females. Consequently, for every 2 hour/day increase in sitting time the risk of obesity increased by 5 percent and type 2 diabetes by 7 percent (Hu et al., 2003).

With a rise in obesity, related comorbidities have also increased hospital discharges and expenses. Hospital costs associated with obesity has risen from $35 million in 1979 to $127 million annually in 1999. In children aged 6 to 11 and adolescents 12 to 17 years of age the percentage of diagnosed diabetes diagnosis increased from 1.43 to 2.36 percent. Obesity discharge rose from 0.36 to 1.07 percent, sleep apnea from 0.14 to 0.75 percent, and gallbladder disease from 0.18 to 0.59 percent from 1979 to 1999 with all categories but sleep apnea being higher in adolescents (Wang and Dietz, 2002). Therefore since obesity related diseases are driving up health care costs the best way to combat this is by preventing obesity. Considering the 4 major factors associated with obesity, the most effective strategies for preventing obesity in both children and adults are likely by changing people’s habits and environment.
Children’s Television Viewing and Diet

Aside from television viewing, other factors working in conjunction with television viewing have led to the rise in overweight and obese individuals, their comorbidities and hospital costs. Several studies have examined the association between television viewing and an individual’s eating habits and overall physical activity (Gentile et al., 2004). For each additional hour of television viewing (TVV) beyond normal viewing, children increase their total energy intake (TEI) from snacks (sweet baked snacks, candy, fried potatoes, fast food, salty snacks, and sugar sweetened beverages) by 167 kilo-calories (Wiecha et al., 2006). Over time, this excessive caloric intake could substantially contribute to the prevalence of obesity in children.

Partially to blame for this rise in calories consumed while watching television is the immense exposure to food advertisements (Halford et al., 2007). Children are exposed to one food commercial every five minutes while watching television. This can add up to about 3 hours of food commercials each week. Furthermore, during 52.5 hours of Saturday morning programming children are exposed to 564 food advertisements with 246 of those ads being high fat and high sugar promoting commercials (Kotz and Story, 1994). In a study conducted by Halford and colleagues (2007) they demonstrated when overweight and obese children, 9-11 years of age, were exposed to food advertisements they tended to eat significantly more high-fat, sweet and high-fat savory foods than lean children. They also tended to eat more high-fat and low-fat sweet foods (27.6 and 36.2g, respectively) and high-fat savory foods (37.9g) after non-food advertisements. Thus, it appears that BMI and the amount of food eaten upon food advertisement exposure are positively correlated (Halford et al., 2007).

Nevertheless, due to children being in school during the week, total energy intake (TEI) while watching television is higher on weekends versus weekdays. Matheson and
colleagues (2004a) reported 73.6 percent of third graders during the weekday and 62.9 percent of third graders during the weekend ate while watching television. Whereas 76.0 percent of fifth-graders ate while watching television during the weekday compared to 58.2 percent during the weekend. Overall it appears that more snacks were consumed in front of the television during the weekday whereas more meals were consumed in front of the television during the weekend. From this study it was also found that regardless of whether the children were eating with the television on or off, the percentage of energy from fat is the same.

However, if screen time is reduced in children, significant changes can be seen in their total energy intake. This was shown in a 6 month school based study implementing a program to decrease third and fourth grade student’s television, videotape, and video game use where overall screen time was reduced with a subsequent decrease in the frequency of children eating in front of the television. This was shown with a significant reduction in the treatment groups BMI from 18.38 to 18.67 kg/m$^2$ vs. 18.10 to 18.81 kg/m$^2$, respectively; adjusted differences -0.45 kg/m$^2$, $P=0.002$. (Robinson, 1999). Epstein and colleagues (2008) found similar results where over the course of 2 years, 4 to 7 year olds decreased their mean (SEM) television, videotape, computer and videogame use by 50 percent (-5.2 (11.1) hours/week at 24 months for control and -17.5(7.0) hours/week at 6 months for treatment, $P<0.001$) leading to a significant reduction in energy intake ($P=0.047$) and zBMI (-0.24 (0.32) at 24 months for intervention, -0.13 (0.37) at 24 months in control, $P<0.05$) for those children whose BMI was at or about the 75th percentile for age and sex. This ability to reduce screen time, which subsequently decreases energy intake in children, poses as an important mechanism to prevent childhood obesity.
Children’s Television Viewing and Physical Activity

Another aspect to the rise in overweight and obesity related to television viewing is physical inactivity. It has been postulated that television-viewing influences whether a child will engage in physical activity or not. For years television viewing has been on the rise and so has physical inactivity. However, television viewing and physical activity studies done by Ekelund and colleagues (2006) amongst others, have found no significant association between television viewing and physical activity when BMI and gender are controlled. This suggests that physical activity and television viewing are separate entities (Laurson et al., 2008b; Ekelund et al., 2006; Marshall et al. 2004).

Faith and colleagues (2001) examined the effects of television viewing when physical activity was required to watch television. When participants were required to pedal a cycle ergometer for the television to work, the experimental group pedaled 64.4 minutes per week on average compared to the control groups who pedaled 8.3 minutes. Engaging in physical activity to make the television work decreased weekly television use by the experimental group to 1.6 hours compared to the control group’s 21.0 hours.

Further studies have shown that if the television, DVD/VCR, video game, and computer use is decreased by 50 percent from a child’s normal weekly usage no change in physical activity (measured by accelerometry) occurs (Epstein et al., 2008). This suggests that children may be substituting screen time with other sedentary and leisure activities. Consequently, if a child’s normal sedentary behavior increased by 50 percent, an increase in caloric intake (250.9 ± 584.6 calories) and decrease in energy expenditure (99.8 ± 154.4 calories) was observed as a consequence of television watching. Computer and video game use was only associated with 2 or less eating occasions which resulted in a 0.7 pound increase per week (Epstein et al., 2002).
Other studies have shown a correlation between television viewing and body fatness (Jackson et al., 2009). Early studies suggested with each additional hour of television viewing an increase in the prevalence of obesity from 1.2 to 2.9 percent in children occurred (Dietz and Gortmaker, 1985). Therefore children with the greatest amount of television viewing were more likely to have a higher body weight, tricep, bicep, abdominal, suprailical and subscapular skin fold, fat mass, and percent fat free mass. Despite with similar muscle strength, nutrition habits, resting energy heart rate, total energy expenditure, and physical activity levels between lean and overweight children, aerobic fitness levels differ (Grund et al., 2001). Television viewing was more closely related to BMI and body composition measured by skin folds than vigorous activity (Andersen et al., 1998). Janz and colleagues (2002) demonstrated total physical activity is inversely related to adiposity levels and/or fat free mass; physical activity decreased total body fatness whereas television viewing increased total body fatness.

Ultimately, if children are not meeting the screen time recommendations (no more than 2 hours of quality programming per day), and physical activity recommendations (11,000 to 13,000 pedometer steps/day or 30 minutes of moderate intense physical activity everyday in children >2), they are 3 to 4 times more likely to be overweight (Laurson et al., 2008b).

If children are physically inactive their chances of gaining excess weight increases. O’Brien and colleagues (2007) collected 7 height and weight measurements in 960 children between the ages of two to twelve years old. As children aged from 24 months (15%) to 36 months (18%), 54 months (25%), first grade (26%), third grade (31%), and fifth and sixth grade (34%) the number of children who were considered overweight increased. This progression of overweight children was significantly associated with a difference in factors of home environment. Factors included: fewer
opportunities for productive activity at the home, less sensitive mothers, and more time spent watching television after school. Demographic characteristics and home environment may also play a large role in determining which children tend to be lean or overweight (O'Brien et al., 2007).

**Children and Entertainment Media**

Increased television viewing, unhealthy snacking behaviors and physical inactivity in the home environment have been accepted in our society as being part of a social norm. However, such an environment promoting high-energy foods, sedentary behaviors and unsafe neighborhoods for outdoor recreation promotes obesity. This obesity-promoting environment has been termed “obesogenic” (Raja, 2010).

Over the past two decades home environments have changed with the rise in popularity and accessibility to entertainment media. This includes the use of computers, the Internet, music, texting, online social networks, and video games. With increasing technology use (1 hour and 17 minutes a day from 2004-2009 in 8-18 year-olds) the need to see a friend or relative to talk to, play out doors for recreation, or even perform research can all be done within the home. In a typical day, this age group averages 7 hours and 38 minutes engaging in an assortment of entertainment media. When multiple mediums are used together, ‘media multitasking’, a total of 10 hours and 45 minutes of media use is packed into those 7 hours and 38 minutes (Rideout et al., 2010).

Of all the entertainment media youth are engaging in video game use has had the most attention. The hypothesis is that since a large portion of a child’s day is spent in front of television screens, if children and their families began engaging in active video gaming, such as Dance Dance Revolution or Nitendo® Wii™ Boxing, it may be a way for them to burn calories while still being safe in the comfort of their homes (Lanningham-
Foster et al., 2006; Vandewater, Shim and Caplovitz, 2004; Stettler, Signer and Suter, 2004). Lanningham-Foster and colleagues found when 9-15 year olds engaged in active video games, Nitendo® Wii™ Boxing, they not only moved more (55 ± 5 arbitrary acceleration units, \( P < 0.001 \)) but also increased mean energy expenditure (189 ± 63 kcal/hr, \( P<0.01 \)) (Lanningham-Foster et al., 2006; Lanningham-Foster et al., 2009). Maloney and colleagues (2008) found similar results in 7 and 8 year old children with Dance Dance Revolution (DDR) which resulted in a significant increase in the children’s vigorous physical activity with a reduction in their light physical activity and screen time (10.5 ± 5.5 hours per week (hours per week, hpw)) to week 10 (9.3 ± 4.9 hpw). However, those children who did not play Dance Dance Revolution increased their amount of sedentary screen time from 9.3 ± 5.7 hpw to 12.3 ± 7.2 hpw.

Nevertheless, not all video game usage is the same. A sex difference has been seen in the amount of video game participation. Cummings and Vanderwater (2007) found that out of 534 adolescents 80 percent of the boys were gamers compared to 20 percent of the girls. Boys were also more inclined to spend time gaming during the week (58 minutes boys vs 44 minutes girls) and weekends (1 hr 37 min boys vs. 1 hr 4 min girls). Just as with television viewing, the amount of time spent playing video games it not related to time spent in sports activities for both boys and girls. Therefore, as children become older the association between electronic game play and weight status diminishes as older children tend to use electronics, such as a computer, for more non-gaming uses (Vandewater et al., 2004).
Adolescents Television Viewing and Diet

As children become adolescents and young adults, new habits begin to form. Once those habits form, especially if they are unhealthy habits, the more difficult it is to break those habits. A particularly unhealthy habit that tends to continue from childhood into adolescence is snacking while watching television.

On average, adolescents spend 2 hours and 47 minutes per day in front of the television and 1 hour and 30 minutes on the computer (Kremers, van der Horst and Brug, 2007). This amounts to a total of 19 to 22 hours of television per week (Van den Bulck and Van Mierlo, 2004). Over 95 percent of adolescents consume snacks and 24 ounces a day of sugar-sweetened beverages while watching television (Kremers et al., 2007), leading to an additional 400 kilo-calories of energy intake per day or 2802 calories per week. Approximately 156 kilo-calories of high sugar and high fat foods is consumed with each hour of television viewed (Van den Bulck and Van Mierlo, 2004).

This habit, eating while watching television, from childhood through adolescence contributes to overweight and obesity. Proctor and colleagues (2003) found that upon entrance into adolescence, an increase in BMI is greatest in those with the highest level of screen time as a child. They also tended to have a higher skin fold measurement (increased body fat) when screen time was 3 hours or more, in part to a high fat diet. This increase in BMI and skin folds was found continues for as long as the unhealthy habit continues.

Adolescents and Physical Activity

As children age, snacking while watching television is likely to continue. Likewise, physical activity and sedentary behavior remains inversely related in adolescents (Epstein et al., 2005; Nelson et al., 2005). As noted previously before, the
amount of television viewing that normal weight and overweight adolescents' watch does not significantly differ (2.44 hours vs. 2.49 hours). Rather, normal weight adolescents spend more time being physically active whereas overweight adolescents spend more time in sedentary activities (Robinson et al., 1993). Eisenmann, Bartee and Wang (2002) found normal weight adolescents have a propensity to engage in more vigorous physical activity than adolescents that are overweight.

Vigorously physically activity decreases the risk of becoming overweight. Adolescents that are currently overweight or at risk of being overweight spend more time engaged in television watching and are at greater risk of gaining more weight (Patrick et al., 2004). However, if overweight and obese adolescents become physically active their rate of weight loss is larger than those adolescents that are of normal weight. This was shown in a longitudinal study by Berkey and colleagues (2003) where normal weight adolescents, aged 10 to 15, who increased their regular physical activity decrease their overall BMI by -0.06 kg/m² per hour increase in daily activity compared to overweight adolescents -0.22 kg/m². However, if physical inactivity increases, adolescent girls BMI tends to increase +0.05 kg/m² per hour increase in daily TV/videos/videogames.

Therefore, it is important to get younger adolescents to be physically active as excessive television watching (>2 hours/day) tends to be greater in younger adolescents than older adolescents (Lowry et al., 2002).

Boys spending 3.5 hours a day compared to girls spending 2.5 hours a day engaged in television, videos, and video games were more likely to experience an increase in their BMI; however, as boys aged they tended to become more physically active leading to a decrease in their BMI (-0.22 kg/m²) (Berkey et al., 2003). Incidentally, older adolescent boys also tended to increase their leisure-time computer use from 11.4 to 15.2 hpw from early to mid-adolescence and 10.4 to 14.2 hpw from mid
to late adolescence (Nelson et al., 2006). Among girls Must and colleagues (2007) found the opposite as girls at 10 years spend more time being active, 4.2 hours per day, compared to, 3.7 hours per day by age 17. With the decline in activities in older adolescent girls the amount of screen time also decreased by one-half (3.6 to 1.8 h/d). Thus, the strong association between screen time and activity levels is not strong (Must et al., 2007).

Nevertheless, adolescent physical activity has been shown to be inversely related to percent body fat (Must et al., 2007). This is because the odds for boys and girls to become overweight or obese is higher when hours of screen time increases during adolescence and into young adulthood regardless of physical activity levels. Screen time independently predicts young adulthood obesity (Boone et al., 2007).

**School Based Intervention**

Television viewing is a correlate to the rise in obesity. Children aged 6-11 years watch a total of 28 hours of television a week (McDonough, 2009). Adolescents, on the other hand, watch an average of 19-22 hours of television a week (Van den Bulck and Van Mierlo, 2004). If portable electronic devices are added, youth 8-18 years old spend a total of 53 hours a week engaged in “media multitasking” (Rideout et al., 2010). Even so, nine months out of the year youth are spending much of their time in school (on average 35 hours a week). Therefore, since so much time is spent in the school environment it is an important medium for interventions to prevent and treat childhood obesity.

The school’s environment provides children and adolescents with social groups, up to two meals a day (breakfast and lunch), snacks, recess and physical education. It is here that children start becoming independent and start choosing what type of
activities they do at recess, what type and how much food they consume, and who their friends are going to be. Therefore all of the influences children and adolescents are subjected to in schools are ideal settings to encourage living a healthy lifestyle through a proper diet and regular physical activity.

When school-based health promotion programs are implemented and geared toward 4th and 5th grade students over the course of a school year, a child’s knowledge, understanding, healthy eating and physical activity increases (Sahota et al., 2001). Foster and colleagues (2008) found when children were provided with 50 hours of food and nutrition education per school year, with all food within the school meeting the nutritional standards based on the Dietary Guidelines for Americans, significantly fewer children became overweight (7.5%) compared to those children not receiving that exposure (14.9%). Furthermore, when school interventions use health education combined with increasing physical activity and decreasing fat and sodium within a child’s diet, strong positive results emerged. In the two intervention schools used in this study the total fat intake decreased by 15.5 and 10.4 percent, saturated fat decreased by 31.7 and 18.8 percent, sodium decreased 40.2 and 53.6 percent and the children increased the amount of time they spent in moderate-to-vigorous physical activity from 10 to 40 percent (Simons-Morton et al., 1991). However, most school interventions modifying both diet and physical activity typically only see results in the physical activity. This is because trying to change a child’s diet is much more difficult as a child does not have much say on what type of food will be served at school or in the home. In addition, dietary changes are hard to measure compared to physical activity and therefore if dietary changes in children do occur it is not always captured through dietary surveys.

As for physical activity, many school-based interventions have shown positive results. Lanningham-Foster and colleagues (2008) compared traditional classroom with
chairs and desks to an activity-permissive environment, a traditional classroom with
desks that encouraged standing, and children on summer vacation. When the children
had the opportunity to engage in more physical activity, children in the activity-
permissive environment (115 ± 3 m/s²) and summer vacation environment (113 ± 8
m/s²), moved more than the traditional school setting (71 ± 0.4 m/s²) (Lanningham-
Foster et al., 2008).

Sustainability of these programs has always been an issue. In some wellness
interventions in schools, short-term effects have been seen. This is in part due to
dosage of the intervention. However, Foster and colleagues (2008) found that two years
after food and nutrition education was delivered the odds for children to become
overweight were 35 percent lower than those children who did not receive that
information (15%). Similar results were seen with the CATCH program where it was
found that by changing the school environment to one that supports healthy behaviors is
able to provide sustaining effects in elementary students 5 years post-intervention
(Hoelscher et al., 2004). Thereby, a sustainable healthy behavior intervention lasting
throughout elementary, middle, and high school could be cost effective. This was
demonstrated by Wang and colleagues (2008) as they found that for 641 students, by
investing $14 in a student per year, 1.9 percent or 5.8 of 310 female students would be
prevented from becoming overweight adults saving society approximately $15,887 in
medical care costs and $25,104 in loss of productive costs. For that reason, and as
these studies have indicated, investing in promoting a healthy environment with
adequate nutrition and physical activity at an early age not only increases an individual’s
quality of life as they age but also decreases health costs.
Parental Influence in Childhood Obesity

Changing the school environment by encouraging more physical activity and eating a healthier diet is likely important and helpful in the prevention and treatment of childhood obesity. Members of the community such as administrators, teachers, health care workers, and parents also need to model these behaviors to instill leading a healthy lifestyle can be achievable and maintainable amongst children and adolescents.

Multiple factors influence a child’s food choices (peer pressure, affordability, school lunch, busy lifestyle, etc.). It is important that interventions that are geared toward preventing childhood obesity begin with the primary influence, the parents. This is important as the physical and dietary environment a child grows up in has the potential to influence the type of adult a child will become (Beydoun and Wang, 2009).

Beydoun and Wang (2009) examined parent-child dietary pattern interrelationships in the United States using the USDA 2005 Healthy Eating Index Score (HEI), and found child-parent resemblance is relatively weak and differs by nutrients, food groups, and social demographic characteristics. Nevertheless, diet quality between child and parent appear to be similar. As children age, 10 years and older, their dietary intake becomes more similar to their parents. The odds for children having a healthy diet increase three-fold when their parents also have a healthy diet.

In addition to dietary habits, weight of parents also influences a child’s weight status. Therefore, having at least one obese parent increases the risk of a child being overweight. Girls from overweight families tend to have a significantly higher BMI; these girls tend to watch more television and eat more snacks while watching television leading to an increase in fat consumed, thereby resulting in a higher BMI.

As described previously, the odds of becoming overweight as a child or adolescent increases when the hours of television viewing increases. However, in non-
overweight families, girls snacking patterns did not predict an increase in BMI. Hours spent watching television were also not related to boys of normal-weight parents (Vandewater and Huang, 2006). Consequently, amount of television viewing was the only predictor of an increase in girls BMI if that girl came from an obese family (Francis, Lee and Birch, 2003).

Several environmental factors play a role in children being sedentary including the enjoyment and preference for screen-based behaviors, family or social factors, rules and restrictions regarding television viewing, parents’ screen time behavior, frequency of family television and computer time, and access to electronic games. If the parents of a child watches greater than 2 hours of television a day as an individual or as a family their child’s television viewing tends to increase significantly. Additionally, if parents report ≥30 min/day of computer and electronic game use, boys and girls are more apt to be sedentary (Salmon et al., 2005). On the other hand, for families that restrict television viewing during mealtimes were less likely to watch 2 or more hours of television a day.

Not only is the family environment influential to a child’s weight but so is the awareness of a child’s weight status. For many parents, recognizing that their child is overweight or obese is difficult. Several studies have found most parents tend to underestimate their child’s weight (Wald et al., 2007; Tschamler et al., 2010). Of 355 child-parent pairs 65 percent of parents considered their overweight child as being of normal weight and 65 percent of parents considered their obese child to be overweight with only 31 percent of those parents being concerned about their child’s weight. Eckstien and colleagues (2006) found similar results where few parents, (36%) identify their child as being overweight or were worried about their child’s weight status. This inability to accurately categorize their child’s weight was associated with mother’s weight status and overweight mothers being the most inaccurate (He and Evans, 2007).
Therefore parents need to not only realize if their child is on the verge of becoming overweight, is overweight or obese but they also need to recognize that their own behavior is influencing their child’s behavior.

**Adults, Television Viewing and Diet**

The school and home environment are the most important and frequently used mediums for childhood obesity interventions. The home environment too, can be seen as a place of intervention, in the lives of adults. Since unhealthy behaviors in children and adolescents are in part, learned from their parents or other adults, a change in such behaviors needs to begin with adults. Modifying the home environment to one that promotes healthy food choices and physical activity as a family increases the opportunities for sustainable changes.

As in youth, adults with higher weight status are more likely to have high amounts of television viewing and associated consumption of high energy dense foods (Stroebele and de Castro, 2004). Blass and colleagues (2006) found young adults given the choice to eat high energy dense foods such as pizza or macaroni and cheese with the television on and off consumed more calories and a longer mealtime when the television was on (793.7 kcal) compared to when the television was off (538.2 kcal). This pattern of would result in a 3-fold increase in men’s and 60 percent increase in women’s abdominal obesity, an independent predictor of cardiovascular disease (Cleland et al., 2008).

Unlike children and adolescents, adults have more control over what type of food they are eating and when they are eating it. However, just as with children and adolescents, adults do not always notice how much they are eating when watching television. Stroebele and Castro (2004) found that adults eating main meals in front of
the television increased the amount of total viewing time and small meal frequency whereas overall physical activity decreased. Eating small meals while watching television also led adults to underestimate their total food intake (Moray et al., 2007); inability to estimate calories consumed, increased daily energy intake leading to a risk for weight gain (Stroebele and de Castro, 2004). However, adults who habitually ate regular sized meals in front of the television were able to accurately predict their total calorie consumption (Moray et al., 2007).

**Adults, Television Viewing and Physical Activity**

Habitual television viewing while consuming energy dense food is a learned behavior that stays relatively static throughout life. The amount of physical activity individuals engage in from childhood through adulthood, on the other hand, is not. Over the course of transitioning from adolescents into young adults, a decline in moderate to vigorous physical activity to less than five bouts per week occurs. Physical activity is replaced with an increase in screen time of greater than fourteen hours per week among all ethnicities. This signifies a shift in an age-related decline in physical activity upon entering adulthood (Gordon-Larsen et al., 2004).

Even with this age-related decline, physical activity is not strongly associated with screen time in adults (Jeffery and French, 1998). Being sedentary is not the same as being physically inactive (Tudor-Locke and Myers, 2001). An individual may receive the recommended amount of physical activity, 150 minutes of moderate-intense aerobic activity a week, yet still spend large amounts of time in sedentary activities (CDC, 2010; Haskell et al., 2007). Therefore, sedentary behaviors are independent from physical activity (Hu et al., 2003).
Activity during childhood and adolescence may have an effect on how activity. Trends in the transition from childhood to adulthood have shown that physical activity decreases with age, smoking, lower education, and alcohol consumption (Simoes et al., 1995). Those individuals who engaged in regular physical activity as an adolescent and had a higher physical fitness test score were more likely to be physically active as adults (Azevedo et al., 2007; Dennison et al., 1988; Tammelin et al., 2003; Telama et al., 2005).

Even if physical activity is variable across life stages, the importance of physical activity never changes. Physical activity is important at all ages because it helps maintain body weight, reduce the risk of cardiovascular disease, type 2 diabetes, some cancers, and strengthens bones and muscles. For that reason the American College of Sports Medicine (ACSM) and the Centers for Disease Control and Prevention (CDC, 2008) have established physical activity guidelines for individuals of all ages. For adults 18 to 65 years of age it is recommended to engage in 30 minutes of moderate-intense physical activity 5 days a week or 20 minutes of vigorous physical activity 3 times a week (Haskell et al., 2007). In 2009, the Behavioral Risk Factor Surveillance System (BRFSS) and the Center for Disease Control and Prevention found that 51 percent of adults met these physical activity recommendations, which has slowly increased since 2001 with only 46.1 percent (CDC, 2008). However, in 2010 the U.S. Department of Health and Human Services reported that only 3 in 10 adults get the recommended amount of physical activity with 37 percent of adults not engaging in any physical activity (Ogden et al., 2010).

As a result, emphasis has been placed on having a manageable daily physical activity routine encouraged through behavior modification. In doing so, lifestyle modification has been shown to be more cost effective than a more structured exercise
program with similar improvements in fitness levels, $46.53 per month vs. $190.24 per month, respectively, (Sevick et al., 2000). Environmental factors and sociodemographic characteristics such as access to sidewalks, trails, and the feeling of safety are all important components of having a physically active lifestyle. Huston and colleagues (2003) found that streets and roads (41.7%), homes (37.6%), private gyms (10.5%) and workplace facilities (9.6%) were the most common places where individuals were physically active. Activity level of individuals is also affected by socioeconomic status partly by having less safe access to places for physical activity. For that reason environmental changes that promote safe areas for physical activity are crucial.

**Adults and Computer Use**

In addition to the environmental impact on physical activity, the technology environment has changed the way adults entertain themselves and conduct day-to-day tasks. With the help of the World Wide Web individuals communicate, receive the news, shop, and even earn a degree without leaving the comfort of their homes. This change in civilization has lead American’s to spend an average of 68 hours a month online. Despite unlimited capabilities of the World Wide Web, Americans still spend more time watching television than using the computer (Rideout et al., 2010).

Because adults live in a technology-based world, media multitasking is on the rise. For example, the act of being on the computer while watching television is becoming more common. However, contrary to high television viewing, high computer use in children, adolescents, and adults has not been found to be associated with body mass index (Fotheringham, Wonnacott and Owen, 2000); rather high computer use has been associated with inactivity. Fotheringham, Wonnacott and Owen (2000) found adults with the highest level of computer use (>8 hours per week) had a tendency to be
male and sedentary (73%). College-age male’s spent on average, 7.1 hours each week on the Internet compared to female’s 5.4 hours per week. Females also tended to use the Internet more for e-mails, research, online shopping and chatting whereas males use the internet for news, playing games, and listening to music (Odell et al., 2000). The World Wide Web is a technology that not only provides instant access with everything being, “only a click away”, but also promotes a lifestyle.

Synopsis

Obesity is a complex disease that has arisen from multifaceted interactions of environmental and heritable factors. Apart from the heritable factors, the basis for the rise in overweight and obesity is due to an energy imbalance. This energy imbalance is a result of an increase in calories consumed, a decrease in regular physical activity, or both (CDC, 2010). Even though there are a multitude of reasons that have contributed to obesity such an energy imbalance, lack of sleep, medication, type of job, busy lifestyle, etc., these areas have not been as extensively explored (McAllister et al., 2009). Therefore, the main focus of this thesis has been on the four primary contributors: screen time, diet, exercise and environment and their influence on an individual’s weight status from childhood through adulthood.

Since the 1980’s time spent watching television has increased in children, adolescents, and adults (Strasburger, 1993). Children and adolescents watch between 19-22 hours of television per week whereas some adults watch up to 32 hours a week (Van den Bulck and Van Mierlo, 2004). In addition, total energy intake from energy dense food has also been on the rise (Wiecha et al., 2006). By watching greater than the recommended 2 hours a day of television, 167-400 additional kilocalories are being consumed leading to higher body mass index overtime (Wiecha et al., 2006; Van den
Bulck and Van Mierlo, 2004). Ultimately the increased number of hours spent watching television per day is associated with an increased prevalence of obesity (Crespo et al., 2001; Gortmaker et al., 1996).

Physical activity and entertainment media, on the other hand, have not been found to be associated with body mass index in children, adolescents, and adults (Hager, 2006; Laurson et al., 2008b; Ekelund et al., 2006; Marshall et al., 2004; and Fotheringham, Wonnacott and Owen, 2000). Even though there is an age-related decline in physical activity upon entering adulthood, physical activity does not appear to be associated with screen time. A rise in other sedentary behaviors may be occurring (Gordon-Larsen et al., 2004; Jeffery and French, 1998; Tudor-Locke and Myers, 2001; Hu et al., 2003). Such sedentary behaviors may include the use of entertainment media, such as Internet, computer, and video game, which has led to an increase in inactivity, partly due to media multitasking (Rideout et al., 2010; Cummings and Vandewater, 2007).

With screen time, diet, and physical activity behaviors being associated with obesity from childhood through adulthood, environmental exposure is partly to blame for the rise in obesity (Beydoun and Wang, 2009). The amount of time spent watching television, type of food consumed, amount of physical activity, and weight status of an adult can all influence the behaviors of their children (Beydoun and Wang, 2009; Francis, Lee and Birch, 2003). Therefore when trying to disrupt unhealthy behaviors, such as eating while watching the television, interventions may need to begin at home with the parents.

Additionally, interventions to promote healthy lifestyles by exploring the relationship between screen time multitasking and eating behavior in young adults and an in school health buddy system to encourage elementary students to become more
physically active while consuming nutritious foods, can be accomplished. Overall, a supporting community and education on how to be a healthy individual and family is needed in the fight against obesity.

I performed two studies during the course of my graduate studies and the results of these studies are contained in this thesis. The purpose of the first study was to determine the difference in the amount of snack food a person consumed while watching television without interruptions or while watching television and multitasking (chatting). Overall, the goal of this study was to understand the impact, if any, of multitasking on caloric intake of snack foods in young adults. The purpose of the second study was to implement a school-based health intervention (Let’s Go 5-2-1-0) that focuses on improving child behaviors related to screen time, diet, exercise and environment. The results and implications of each of these studies are discussed here. Each study is written separately in scientific manuscript format to allow for submission of each study for scientific review by a scholarly journal in the field of nutrition, physical activity and obesity.
CHAPTER III – TECHNOLOGY BASED MULTITASKING POSES
IMPLICATIONS FOR WOMEN

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Abstract

Over the past 12 years media multitasking has been on the rise with much of the multi-media increase being computer usage while watching television. Since media multitasking is already occurring, disrupting negative behaviors through media multitasking may lead to changes in snacking behavior and overall energy intake in adolescents and adults. Therefore, the purpose of this study was to examine the potential to disrupt snacking behavior associated with television watching through the use of multitasking. Twenty-three men and 27 women (aged 25 ± 4 y, BMI 25.2 ± 4.1 kg/m² and 23 ± 4 y, BMI 25.5 ± 6.4 kg/m²) participated, each completing both the control (watching a movie) and treatment (watching a movie while online chatting) activities. We observed sex differences with females consuming significantly more popcorn while chatting (P = .051) compared to males who consumed significantly more popcorn while not chatting (P = .041). Chip consumption was significantly greater (P = .026) when not chatting for all participants. We also observed weight status and sex differences with more (P<0.05) overweight and obese females consuming cookies while chatting compared to significantly more (P<0.05) overweight and obese males consuming popcorn while not chatting. Therefore media multitasking have negative implications for females, especially those who are overweight or obese.
Introduction

Obesity has become a growing public health concern over the past three decades afflicting people of all ages and all socioeconomic groups. In the United States, overweight and obesity affects 72.3 percent of adult men and 64.1 percent of adult women (Flegal et al., 2010). One factor associated with these rising rates of overweight and obesity is screen time. The main debate around screen time and obesity is whether the different modes of screen time impact dietary intake (increased caloric intake), physical activity (increased sedentariness), or both.

As adolescents transition into adulthood, time spent in moderate to vigorous physical activity declines whereas television viewing (TVV) rises (Gordon-Larsen et al., 2004). By increasing the time spent in sedentary activities, such as television viewing, the risk for obesity also increases. It has been found that men and women who engage in the most television viewing, greater than 3 hours/day, tend to have a 2-4 fold increased risk of becoming obese than those who watch the least amount of television (Bowman, 2006; Hu et al., 2003). Physical activity declines with age as well, but the relationship of this decline to screen time is less clear (Jeffery and French, 1998).

On the other hand, excess calories consumed while watching television appear to be more strongly related to the risk of obesity compared to physical activity. When television is watched at high volumes it can contribute to weight gain indirectly, by increased exposure to energy-dense food advertisements, or directly through increased calories consumed. In a study conducted by Blass and colleagues (Blass et al. 2006) young adults who ate calorically-dense foods with the television on consumed more calories (793.7 kcal) compared to when the television was off (538.2 kcal). This behavior coupled with increased television viewing, increased small meal frequency and an overall decrease in physical activity can lead to a higher body mass index (BMI),
defined as the weight in kilograms divided by height in meters squared (kg/m\(^2\)) (Stroebele and de Castro, 2004).

Television viewing can also influence the amount of time spent in media multitasking. The Kaiser Family Foundation reports media multitasking has increased from 16 percent in 1999 to 26 percent in 2005 with much of the multi-media increase being computer usage while watching television (Rideout, 2010). As media multitasking is on the rise, American’s are watching more television, 153 hours every month, compared to 68 hours a month on the Internet (McDonough, 2009). Since media multitasking is already occurring, disrupting negative behaviors through media multitasking may lead to changes in snacking behavior and overall energy intake in adolescents and adults. A study that examined 13 activities and the likelihood of 3 generations performing those activities separately or together found those individuals who were born between 1980 and the present (Net generation) were able to multitask more and better than individuals who were born between 1965-1979 (Generation X) and 1946-1964 (Baby Boomers). The Net generation has grown up with technology so they are more inclined to spend time instant messaging, using the Internet, playing video games, texting, eating and listening to music while doing other tasks compared to the older two generations (Carrier et al., 2009). Disrupting negative behaviors have shown to be related to television viewing may be a good target for obesity prevention.

In the present study, we examined the potential to disrupt snacking behavior associated with television watching through the use of multitasking. Our hypothesis was young adults would change their snacking behavior when multitasking, in the form of online chatting, was combined with watching a movie.
Recruitment and Eligibility

The University’s Institutional Review Board approved the study. Subjects were recruited through flyers placed around campus targeting high traffic areas including large lecture halls, on-campus cafes, and student study areas. Subjects responded to the flyers via E-mail and were provided detailed information about the study. Eligibility criteria for the study were men and women between the ages of 18-35, a BMI > 18.5, in general good health, no known major metabolic diseases (diabetes, hypoglycemia, hyperglycemia, thyroid disorder), not known to be pregnant, no allergies to any of the foods provided during the study, and were non-smokers. If the interested subjects still wished to participate, they were encouraged to select appointments at approximately the same time on two days for participation.

Procedures

The purpose of the study was to determine the difference in the amount of snack food consumed while watching television and multitasking (chatting) or while watching television without multitasking. However, slight deception was used by telling the subjects, “The study intends to examine the effect of a test meal on activity and behavior while watching television and chatting.”

The study consisted of two visits within one week to the Nutrition Wellness Research Center on the University’s campus. One visit served as an experimental visit and the other visit served as a control. Each participant was given an e-mail reminder to abstain from food and beverage for at least 6 hours prior to their arrival. The days were randomized according to availability between experimental and control visits.

On the first visit, subjects read and signed an informed consent document. Participants were also given a physical activity, eating behavior, and screen time survey
and asked to provide demographic information (race, ethnicity, date of birth, education level, and occupation). Participant’s height and weight were measured with shoes removed and in light clothing using a stadiometer and scale, respectively (Seca Model 763, Sec GmbH, Hamburg, Germany). BMI was calculated from the weight in kilograms divided by the height in squared meters. At both the control and experimental visit, participants were seated in a private room, which had a couch, table, end table, and television with DVD player. For both visits participants were given a selection of eight movies, each approximately 90 minutes in length, and were allowed to select one to watch. Participants were given a standard snack of approximately 150 calories and were asked to eat it before the movie started. Four snacks of similar caloric content (120-150 calories per 30g serving) were available for the participants to consume at their leisure. These snacks included cheese crackers, cookies, popcorn, and chips and were weighed out and placed in the study room on a table next to the couch prior to the arrival of the participant. Water was also provided ad libitum. Participants were instructed not to consume any outside food or drink throughout the duration of the study. Additionally, all participants’ cell phones were removed for the study duration. Participants were fitted with four small (<15 gram) wire-free accelerometers (Msr-145S Standard Data Logger) on each thigh and upper arm.

The movie choices and access to food for the experimental visit were the same as the control visit; however, participants were given a laptop and asked to chat with a member of the lab staff as well as any outside contacts they may find during the session, via Google’s GChat, using a generic account provided by the lab. The participants watched a movie of their choosing. They were encouraged to stay active on the laptop chatting and were informed that their chat content and browsing would not be recorded.
The chat content with the lab staff followed a script of both closed- and open-ended questions of a non-sensitive nature.

At the conclusion of each session the activity sensors were collected from the participant and after the subject had left, the remaining food was collected and weighed to determine the amount of each type consumed during the study. After the experimental session, a lab staff member copied and pasted the participants’ chat into a word processing program and conducted a character count and a word count to determine the volume of chatting. Copies of the chats were then deleted.

Data Analysis

Survey data and food consumption data were tested using a mixed-model analysis of variance (ANOVA) categorized on the basis of sex and body type (normal vs. overweight/obese). BMI and age were also used as continuous data to assess differences in survey information and food consumption using a linear model of variance (ANCOVA). Subjects were categorized as eating more or less of a certain food either while chatting or not chatting. To do this we used prior prevalence as the parameter for a binomial distribution with the assumption that there would be a 50/50 chance of our subjects to consume either more or less food while chatting or not chatting. However, when we collected our data, the 50/50 chance did not hold true and thus we used our experimentally determined prevalence as the parameters for our binomial distribution of eating based on type of food, sex, overall prevalence, or all combinations of these. All statistical tests were analyzed as two-tailed test with statistical significance assumed at P < 0.05.
Results

The present study included 50 individuals. Demographic characteristics of participant age, height, weight, and BMI are presented in Table 1. Among the 50 participants 14 males and 17 females were considered lean with a BMI <25.0 kg/m² (mean BMI <25.0 kg/m², 21.96 kg/m²) while 9 males and 10 females were considered either overweight or obese with a BMI >25 (mean BMI >25.0 kg/m², 29.36 kg/m²). There were no significant differences in the amounts of foods consumed between the study visits for each food (popcorn, chips, cookies, or crackers) (Table 1).

Results from the physical activity, screen time and eating behavior survey administered at the beginning of the study suggest no significant differences in these behaviors, except for the amount of time reported to be spent in video gaming (data not shown). Males participated in the highest amount of video gaming compared to females (P <0.005, males: 3.028 ± 3.98 hr/d vs. female: 0.118 ± 0.332 hr/d). ANCOVA results revealed a significant interaction (P = 0.040) between sex and BMI relative to the amount of video gaming. Overweight/obese males reported playing 3.5 ± 4.6 hours of video games each week and normal weight males reported playing 2.7 ± 3.6 hours of video games each week. Overweight/obese females reported playing no video games each week and normal weight females reported playing 0.17 ± 0.39 hours of video games each week. Additionally, sex-related trends (P = 0.08) were also observed related to chatting; females spent more hours each week in computer chatting. Normal weight females chatted 11.1 ± 8.8 hours each week and overweight/obese females chatted 18.0 ± 12 hours each week. Normal weight males chatted 9.9 ± 9.7 hours each week and overweight/obese males chatted 7.2 ± 7.2 hours each week.
Figure 2 and 3 examined participants who ate more or less during chatting versus non-chatting rather than absolute amount of food consumed. Variances were too high on actual food consumption to elicit any significant differences; therefore change in consumption was examined. In these calculations we also included only those individuals who consumed a portion or all of the food given. Therefore, when looking at the percentage of subjects who consumed more snacks while chatting versus non-chatting, females consumed significantly more popcorn while chatting ($P = .051$) compared to males who consumed significantly more popcorn while not chatting ($P = .041$). Chip consumption was also significantly greater ($P = .026$) when not chatting when male and female consumption was combined (Figure 2). Participant's BMI was also a factor in snack consumption while chatting versus non-chatting with significantly more ($P<0.05$) overweight and obese females consuming cookies while chatting compared to significantly more ($P<0.05$) overweight and obese males consuming popcorn while not chatting (Figure 3).

**Discussion**

This study was designed to measure the effects of engaging in multitasking (chatting) on snacking behavior. Sight deception was used by informing participants, “The study intended to examine the effect of a test meal on activity and behavior while watching television and chatting”. Since the focus was not physical activity but rather food consumption, no physical activity data has been reported at this time. Instead, our hypothesis was that when participants were instructed to watch a movie while multitasking (chatting) snacking behavior would change.

Our results were supportive of our hypothesis demonstrating food consumption is related to multitasking but is dependent on sex and weight status. Females and also
overweight/obese females consumed significantly more snacks while multitasking (chatting while watching a movie) compared to males. Males, including overweight/obese males consumed less snacks while media multitasking. The implications for these sex and weight status differences in snacking and media multitasking deserve further exploration.

It has been found that transitioning from adolescents into young adulthood increases sedentary time in both males and females by 2 hours/day (men: 50.8 percent, 7.2 hours/day; women: 53 percent, 7.3 hours/day) (Matthews et al., 2008). Thomson and colleagues (2008) found that in young adults, men watch significantly more TV per day (men, $2.1 \pm 1.6$ h/d; women, $1.7 \pm 1.2$ h/d; $P<0.01$) leading to significantly larger waist circumferences than women (men, $89.5 \pm 10.5$ cm; women, $78.2 \pm 11.4$ cm; $P<0.01$). However, they also found that time spent watching TV increases with an increase frequency of consuming food and beverages during TVV, leading to a 3-fold increase in the prevalence of moderate abdominal obesity in men and 60 percent higher rate of severe abdominal obesity in women with severe abdominal obesity being nearly twice as high in women who consumed snacks and soft drinks during TVV. Thereby leading to women having a significant correlation to waist circumference ($r=0.16$) after adjustment for demographic characteristics compared to men (Thomson et al., 2008).

Possible cause for this increase in waist circumference in females may be due to women who spend the greatest amount of time watching TV being more prone to spend time in other sedentary behaviors and not engage in leisure-time physical activity, contrary to men (Sugiyama et al., 2008). Even when television viewing is reduced, no significant decreases in total energy intake occur, unlike in children where a 50 percent reduction in screen time (TV, videotape, computer, video games) significantly reduced their total energy intake and BMI (Otten et al., 2009; Robinson, 1999). This difference in
response to changes in screen time may be due to adults having more established patterns of food consumption, especially snacks and soft drinks, during sedentary behaviors compared to children (Nielsen, Siega-Riz and Popkin, 2002).

Other studies have also demonstrated a relationship between dietary intake and multitasking with screen use. Shi and Mao (2010) examined recreational computer use with snacks and reported excessive recreational computer use (>3 hours/day) predicted undesirable eating behaviors of high intake of fast food and sugary beverages in adolescents. In contrast, if adolescents were not exposed to excessive media (>3 hours/day) during the week or weekend they decreased their overall consumption of fast food and sugary beverages while increasing their consumption of fruits and vegetables. This maybe due to less fast food and sugary beverage advertisement viewed (Shi and Mao, 2010; Weber, Story and Harnack, 2006; Boynton-Jarrett et al., 2003). Because Internet use also provides food advertisements, an association between high computer use and risk of being overweight has also been observed (Shi and Mao, 2010; Lajunen et al., 2007). As for other technology-based multitasking it has been found that those activities, such as high cell phone use, may also lead to an increased risk of being overweight (Shi and Mao, 2010; Lajunen et al., 2007; Eisenmann, Bartee and Wang, 2002). Media-multitasking also has a negative impact on productivity, as media-multitasking actually decreases performance by taking longer to complete a task well than if full concentration was given to the project (Crenshaw, 2008). Although some evidence supports that women are more efficient at multitasking as compared to men, multitasking may not be a good strategy to disrupt snacking during television watching for women.

Even though these results are based on a relatively small sample, there is also evidence to suggest that there are differences between lean and overweight individuals.
Therefore more research in this area of food’s interaction with technology is needed to examine how sex and weight status influence food choices with multitasking among sedentary activities such as chatting, video gaming, and television viewing.

To our knowledge, this is the first study to examine snacking behaviors associated with technology based multitasking behaviors in young adults. However, a study of 9-13 year olds reported similar results to this study was observed where no change in energy consumption when multitasking occurred. In that study motor video games, playing video games while walking on a treadmill at 1.2 km.h\(^{-1}\), verses sedentary video gaming does not alter energy consumption in children (Mellecker et al., 2010). The data suggests when snacks are freely available energy intake prevails in children and young adults even when both hands are involved in a task or game.

We recognize there were limitations to the current study. Limitations included: snacks provided might not have appealed to every participant, snack amounts were limited as they were the same amount for every participant, and snacks were not in their original package. The selected snack foods were selected due to their commonality and nutritional values in calories and fat. Therefore even though they may not have appealed to everyone, a certain percentage of the subjects ate the snacks. Future inclusion criteria might be to select individuals who not only were not allergic to the snack foods but that they like the snack foods. An additional limitation of this study is the time of day the study participant participated. For example, if a participant’s scheduled participation time was in the morning and they tended not to be breakfast eaters these participants total grams of snacks consumed would likely be lower than someone whose participation time was in the afternoon. Additionally, due to the low number of overweight and obese males and females in this study future research is needed to explore this weight category more thoroughly, as ANCOVA suggested weight status was significant, to see
if there is a significant difference in weight status and amount of food consumed while watching television and multitasking with online chatting.
Table 1. Demographics and food consumption for FIT participants

<table>
<thead>
<tr>
<th></th>
<th>Men (n = 23)</th>
<th>Women (n= 27)</th>
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<tbody>
<tr>
<td>Height (cm)</td>
<td>178.3 ± 6.9</td>
<td>165.5 ± 6.7</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>80.0 ± 11.5</td>
<td>70 ± 18.5</td>
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<tr>
<td>BMI (kg/m²)</td>
<td>25.2 ±4.1</td>
<td>25.5 ±6.4</td>
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<tr>
<td>Age (yrs)</td>
<td>25 ± 4</td>
<td>23 ±4</td>
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**Food Consumption (g)**

- chat or +chat

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<thead>
<tr>
<th>Food Item</th>
<th>Men (-chat)</th>
<th>Men (+chat)</th>
<th>Women (-chat)</th>
<th>Women (+chat)</th>
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<tbody>
<tr>
<td>Popcorn</td>
<td>12.3 ±12.9</td>
<td>10.8 ±12.0</td>
<td>12.1 ± 11.3</td>
<td>15.6 ± 11.4</td>
</tr>
<tr>
<td>Chips</td>
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<td>33.3 ±22.0</td>
<td>25.6 ± 22.8</td>
<td>29.9 ± 21.1</td>
</tr>
<tr>
<td>Cookies</td>
<td>56.4 ±30.3</td>
<td>48.6 ±33.9</td>
<td>27.6 ± 26.5</td>
<td>38.3 ± 32.5</td>
</tr>
<tr>
<td>Crackers</td>
<td>27.2 ±25.4</td>
<td>36.6 ±31.7</td>
<td>28.7 ± 21.2</td>
<td>32.7 ± 27.7</td>
</tr>
<tr>
<td>Total (-chat)</td>
<td>135.9 ±54.8</td>
<td>129.3 ±62.4</td>
<td>93.8 ± 60.6</td>
<td>116.4 ± 55.5</td>
</tr>
<tr>
<td>Total (+chat)</td>
<td>129.3 ±62.4</td>
<td>116.4 ± 55.5</td>
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</tbody>
</table>
Figure 1. Patterning of food consumption during movie watching while chatting vs. non-chatting

<table>
<thead>
<tr>
<th>Group</th>
<th>Prevalence Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Food Specific</td>
</tr>
<tr>
<td>a</td>
<td>Popcorn</td>
</tr>
<tr>
<td>b</td>
<td>Popcorn</td>
</tr>
<tr>
<td>c</td>
<td>Chips</td>
</tr>
<tr>
<td>d</td>
<td>Chips</td>
</tr>
<tr>
<td>e</td>
<td>Chips</td>
</tr>
<tr>
<td>f</td>
<td>All Foods</td>
</tr>
</tbody>
</table>

Figure 1a. Significance values of all consumption patterns based on the prevalence of food consumption, based on food-specific, sex-specific, comprehensive, or even prevalence of consumption. Significance levels are shown for all significant comparisons. P-values are shown for non-significant comparisons. P-values > 0.10 are shaded.
Figure 2. Patterning of food consumption during movie watching while chatting vs. non-chatting, separated by body category: Normal = BMI < 25 kg/m², OW/OB = BMI >= 25 kg/m²

<table>
<thead>
<tr>
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<th>Food Specific</th>
<th>Sex Specific</th>
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<td></td>
<td>Popcorn</td>
<td>Normal Female</td>
<td>&lt; 0.05</td>
<td>0.075</td>
<td>&lt; 0.0025</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>b</td>
<td></td>
<td>Popcorn</td>
<td>OW/OB Female</td>
<td>&gt; 0.10</td>
<td>&gt; 0.10</td>
<td>&lt; 0.05</td>
<td>0.090</td>
</tr>
<tr>
<td>c</td>
<td></td>
<td>Cookies</td>
<td>OW/OB Female</td>
<td>0.070</td>
<td>&lt; 0.05</td>
<td>&lt; 0.01</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>d</td>
<td></td>
<td>Goldfish</td>
<td>OW/OB Female</td>
<td>&gt; 0.10</td>
<td>&gt; 0.10</td>
<td>&lt; 0.05</td>
<td>&lt; 0.090</td>
</tr>
<tr>
<td>e</td>
<td></td>
<td>Chips</td>
<td>Normal Male</td>
<td>&gt; 0.10</td>
<td>&gt; 0.10</td>
<td>&lt; 0.05</td>
<td>&gt; 0.10</td>
</tr>
<tr>
<td>f</td>
<td></td>
<td>Popcorn</td>
<td>OW/OB Male</td>
<td>&lt; 0.05</td>
<td>&lt; 0.025</td>
<td>&lt; 0.05</td>
<td>0.066</td>
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</tbody>
</table>

Figure 2a. Significance values of all consumption patterns based on the prevalence of food consumption, based on food-specific, sex specific, comprehensive, or even prevalence of consumption. Significance levels are shown for all significant comparisons. P-values are shown for non-significant comparisons. P-values > 0.10 are shaded.
REFERENCES


CHAPTER IV – EXTRA CURRICULAR PHYSICAL ACTIVITY POSES BENEFIT TO
OVERWEIGHT AND OBESE ELEMENTARY STUDENTS

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A paper to be submitted to the journal *Obesity*

Abstract

Implementing school-based programs to establish healthy habits in youth have been found to have a positive impact. Additional benefits have been shown when supplementing classroom education with 1:1 health coaching provided by nursing students. Therefore the purpose of this study was to implement and evaluate health behavior change in elementary school children who received classroom health education along with mentoring from high school students. Forty-one 4th grade students (23 males and 18 females) participated in the intervention. No significant differences were seen in the outcome measures of BMI, BMI percentile, steps/day, and healthy habits from baseline and midpoint. However, upon examination of the pedometer data, we noted that males tended to walk more than females during both time periods (15630 ± 2509 steps/day vs. 14100 ± 1595 steps/day, P < 0.05 for fall, 15720 ± 22397 steps/day vs. 13580 ± 2359 steps/day, P < 0.01 for winter). There were significant differences in steps taken between subjects who participated in sports and those who did not participate in sports for both the baseline and midpoint period. These findings were independent of each other and led to an interaction between sports participation and body weight status with significantly more steps taken during fall sports (P < 0.063) and winter sports (P < 0.05) for overweight/obese children. This indicates the importance of involvement with
organized physical activities from a young age as a potential measure for obesity prevention with overall health benefits.

Introduction

Since the 1980’s the number of overweight and obese children in the United States has doubled (World Health Organization [WHO], 2011b; Centers for Disease Control and Prevention (CDC), 2010). In the most recent National Health and Nutrition Examination Survey (NHANES) data for 2007-2008 it was estimated that 12 percent of the nation’s children and adolescents ages 2-19 years were at or above the 97th percentile, 17 percent were at or above the 95th percentile, and 32 percent were at or above the 85th percentile (Ogden et al., 2010a).

Obesity is a multifactorial disease with many external factors contributing to the increase in body weight. Four primary external contributors leading to this rise in obesity include television viewing (largest component of screen time), diet, exercise, and environment. This evolution of increasing sedentary behavior and eating larger portions of processed food has led to an ever increasing rate of comorbidities such as diabetes, hypertension, hyperlipidemia, hypertension, and asthma in overweight children and adolescents (Daniels et al., 2005; Daniels 2006). Therefore, interventions geared at preventing child and adolescent obesity are needed.

Nine months out of the year youth are spending much of their time in school, approximately 35 hours a week. The school’s environment provides children and adolescents with social groups, up to two meals a day (breakfast and lunch), snacks, recess and physical education. It is here where children start becoming independent and start choosing what type of activities they do at recess, the type and amount of food they consume, and their friends. Therefore, schools are ideal settings for interventions
that encourage living a healthy lifestyle through a proper diet and regular physical activity.

Much of the emphasis on previous childhood obesity school interventions has been geared toward physical activity and nutrition (Nicklas, Hayes and Association, 2008). Programs such as Coordinated Approach to Child Health (CATCH) and SWITCH are school-based interventions that have aimed to modify physical activity and diet of elementary students. The CATCH program focus was on changing the behavior of elementary school students’ physical activity and healthy eating through curriculum provided by classroom teachers (Franks et al., 2007; Hoelscher et al., 2004; Lytle et al., 1996). SWITCH, on the other hand, was a community-, school-, and family-based intervention that focused on increasing physical activity, reducing the amount of screen time (television and video game time), and increasing fruit and vegetable consumption in elementary students by educating the public on childhood obesity prevention and by providing specific interventions for the families of elementary students (Franks et al, 2007; Gentile et al., 2009; Eisenmann et al., 2008).

It has been shown by Foster and colleagues (2008) that when children are provided with 50 hours of food and nutrition education per student per school year, with all food meeting the nutritional standards based on the Dietary Guidelines for Americans, significantly fewer children became overweight (7.5%) compared to those children who did not receive the exposure (14.9%). Additionally, when school-based health promotion programs were implemented over the course of a school year, a child’s knowledge, understanding, healthy eating and physical activity increased (Sahota et al., 2001).

A clinical-based toolkit modified into a school based program called Let’s Go 5-2-1-0 (formerly known as the Keep Me Healthy 5-2-1-0) is a program developed as part of the Maine Youth Overweight Collaborative (MYOC) (Polacsek et al., 2009). Let’s Go 5-
2-1-0 focuses on healthy habits where each number represents a specific behavior associated with preventing childhood obesity. Through motivational interviewing techniques, the messages are delivered to participating children to encourage healthy behaviors. Thus far, this framework and toolkit have shown promise as an intervention for addressing overweight risk among children (Rogers and Motyka, 2009).

The current study is an extension of a previous study, which examined the feasibility, logistics, and health outcomes of implementing the 5-2-1-0 program as a school based intervention in Rochester, Minnesota. In the previous study the Let’s Go 5-2-1-0 program was delivered by senior nursing students to 4-5th grade elementary students (Tucker et al., 2010). In the present study, the emphasis was to examine the health outcomes of implementing the 5-2-1-0 program in a smaller rural community with fewer resources. The program was targeted at three 4th grade classes where pre-selected high school students provided 1:1 weekly health coaching guided by principles of motivational interviewing. The purpose of the study was to implement and evaluate health behavior change in elementary school children who received classroom health education along with the mentoring from high school students. By providing weekly 1:1 health coaching this school-based intervention provides a unique component to preventing childhood obesity as many other school-based interventions such as CATCH and SWITCH only utilize community or classroom education. Thereby, our objective is that by working 1:1 with elementary students, the intervention curriculum will be more effective as it is geared to the elementary student and their personal health goals. Our primary hypothesis was that participation in the program would increase physical activity levels, as measured by change in steps. The study and results described below are representative of a mid-point evaluation of the program in December 2010 after the program started in August 2010. The rationale for the mid-point evaluation was based
on previous experience where duration of 4 months was sufficient to lead to increased
physical activity for participating children. The mid-point evaluation in the current study
represented a 3-month program duration.

**Recruitment and Eligibility**

The University's Institutional Review Board approved the study. Subjects were
recruited by introducing the study during class time and sending an informational letter,
consent and assent form home with the students. Eligibility criteria for the study were 4th
grade children and high school students in a rural Midwest town (population
approximately 2,500). For the students who were interested in participating in the study
signed parental informed consent and informed assent forms were obtained.

**Procedures**

The Superintendent's office was first contacted to recruit the elementary and high
school principals for participation. Upon recruitment, an initial meeting was organized
between the principals and study investigators in the spring of 2010. Follow up contact
was kept throughout the summer in preparation for the study to begin at the beginning of
the school year.

Baseline and mid-year data were collected on body mass index (BMI), calculated
by dividing the weight in kilograms by height in squared meters, BMI percentile, health
habits and physical activity. This was facilitated through the school's nurse and study
investigators. Health habits were measured using a Healthy Habits Survey, developed
by the Maine Youth Overweight Collaborative. This survey is a 10-item measure of
health habits related to nutrition, screen time, physical activity, and family eating
patterns. Physical activity was measured using a StepWatch Activity Monitor (SAM,
OrthoCare Innovations, Seattle, Washington) following the manufacturers' recommendations. The SAM is a research-grade pedometer for assessment of walking activity. It is a small (70 x 50 x 20 mm; 38 g), waterproof, self-contained device that is worn on the ankle and records the number of steps taken every minute. The SAM is specific to the individual by specifying the subjects' height and does not provide feedback to the subject, and thus, does not encourage “performance behavior.” Step detection accuracy varies according to walking speed, but at average walking speeds (2mph), accuracy is approximately 98% (Mitre et al., 2009).

Intervention

The study occurred during the school day and began on the first day of school, mid-August, until Winter break, mid-December. Upon obtaining consent and assent from three, 4th grade classes, the participating 41 students were measured with shoes and heavy objects removed for their height and weight using a stadiometer and scale, respectively (Genentech Accustat Stadiometer; Genentech Inc.). BMI was then calculated based on developmental percentiles using height and weight (CDC). Height was also used to program pedometers that would measure the student's physical activity, steps/minute. The elementary students were instructed to wear the pedometers for one school week at two different time points, September and December. For each measurement week, Monday mornings at school began with a study investigator demonstrating and assisting the 4th grade students on proper pedometer use. Once the pedometers were on the students, instructions were given so the students understood the importance of wearing the pedometers everyday of the week during all activities except for showering. At the end of each measurement week, the pedometers were returned to a study investigator at the end of the school day on Friday.
The study also consisted of three in-class educational sessions to both elementary and high school students. These sessions occurred in September 2010 and were presented separately. The focus of the educational sessions in the elementary school was to introduce the meaning of 5-2-1-0 (5 servings of fruits and vegetables, 2 hours or less of screen time, 1 hour of physical activity, and 0 sugary beverages) and explain the importance of each category. For the high school students, the educational sessions also provided information on 5-2-1-0 and its importance along with instructions on how to deliver these messages, based on motivational interviewing techniques to provide autonomy support, on a weekly basis to the elementary students. Upon completing the educational sessions, a high school student was paired with an elementary student to discuss nutrition and activity-related behaviors. The student pairs established a contract together termed “Health Buddy” that included (a) goals for increasing physical activity and improving nutrition patterns for elementary students, and (b) as often as weekly meetings to implement and evaluate the goals. The meetings between the “Health Buddies” took place during one lunch period each week as allowed by the school schedule. For example, during some weeks it was recognized that the usual meeting days might be interrupted by out of the ordinary school events/trips. The Let’s Go 5-2-1-0 Program provided the structure related to physical activity and healthy nutrition.

Outcomes assessed included elementary student BMI based on developmental percentiles using height and weight, healthy habits, progress on goal attainment, and physical activity from step counts. Goal setting, tracking, and readiness for change data were collected at each visit between the elementary student and high school student.
Data Analysis

Changes in BMI, BMI percentile, and the items on the Healthy Habits Survey from baseline to mid-year were evaluated both as continuous variables and using indicator variables for positive changes. Positive changes were defined as increases in the number of servings of fruits/vegetables per day, the number of family of family dinners per week, the number of times the participant ate breakfast per week, the number of servings of water per day, the number of servings of nonfat/reduced fat milk per day, decreases in BMI, BMI percentile, the number of times the participant ate take out/fast food per week, minutes of TV, movies, video, or computer games per day, the number of servings of 100% fruit juice per day, the number of servings of fruit or sports drinks per day, the number of servings of non-diet soda or punch per day, and the number of servings of whole milk per day.

Data from the pedometers (SAM) were analyzed through standardized procedures. A “complete” day of step data was defined as a day when the pedometer was worn for all waking hours (defined as 7 AM until 10 PM). For a participant’s step data to be included in the final analyses, at least 3 day’s of complete data were needed (Trost, McIver and Pate, 2005). The number of participants meeting these criteria was 41 students. To address if the intervention resulted in significant increases in child physical activity levels from baseline to mid-point, we numerically compared steps while participants were attending school at baseline and at mid-point. We also examined at the students’ steps compared to whether they were involved in fall and/or winter sports. To evaluate changes in steps, ANOVA with post hoc Tukey/Kramer tests, were used. All data are reported as mean ± Standard Deviation (SD), unless otherwise noted.
Results

Forty-one (23 males and 18 females) out of 48, 4th grade students participated in the intervention (Table 1). The mean ± Standard Deviation BMI percentile at the start of the study was 52.8 ± 31.5 and 65.2 ± 31.7 in males and females, respectively. During the midpoint examination of anthropometric data, the BMI percentile was 51.8 ± 32.6 for males and 62.6 ± 33.8 in females. Using BMI for age charts, we determined that among males (17 lean, 39.1 ± 21.8%, 1 overweight, 89%, and 5 obese, 97 ± 1.0%) and among females (11 lean, 47.1 ± 27.6%, 4 overweight, 90 ± 3.2%, and 3 obese, 98 ± 0.6%). There were no significant differences in BMI percentile between the 3 classrooms and there were no significant changes in BMI percentile from the start to the midpoint data collection period.

After examining anthropometric parameters, we examined physical activity level at the beginning and midpoint of the study (fall and winter). Overall, children were meeting recommendations (11,000-13,000 steps/day) for daily steps (Vincent and Pangrazi, 2002). There were no significant differences in steps taken from the start of the study to the midpoint data collection period (Table 1). There were also no significant differences in steps taken between normal weight and overweight/obese children or between classrooms (Figure 2). However, upon examination of the pedometer data, we noted that males walked more than females during both time periods (15630 ± 2509 steps/day vs. 14100 ± 1595 steps/day, P < 0.05 for fall, 15720 ± 22397 steps/day vs. 13580 ± 2359 steps/day, P < 0.01 for winter).

In addition to measuring the number of steps taken, we also asked the students if they were participating in a sport outside of the school day. There were significant
differences in steps taken between subjects who participated in sports and those who did not participate in sports for both the pre- and post-intervention period (Table 2). These differences did not seem to be specifically related to participation in the sport. For example, there was a significant difference in subjects in the fall between sports participants and non-sports participants (14020 ± 1997 steps/day for 18 non-sports participants vs. 15760 ± 2229 steps/day for 22 sports participants, P < 0.05) but the same significance held true for steps measured in the winter (13895 ± 2020 steps/day for non-sports participants vs. 15563 ± 2788 steps/day for sports participants, P < 0.05), regardless if the subjects engaged in winter sports. These differences also extended to students participating in winter sports. Subjects engaging in winter sports took significantly more steps in the fall (16060 ± 2514 steps/day for 16 sports participants vs. 14260 ± 1818 steps/day for 24 non-sports participants, P < 0.05) as well as in the winter measurement period (16240 ± 2676 steps/day for sports participants vs. 13860 ± 2066 steps/day for non-sports participants, P < 0.005). The difference in steps correlated with sports participation appeared to be particularly strong in overweight/obese children vs. normal weight children (Figure 3). For example, the difference between normal weight children between 12 sports participants and 18 non-sports participants in winter sports was not nearly as great as the differences in overweight/obese children between 4 sports participants and 6 non-sports participants. Looking at the fall, normal weight sports participants took an average 884 steps/day more than non-sports participants and overweight/obese sports participants took an average 4550 steps/day more than non-sports participants. At the midpoint or winter measurement period, normal weight sports participants took an average 1228 steps/day more than non-sports participants and overweight/obese sports participants took an average, 5941 steps/day more than non-
sports participants. This difference led to an interaction between sports participation and body weight status in measuring steps. This effect was significant in participants of winter sports (P < 0.05) and trending in the same direction for overweight/obese children engaging in fall sports (P < 0.063). Sex was also strongly related to steps and sport participation, although there were no interactions between the two factors.

Overall, there were no significant differences in the responses for the healthy habits surveys, but a qualitative examination of the data shows that children appeared to be maintaining and sometimes adopting healthy habits (Figure 1). Each panel in this Figure represents data from each of the main “5210” behaviors reported in the Healthy Habits Survey. Data is shown for all subjects, where each line represents a student. For example, in Panel A (labeled “5”), the upper red arrows shows the number of students that increased their fruit and vegetable consumption from fall to winter, as well as the starting to ending number of servings for that child. The black lines in the middle of the graph show the students that did not change their fruit and vegetable consumption from the fall to winter. Finally, the lower blue arrows show the number of students that decreased their fruit and vegetable consumption from fall to winter. In Panel B of Figure 1, amount of television viewing is shown, Panel C depicts amounts of physical activity and Panel D depicts amount of soda consumption.

The final assessment that we made at the midpoint of the study was to understand the relationship between the “Health Buddies” (elementary student and high school student). To determine if the intervention was delivered correctly and effectively using autonomy support by the high school students, the 4th grade students filled out an autonomy questionnaire. Favorable responses on the questionnaire dominated, with 97 percent favorable responses for all questions (6.5 ± 0.3, mean ± standard deviation). Of
the remainder, most (2.5% of all questions) were ambivalent with less than 1 percent of all responses being unfavorable.

Discussion

The intent of the 5-2-1-0 program is to guide children’s behavior toward making healthy choices where each number represents a specific behavior associated with preventing childhood obesity (5 servings of fruits and vegetables, 2 hours or less of screen time, 1 hour of physical activity, and 0 sugary beverages). The aim of this study was to examine the health outcomes of implementing the 5-2-1-0 program in a small community with few resources. For this to be possible a community partnership was formed between the school and university to explore such an innovative childhood obesity prevention strategy delivered within a school setting.

Outcome measures of the study were the 4th grade students BMI, BMI percentile, steps, and health behaviors, as measured by the Healthy Habit Survey. No significant differences from pre and midpoint intervention were found between any of these measures. In spite of that, the curriculum was well received by the students, as reported from the “Health Buddy” Autonomy Survey where the data did show that many children were maintaining their current healthy habits. This was especially seen with physical activity as the 4th grade students total step count did not significantly change from baseline to midpoint (late summer to winter). The intervention may have worked by allowing for the maintenance of physical activity as we did not observe declines in physical activity due to seasonal effects. Therefore, the intervention may work by helping children to maintain healthy habits and eventually prevent the development of obesity. Obesity prevention rather than treatment is recognized as an important
strategy for decreasing overall obesity rates in the United States (White House Task
Force on Childhood Obesity, 2010).

In many cases treating obesity is a difficult task with very few interventions
resulting in a positive long-term effect. For an effective obesity treatment intervention it
takes highly motivated individuals, an intense curriculum, compliance, dedication, and a
sustained intervention. However, even though treatment approaches may be effective in
the short-term, high rates of relapse occur in the long-run (Epstein et al., 2008). For that
reason many interventions have been constructed as obesity prevention studies. It has
been advocated that by implementing obesity intervention programs (such as in schools)
the overall prevalence of risk factors to all children regardless of their obesity risk will be
lowered (Power, Lake and Cole, 1997). This would enable all children to benefit from
the intervention through promotion of a healthy diet and active lifestyle (Livingstone,
McCaffrey and Rennie, 2006). This was demonstrated with the CATCH program where
it was found that by changing the school environment to one that supports healthy
behaviors, positive improvements in health for elementary students were maintained 5
years post-intervention (Hoelscher et al., 2004). The American Dietetic Association
recommends that a combination of family-based and school-based multi-component
programs involving parent training, behavioral counseling, nutrition education, and
physical activity is the most feasible way to support healthy lifestyle in children and their
families ((ADA), 2006).

Although the 5-2-1-0 program did not significantly change targeted behaviors by
the midpoint of the intervention, there were other important observations concerning
physical activity in the 4th grade students. Children who were involved in sports were
taking significantly more steps compared to students not involved in sports and there
were no apparent seasonal effects with this observation. Additionally, the involvement in
sports for overweight and obese children seemed to be especially important. Those children who were overweight and obese and partook in sports acquired significantly greater steps compared to those overweight and obese children who were not involved in sports. This indicates the importance of child involved with organized physical activities from a young age as a potential preventative measure for obesity with overall health benefits.

This preventative measure of being involved in sports, specifically for females, didn’t occur until 1972 with Title IX of the Educational Amendments banning of sex discrimination in schools. The most significant outcome from this amendment was the ability for women to participate in sports. This resulted in a 600 percent increase in female participation in high school sports (U.S. Department of Education, 2000). By allowing females to participate in high school organized school athletics by 1987, the year of mandated compliance, a modest lower BMI and rate of obesity with an increase in physical activity has been seen in these adult women (Kaestner and Xin Xu, 2010).

The health benefit associated with involvement in sports is important to note as it has been shown that as children age the amount of moderate and vigorous physical activity they partake in decreases, especially in females (Kimm et al., 2002). Pate and colleagues (2009) reported a 4 percent decline per year in physical activity occurs from 6th to 8th grade in females. However, if 8th grader females participated in sports they were more likely to be physically active later in adolescence (12th grade) compared to those who did not participate in sports. A dose response also occurred indicating that the more years of sports participation the more physically active girls tend to be, especially when it comes to vigorous physical activity (Pfeiffer et al., 2006).

In knowing this, the school environment is a place where an increase in physical activity can occur. This increase must come in a form of an after school activity as
Physical Education and recess are typically not enough to meet the recommendation of 60 minutes of daily physical activity (U.S. Department of Health and Human Services, 2007). Additionally, there is extra encouragement for youth to become more physically active as indicated by several objectives in *Healthy People 2020* focusing on increasing physical activity among children and adolescents. Some of these objectives include: PA-3 Increase the proportion of adolescents who meet current Federal physical activity guidelines for aerobic physical activity and for muscle-strengthening activity and PA-6 Increase regularly scheduled elementary school recess in the United States (U.S. Department of Health and Human Services, 2007). If active participation can be encouraged at a younger age, the recommended 60 minutes of daily physical activity may be obtained. In meeting these *Healthy People 2020* objectives, long-term health benefits and an overall lower BMI and rate of obesity may arise.

Limitations to this study, as measured by BMI, steps, and the Healthy Habit Survey, is the inaccuracy of self report data, Healthy Habit Survey, and possibly the short administration, (3-months), of the program. To account for this a longer program may be advised with an interviewer-administered questionnaire with food models to obtain more accurate self-report healthy habit data. The overall program length is for the entire school year. The final data collection for the program will occur in May-June 2011.

In conclusion, the 5-2-1-0 curriculum and high school student mentoring coaching were offered as a prevention intervention to all children in the program classrooms. Although no significant changes in behavior were seen with the intervention the data suggests that many elementary students were already engaging in healthy behaviors and that the intervention may have prevented a decline in steps per day during the mid-point measure where a decline tends to occur due to seasonal effects. Participation in organized sports appeared to play a beneficial role in both sexes and for
overweight/obese children to increase physical activity. More research regarding both sports involvement at an elementary level and its affect on overall physical activity level and health benefits is necessary.
Table 1. Demographics and step count for elementary students participating in the 5-2-1-0 intervention.

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<th>Male (n = 23)</th>
<th>Female (n= 18)</th>
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<td><strong>Baseline (Fall)</strong></td>
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<td>(Mean ± SD)</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>55.2 ± 2.3</td>
<td>54.8 ± 2.0</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>78.4 ± 18.4</td>
<td>86.3 ± 27.5</td>
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<tr>
<td>BMI Percentile (%)</td>
<td>52.8 ± 31.5</td>
<td>65.2 ± 31.7</td>
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<tr>
<td>BMI (kg/m²)</td>
<td>17.8 ± 3.6</td>
<td>20.3 ± 6.0</td>
</tr>
<tr>
<td>Age (yrs)</td>
<td>9.4 ± 0.5</td>
<td>9.3 ± 0.5</td>
</tr>
<tr>
<td><strong>Midpoint (Winter)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height (cm)</td>
<td>56.0 ± 2.4</td>
<td>55.5 ± 2.1</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>80.2 ± 18.6</td>
<td>89.6 ± 30.2</td>
</tr>
<tr>
<td>BMI Percentile (%)</td>
<td>51.8 ± 32.6</td>
<td>62.6 ± 33.8</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>17.7 ± 3.5</td>
<td>20.8 ±6.4</td>
</tr>
<tr>
<td>Age (yrs)</td>
<td>9.5 ± 0.5</td>
<td>9.3 ± 0.5</td>
</tr>
<tr>
<td><strong>Steps</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>15630 ± 2509</td>
<td>14100 ± 1595*</td>
</tr>
<tr>
<td>Midpoint</td>
<td>15720 ± 2397</td>
<td>13580 ± 2359**</td>
</tr>
</tbody>
</table>

*Significantly fewer steps taken compared to males, P < 0.05
**Significantly fewer steps taken compared to males, P < 0.01
Figure 1. Each panel in this Figure represents data from each of the main “5210” behaviors (Panel A, 5 fruits and vegetables, Panel B, 2 hours or less screen time, Panel C, at least one hour of physical activity, and Panel D, 0 sugar-sweetened beverages) reported in the Healthy Habits Survey. Data is shown for all subjects, where each line represents a student. The red line indicates an increase in behavior, black line indicates maintenance of a behavior, and the blue line indicates a decrease in behavior.
Figure 2. Average steps taken by students (males and females) at baseline (fall) and mid-point (winter) measurement periods. Data are compared relative to participant sex, weight category (normal weight compared to overweight/obese (OW/OB)), and sports participation (by season, fall or winter sports).
Figure 3. Average steps taken by students (males and females) at baseline (fall) and mid-point (winter) measurement periods. Data are compared relative to sports participation (fall or winter) and weight category (normal weight or overweight/obese (OW/OB)).
REFERENCES


CONCLUSIONS

I performed two studies during the course of my graduate studies and the results of these studies were described above. The purpose of the first study was to determine the difference in the amount of snack food a person consumed while watching television without interruptions or while watching television and multitasking (chatting). Overall, the goal of this study was to understand the impact, if any, of multitasking on caloric intake of snack foods in young adults. The purpose of the second study was to implement a school-based health intervention (Let's Go 5-2-1-0) that focuses on improving child behaviors related to screen time, diet, exercise and environment.

The first study was a hypothesis-generating study where screen time and diet were the focus. Technology based multitasking (chatting) was examined as a variable that might be associated with food consumption. We identified that food consumption or “snacking” while multitasking was related to sex and weight status. This was shown by examining the number of participants who ate more or less during chatting versus non-chatting while watching a movie. Females consumed significantly more food while multitasking (chatting/movie watching) compared to men, who consumed more food without multitasking (watching movie alone). There appeared to be a stronger relationship in both sexes for those individuals who were overweight or obese to eat more.

Even though these results were based on a relatively small sample, there was evidence to suggest that there may be differences between normal weight and overweight individuals relative to food consumption and multitasking. More research in this area of food’s interaction with technology is needed to see how sex and weight
status play a role in food choices along with sedentary activities such as chatting, video gaming, and television viewing. A future follow-up study will focus on duplicating these results in a larger sample with a more equal distribution of normal weight, overweight, and obese young adults.

The school-based study was focused on four target behaviors or contributors to obesity through a program called Let’s Go 5-2-1-0. The Let’s Go 5-2-1-0 program focused on healthy habits where each number represented a specific behavior associated with preventing childhood obesity (5 servings of fruits and vegetables, 2 hours or less of screen time, 1 hour of physical activity, and 0 sugary beverages). The specific aim of our study was to examine the health outcomes of implementing the 5-2-1-0 program in a small community with few resources.

Results from the study at mid-point of the program indicated no significant change in the students’ BMI, steps, or health behaviors. However, we did observe maintenance of healthy behavior. If children are already meeting the recommendation for amount of screen time, for example, there is less of a need to promote behavior change, and rather there likely needs to be reinforcement of already healthy behavior. We cannot conclude that our intervention was not working using the mid-point evaluation. The length of the program, non-randomized design, and small number of students may have limited our ability to detect differences. We did observe, however, that those students (regardless of BMI status) who participated in organized sports took more steps compared to students who did not participate in sports, with little or no decrease due to season. Organized sports participation may be a strategy for reaching physical activity recommendations and as a way to provide additional health benefits to children. In all, the 5-2-1-0 program provided constant encouragement for living a healthy lifestyle and was well received by all elementary students. The final data
collection period will be critical in determining the overall impact of the 5-2-1-0 Program in Sibley-Ocheydan Elementary School.
APPENDIX A: FOOD INTERACTION WITH TECHNOLOGY CONSENT FORM

INFORMED CONSENT DOCUMENT

Title of Study: Food Interaction with Technology (FIT)

Investigators: Randal Foster, Lorraine Lanningham-Foster, Erin Thole, Laura Kimm, Megan Barnes, Maren Vik, Kai Ling Kong, Shiny Parsai, Elsa Kracke, Samantha Kling

This is a research study. Please take your time in deciding if you would like to participate. Please feel free to ask questions at any time.

INTRODUCTION

The purpose of this study is to determine how a meal affects your behavior and activity while watching TV or chatting on the computer. You are being invited to participate in this study because you are a resident of Ames or the surrounding area

DESCRIPTION OF PROCEDURES

If you agree to participate in this study, your participation will last for one week and will consist of two, three-hour visits within one week. You will be asked to fast and abstain from caffeine for 6 hours prior to the study. During the study you may expect the following study procedures to be followed: You will be asked some general questions about your health and habits related to diet, exercise and screen time. Your weight and height will be checked. Small sensors will be placed on your arms and one leg using elastic wrap and one sensor will be clipped to your clothing at the waist. You will then be asked to eat all of a test meal if possible. You will select two movies from a list. In one visit you will watch the movie. During the other visit you will watch a movie and also be permitted to chat or access the internet as much as you like, either through your own chat account or through one we will provide. One of the investigators will maintain a chat with you through the experiment and you may chat with anyone externally if you like. The investigators are trained to ask you open-ended questions to keep you chatting, but you may refuse to answer any question they ask for any reason. Your answers to any questions the investigator asks will not be permanently recorded. You will be permitted to stop the study at any time. You will be permitted to visit the restroom at any time if needed. During the session you will be monitored by a video camera. Any chats you engage in will be counted for the number of characters and words you use but the chats will not be permanently recorded and will be erased at the end of the session.

RISKS

While participating in this study you may experience the following risks: There are no risks associated with participating in this study

BENEFITS
If you decide to participate in this study there will be no direct benefit to you. It is hoped that the information gained in this study will benefit society by determining how behavior and activity may be affected after eating a meal and providing information to help prevent or treat obesity.

**COSTS AND COMPENSATION**

You will not have any costs from participating in this study. You will be compensated for participating in this study. You will need to provide your address in order for us to pay you. You will receive $15.00 for the first visit and $20.00 for the second visit.

**PARTICIPANT RIGHTS**

Your participation in this study is completely voluntary and you may refuse to participate or leave the study at any time. If you decide to not participate in the study or leave the study early, it will not result in any penalty or loss of benefits to which you are otherwise entitled.

**RESEARCH INJURY**

Emergency treatment of any injuries that may occur as a direct result of participation in this research is available at the Iowa State University Thomas B. Thielen Student Health Center, and/or referred to Mary Greeley Medical Center or another physician or medical facility at the location of the research activity. Compensation for any injuries will be paid if it is approved in accordance with the Iowa Tort Claims Act, Chapter 669 Iowa Code. Claims for compensation should be submitted on approved forms to the State Appeals Board and are available from the Iowa State University Office of Risk Management and Insurance

**CONFIDENTIALITY**

Records identifying participants will be kept confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. However, federal government regulatory auditing departments of Iowa State University and the Institutional Review Board (a committee that reviews and approves human subject research studies) may inspect and/or copy your records for quality assurance and data analysis. These records may contain private information.

To ensure confidentiality to the extent permitted by law, the following measures will be taken: subjects will be assigned a random code that all data will be associated with. The key to this code will be kept in a locked cabinet in a locked office accessible only to Randal Foster and Dr. Lanningham-Foster. All chats during the sessions will be erased and no permanent record will be kept. Videographic or still images of your participation will be kept in a locked file in a locked office and will not be released or published without your consent. Activity data will be kept for a period of 5 years after which they will be erased or destroyed. If the results are published, your identity will remain confidential.

**QUESTIONS OR PROBLEMS**
You are encouraged to ask questions at any time during this study.

- For further information about the study contact Randal Foster (515-294-0861) or Lorraine Lanningham-Foster (515-294-4684)

- If you have any questions about the rights of research subjects or research-related injury, please contact the IRB Administrator, (515) 294-4566, IRB@iastate.edu, or Director, Office of Responsible Research, (515) 294-4215, 1138 Pearson Hall, Ames, Iowa 50011.

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PARTICIPANT SIGNATURE

Your signature indicates that you voluntarily agree to participate in this study, that the study has been explained to you, that you have been given the time to read the document and that your questions have been satisfactorily answered. You will receive a copy of the written informed consent prior to your participation in the study.

Participant’s Name (printed) ________________________________

______________________________ (Participant’s Signature)   ___________________ (Date)

INVESTIGATOR STATEMENT

I certify that the participant has been given adequate time to read and learn about the study and all of their questions have been answered. It is my opinion that the participant understands the purpose, risks, benefits and the procedures that will be followed in this study and has voluntarily agreed to participate.

_________________________________________________________   (Signature of Person Obtaining Informed Consent)   (Date)
Movie Watchers Wanted!

Effects of a meal on movement and activity

Women and men 18-35 years are needed for a research study being conducted to analyze the effects of a particular meal on activity and movement for the duration of a movie. The study will include two, three-hour visits within one week. Payment will be offered for your participation in the study. Participation is voluntary.

Please contact Dr. Lorraine Lanningham-Foster at studyfit@gmail.com for more information.
The purpose of our study is to understand how food interacts with activity and behavior while using technology. Our study consists of two, three-hour visits within one week. We are looking for 18-35 year old healthy non-smokers. For the study, we would ask you to come to Iowa State University’s Nutrition and Wellness Research Center (NWRC) for a screening visit, either on campus or at our location south of campus twice for 3 hours at a time. On each visit we ask that you fast and abstain from caffeine for 6 hours before your visit time. On your first visit we will ask you some questions about your general health habits. We will then ask you to eat a test meal and watch a movie you select from a variety of movies we will have. On one of the two visits you will also be asked to chat on the computer with a lab employee while watching the movie. You may also chat with others. Participation in this study is voluntary and information about you will be kept confidential. Each person who participates will receive $15.00 for the first visit and $20.00 for the second visit.

If you are interested in this study please reply to Dr. Lorraine Lanningham-Foster at studyfit@gmail.com.

TELEPHONE SCRIPT

Food Interaction with Technology

This script will be used when returning calls to potential participants.

“Good morning/afternoon. This is Randal Foster calling from Iowa State University. May I please speak to_____?

If potential participant is home:

“I am contacting you in response to your interest in our research study on Food Interactions with Technology.”

Our study consists of two, three-hour visits to the Nutrition Wellness Research Center within one week. Before you would begin, I would you like to find out if you think you would be eligible for this study. For this study we need subjects who are:
• Between the ages of 18 and 35
• Familiar with chatting on the computer
• Capable of fasting for 6 hours
• Do not have any severe food allergies
• Free from any major medical problems like diabetes, hypoglycemia, or thyroid problems
• Nonsmokers

Do you think you would be eligible for this study?

If “no”

“If you think you would be interested in other studies at Iowa State University I can take your name and number”

If “yes”

“I’d like to tell you about our study. Please feel free to stop me if you have any questions. The study consists of two, three-hour visits to our Nutrition Wellness Research Center, either on campus or at our location south of campus. We will ask you to fast for 6 hours and abstain from caffeine or beverages other than water. We will ask you to come to the NWRC and select two movies while we attach four small, wire-free motion sensors on top of your clothing with elastic bands. We will give you a moderate-sized test meal. After this, we will ask you in one session to watch a movie and in the other session to chat on the computer while watching a movie. We will watch you with a video camera and monitor your activity with the sensors while you do this. You will be compensated $15.00 for your first visit and $20.00 for your second visit.

“Are you still interested in this study?”

If no:
“Thank you for your interest and time.”

If yes:

“Is now a good time or would you like me to call you back?

Would you like for me to arrange a screen visit at this time?

If so, what days might work for you?

Is there a particular time-frame that might work for you?

Do you have any questions that I can answer?

My name is (Dr. Lorraine Lanningham-Foster/Randal Foster). You can call me if you have any questions or needs regarding this study. My number is xxx-xxx-xxxx. Thank you for your time and interest.”
APPENDIX C: FOOD INTERACTION WITH TECHNOLOGY SURVEYS

FIT Study Questionnaire

Name: _________________________  Date: ____________________

How often do you exercise? ______________________________

What type of exercises do you do?
_____________________________________

How much water do you drink daily?
______________________________________

What besides water, what do you drink?
__________________________________________

How often and how much of the above beverages do you drink?

______________________________________________________

How often do you eat breakfast? _______________

How often do you eat desserts, candy or other sweets? __________
If so what kind_____________________________

How often do you snack? _______________
If so what kind? ________________________________

How often do you buy food or drink at a movie theatre when you are watching a movie?
________________________________________

How many hours of TV/Movies/Video games are you involved in each week?

TV: ____________ hours  Movies: ____________ hours

Video Games: ____________ hours

What technology based ways of communication do you engage in?
Social networking sites i.e.: Cell phone texting, online chatting, webcam, e-mail, twitter, etc.

On average, how much time per week is you involved in these technology based ways of communicating? (I.e.: total time of texting a week)

__________________minutes   ___________________hours

While watching TV/Movies or playing video games, do you perform any of the following tasks and how often do you perform them?

***For these questions, 1 = Always, 2 = Often, 3 = Sometimes, 4 = Rarely, and 5 = Never, please circle one

Chatting with friends using social networking tool (Facebook, G-mail, etc)?

1………………..2………………..3………………..4………………..5

Texting with friends using cell phone/smart phone?

1………………..2………………..3………………..4………………..5

Performing house work/tasks (folding laundry, making dinner)?

1………………..2………………..3………………..4………………..5

Performing computer or non-computer related school work or job-related tasks?

1………………..2………………..3………………..4………………..5

Eating a meal (breakfast, lunch or dinner)?

1………………..2………………..3………………..4………………..5

Eating a snack (any time of day)?

1………………..2………………..3………………..4………………..5

Exercising (for example while on sports equipment at the gym)?

1………………..2………………..3………………..4………………..5

Performing any other tasks not listed above while watching TV/movies/video games?

1………………..2………………..3………………..4………………..5
APPENDIX D: LET’S GO 5-2-1-0 CONSENT FORMS

INFORMED CONSENT DOCUMENT

Title of Study: Student Mentoring for Promoting a Healthy Body

Investigators: Lorraine Lanningham-Foster, Randal Foster, Erin Thole, Kai Ling Kong, Shiny Parsai, Megan Barnes, Samantha Kling

This is a research study. Please take your time in deciding if you would like to participate. Please feel free to ask questions at any time.

INTRODUCTION

The purpose of this study is to implement and evaluate healthy behavior change and physical activity levels in elementary and high school children who receive classroom health education.

DESCRIPTION OF PROCEDURES

This research study will last most of the 2010-2011 school year (September – May).

If you agree for your child to be in the study, he or she will be asked to participate in the following procedures. There are two sections below, one that describes what will happen for the fourth grade students and one section that describes what will happen for the high school students.

Fourth Grade Students

During the first month of the study, your child will participate in his or her normal school-week activities. Your child’s age, height, and weight will be recorded. Your child’s height and weight will be measured by study staff in a private room under the supervision of the school nurse. Your child’s height and weight will be measured with shoes, heavy clothing and jewelry items removed. Your child will also be asked to complete the Healthy Habits Survey. The Healthy Habits Survey is 10 questions about your health habits related to nutrition, screen time, physical activity, and family eating patterns. It will take approximately 5 minutes to complete.

During this month, your child’s physical activity will be measured using an ankle-worn step-counter (pedometer, StepWatch). Your child will wear a StepWatch on his/her ankle for 1 week. The StepWatch will be programmed and ready to place on your child’s ankle after your child’s height and weight are measured. Your child will be instructed on how to wear the monitor and how to take it on and off. Your child will be asked to wear the pedometer whenever he/she is awake. Your child will be allowed to take off the pedometer during sleeping and showering times. After one week of wearing the pedometer, your child will be asked to return the pedometer to his/her teacher.

Your child will be put in one of 2 groups by chance (as in the flip of a coin). The first group will have a study team member (graduate student in Nutritional Sciences) come to the classroom. The graduate student will teach your child about healthy habits for nutrition and physical activity.
The second group will also have the graduate student come to the classroom for the health education. But this second group will also have high school students assigned to work with them on goals for improving diet and/or physical activity.

The student pairs will establish a contract together termed “Health Buddy” that includes (a) goals for increasing physical activity and improving nutrition patterns for elementary students, and (b) as often as weekly meetings to implement and evaluate the goals. The exact date and time of the meeting will be coordinated with your child’s teacher and will occur during your child’s recess/lunch time at school. These visits will take about 30 minutes.

At the first meeting, your child will talk about how ready he/she might be to make changes in his/her diet or physical activity. If your child wants to make changes, your child and the high school student will set a goal for making a change. The first meeting will take 30-60 minutes. Your child’s goals and progress will be discussed during each meeting.

During study months 2-8, your child and his/her high school student will meet every other week. Your child’s progress on goals will be discussed and recorded. If necessary, there may need to be meetings in 2 consecutive weeks due to holiday breaks (such as Thanksgiving or Spring Break).

Whether your child is assigned to either group, your child will have his/her age, height, physical activity and weight measured during the fourth study month (December) and the final study month (April) as your child did in the start of the study. Your child will also complete the Healthy Habits Survey again.

Finally, your child will complete a short survey to let us know what he/she thought of meeting with the health buddy.

**High School Student**

If your child is a high school student and participating in this study, your child will be asked to attend 2-3 lunch time meetings to learn about the Let’s Go 5-2-1-0 Program. A graduate student in Nutritional Sciences will meet with your child to talk about the program. Your child will be given brochures about health habits to share with an elementary school child. Your child will also learn how to use 3 tools to help elementary students improve their health habits: Readiness Ruler, Goal Setting sheet, and Goal Tracking sheet.

After the 4th grade student completes the early measurements, your child will start working with a 4th grade student. Your child will work with them on goals for improving diet and/or physical activity.

The student pairs will establish a contract together termed “Health Buddy” that includes (a) goals for increasing physical activity and improving nutrition patterns for elementary students, and (b) as often as weekly meetings to implement and evaluate the goals. The exact date and time of the meeting will be coordinated with teachers and will occur during the 4th graders recess/lunch time at school. These visits will take about 30 minutes.
At the first meeting, your child will talk with his/her Health Buddy about how ready he or she might be to make changes in his or her diet or physical activity. If the 4th grader wants to make changes, your child and the 4th grader will set a goal for making a change. The first meeting will take 30-60 minutes. Your child’s Health Buddy’s goals and progress will be discussed during each meeting.

During study months 2-8, your child and his/her 4th grade student will meet every other week. The 4th grade student’s progress on goals will be discussed and recorded. If necessary, there may need to be meetings in 2 consecutive weeks due to holiday breaks (such as Thanksgiving or Spring Break).

RISKS

While you participate in this study your child may experience the following risks: Some questions your child will be asked to answer in the study questionnaire(s) may make your child feel uncomfortable. Your child may choose not to answer any questions that are uncomfortable to him/her. If your child chooses to start an exercise program, there may be an increased risk of physical injury from participating in the study. The risks of this research study are minimal, which means that we do not believe that they will be any different than what your child would experience at a routine clinical visit or during his or her daily life.

BENEFIT

If your child decides to participate in this study your child will benefit by having a better understanding of how to live a healthy lifestyle. It is hoped that the information gained in this study will benefit society by examining the feasibility of implementing a school-based health coaching intervention. This could lead to healthy lifestyle changes within a family contributing to healthy body weight. Your child’s participation in this study may help researchers to gain information to develop more effective childhood obesity prevention and intervention programs.

COST AND COMPENSATION

Your child will not have any costs from participating in this study. However, participants will receive items for their study participation including pedometers, water-bottles, pencils, pens, stickers, and Frisbees. No monetary compensation will be provided.

PARTICIPANTS RIGHTS

Your child’s participation in this study is completely voluntary and your child may refuse to participate or leave the study at any time. If your child decides to not participate in the study or leave the study early, it will not result in any penalty or loss of benefits to which your child is otherwise entitled.

CONFIDENTIALITY
Records identifying participants will be kept confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. However, federal government regulatory auditing departments of Iowa State University and the Institutional Review Board (a committee that reviews and approves human subject research studies) may inspect and/or copy your records for quality assurance and data analysis. These records may contain private information.

To ensure confidentiality to the extent permitted by law, the following measures will be taken: subjects will be assigned a random code that all data will be associated with. The key to this code will be kept in a locked cabinet in a locked office accessible only to Dr. Lanningham-Foster, Randal Foster, and Erin Thole. All 1:1 coaching sessions between high school and elementary students will also be confidential. Activity data will be kept for a period of 5 years after which they will be erased or destroyed. If the results are published, your identity will remain confidential.

QUESTIONS OR PROBLEMS

You are encouraged to ask questions at any time during the study.

• For further information about the study contact Dr. Lorraine Lanningham-Foster (515-294-4684).

• If you have any questions about the rights of research subjects or research related injury, please contact the IRB Administrator, (515) 294-4566, IRB@iastate.edu, or Director, Office for Responsible Research, (515) 294-4215, 1138 Pearson Hall, Ames, Iowa 50011.

************************************************************************

You have been asked to take part in a research study, at Iowa State University. The information about this study has been provided to you to inform you about the nature of this IRB approved study.

• I have read the whole consent form, and all of my questions have been answered to my satisfaction.

• I know that joining the study is voluntary and I agree to join the study.

• I know enough about the purpose, methods, risks, and possible benefits of the study to decide that I want to join.

• I know that I can call the investigator and research staff at any time with any new questions or to tell them about side effects.

• I understand that I may withdraw from the study at any time.
Please sign and date to show that you have read and understand all of the above guidelines. Please do not sign unless you have read the entire packet of information. If you do not want to sign, you don’t have to, but if you don’t you cannot participate in this research study.

(Date / Time)  (Printed Name of Participant)

(Signature of Participant)

(Date / Time)  (Printed Name of Representative Signing for Participant, if applicable)

(Signature of Representative Signing for Participant, if applicable)

Investigator Statement

I certify that the participant has been given adequate time to read and learn about the study and all of their questions have been answered. It is my opinion that the participant understands the purpose, risks, benefits and the procedures that will be followed in this study and has voluntarily agreed to participate.

(Signature of Person Obtaining Consent)  
______________  (Date)
INFORMED CONSENT DOCUMENT (High School Students)

Title of Study: Student Mentoring for Promoting a Healthy Body

Investigators: Lorraine Lanningham-Foster, Randal Foster, Erin Thole, Kai Ling Kong, Shiny Parsai, Megan Barnes, Samantha Kling

This is a research study. Please take your time in deciding if you would like to participate. Please feel free to ask questions at any time.

INTRODUCTION

The purpose of this study is to implement and evaluate healthy behavior change and physical activity levels in elementary and high school children who receive classroom health education.

DESCRIPTION OF PROCEDURES

This research study will last most of the 2010-2011 school year (September – May).

If you agree to be in the study, you will be asked to participate in the following procedures. There are two sections below, one that describes what will happen for the fourth grade students and one section that describes what will happen for the high school students.

Fourth Grade Students

During the first month of the study, you will participate in your normal school-week activities. Your age, height, and weight will be recorded. Your height and weight will be measured by study staff in a private room. Your height and weight will be measured with shoes, heavy clothing and jewelry items removed. You will also be asked to complete the Healthy Habits Survey. The Healthy Habits Survey is 10 questions about your health habits related to nutrition, screen time, physical activity, and family eating patterns. It will take approximately 5 minutes to complete.

During this month, your physical activity will be measured using an ankle-worn step-counter (pedometer, StepWatch). You will wear a StepWatch on your ankle for 1 week. The StepWatch will be programmed and ready to place on your ankle after your height and weight are measured. You will be instructed on how to wear the monitor and how to take it on and off. You will be asked to wear the pedometer whenever you are awake. You will be allowed to take off the pedometer during sleeping and showering times. After one week of wearing the pedometer, you will be asked to return the pedometer to your teacher.

You will be put in one of 2 groups by chance (as in the flip of a coin). The first group will have a study team member (graduate student in Nutritional Sciences) come to the classroom. The graduate student will teach you about healthy habits for nutrition and physical activity.
The second group will also have the graduate student come to the classroom for the health education. But this second group will also have high school students assigned to work with them on goals for improving diet and/or physical activity.

The student pairs will establish a contract together termed “Health Buddy” that includes (a) goals for increasing physical activity and improving nutrition patterns for elementary students, and (b) as often as weekly meetings to implement and evaluate the goals. The exact date and time of the meeting will be coordinated with your teacher and will occur during your recess/lunch time at school. These visits will take about 30 minutes.

At the first meeting, you will talk about how ready you might be if you want to make changes in your diet or physical activity. If you want to make changes, you and the high school student will set a goal for making a change. The first meeting will take 30-60 minutes. Your goals and progress will be discussed during each meeting.

During study months 2-8, you and your high school student will meet every other week. Your progress on goals will be discussed and recorded. If necessary, there may need to be meetings in 2 consecutive weeks due to holiday breaks (such as Thanksgiving or Spring Break).

Whether you are assigned to either group, you will have your age, height, physical activity and weight measured during the fourth study month (December) and the final study month (April) as you did in the start of the study. You will also complete the Healthy Habits Survey again.

Finally, you will complete a short survey to let us know what you thought of meeting with your health buddy.

**High School Student**

If you are a high school student and participating in this study, you will be asked to attend 2-3 lunch time meetings to learn about the Let’s Go 5-2-1-0 Program. A graduate student in Nutritional Sciences will meet with you to talk about the program. You will be given brochures about health habits to share with an elementary school child. You will also learn how to use 3 tools to help elementary students improve their health habits: Readiness Ruler, Goal Setting sheet, and Goal Tracking sheet.

After the 4th grade student completes the early measurements, you will start working with a 4th grade student. You will work with them on goals for improving diet and/or physical activity.

The student pairs will establish a contract together termed “Health Buddy” that includes (a) goals for increasing physical activity and improving nutrition patterns for elementary students, and (b) as often as weekly meetings to implement and evaluate the goals. The exact date and time of the meeting will be coordinated with teachers and will occur during the 4th graders recess/lunch time at school. These visits will take about 30 minutes.

At the first meeting, you will talk with your Health Buddy about how ready he or she might be to make changes in his or her diet or physical activity. If the 4th grader wants to
make changes, you and the 4th grader will set a goal for making a change. The first meeting will take 30-60 minutes. Your Health Buddy’s goals and progress will be discussed during each meeting.

During study months 2-8, you and your 4th grade student will meet every other week. The 4th grade student’s progress on goals will be discussed and recorded. If necessary, there may need to be meetings in 2 consecutive weeks due to holiday breaks (such as Thanksgiving or Spring Break).

**RISKS**

While you participate in this study you may experience the following risks: Some questions you will be asked to answer in the study questionnaire(s) may make you feel uncomfortable. You may choose not to answer any questions that are uncomfortable to you. If you choose to start an exercise program, there may be an increased risk of physical injury from participating in the study. The risks of this research study are minimal, which means that we do not believe that they will be any different than what you would experience at a routine clinical visit or during your daily life.

**BENEFIT**

If you decide to participate in this study you will benefit by having a better understanding of how to live a healthy lifestyle. It is hoped that the information gained in this study will benefit society by examining the feasibility of implementing a school-based health coaching intervention. This could lead to healthy lifestyle changes within a family contributing to healthy body weight. Your participation in this study may help researchers to gain information to develop more effective childhood obesity prevention and intervention programs.

**COST AND COMPENSATION**

You will not have any costs from participating in this study. However, participants will receive items for their study participation including pedometers, water-bottles, pencils, pens, stickers, and Frisbees. No monetary compensation will be provided.

**PARTICIPANTS RIGHTS**

Your participation in this study is completely voluntary and you may refuse to participate or leave the study at any time. If you decide to not participate in the study or leave the study early, it will not result in any penalty or loss of benefits to which you are otherwise entitled.

**CONFIDENTIALITY**

Records identifying participants will be kept confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. However, federal government regulatory auditing departments of Iowa State University and the
Institutional Review Board (a committee that reviews and approves human subject research studies) may inspect and/or copy your records for quality assurance and data analysis. These records may contain private information.

To ensure confidentiality to the extent permitted by law, the following measures will be taken: subjects will be assigned a random code that all data will be associated with. The key to this code will be kept in a locked cabinet in a locked office accessible only to Dr. Lanningham-Foster, Randal Foster, and Erin Thole. All 1:1 coaching sessions between high school and elementary students will also be confidential. Activity data will be kept for a period of 5 years after which they will be erased or destroyed. If the results are published, your identity will remain confidential.

QUESTIONS OR PROBLEMS

You are encouraged to ask questions at any time during the study.

• For further information about the study contact Dr. Lorraine Lanningham-Foster (515-294-4684).

• If you have any questions about the rights of research subjects or research related injury, please contact the IRB Administrator, (515) 294-4566, IRB@iastate.edu, or Director, Office for Responsible Research, (515) 294-4215, 1138 Pearson Hall, Ames, Iowa 50011.

************************************************************************

You have been asked to take part in a research study, at Iowa State University. The information about this study has been provided to you to inform you about the nature of this IRB approved study.

• I have read the whole consent form, and all of my questions have been answered to my satisfaction.

• I know that joining the study is voluntary and I agree to join the study.

• I know enough about the purpose, methods, risks, and possible benefits of the study to decide that I want to join.

• I know that I can call the investigator and research staff at any time with any new questions or to tell them about side effects.

• I understand that I may withdraw from the study at any time.

Please sign and date to show that you have read and understand all of the above guidelines. Please do not sign unless you have read the entire packet of information. If you do not want to sign, you don’t have to, but if you don’t you cannot participate in this research study.
Investigator Statement

I certify that the participant has been given adequate time to read and learn about the study and all of their questions have been answered. It is my opinion that the participant understands the purpose, risks, benefits and the procedures that will be followed in this study and has voluntarily agreed to participate.

_________________________________________ (Signature of Person Obtaining Consent)

________________ (Date)
APPENDIX E: LET’S GO 5-2-1-0 ASSENT FORMS

Assent Form to Take Part in a Research Study (4th grade students)

TITLE: Student Mentoring for Promoting a Healthy Body

Investigators: Lorraine Lanningham-Foster, Randal Foster, Erin Thole, Kai Ling Kong, Shiny Parsai, Megan Barnes, Samantha Kling

ASSENT FORM

You are being asked to be in a research study.

You are being asked to take part in this research study because we want to understand if your health activity levels will change if you take part in health education in your classroom and work with a partner called your Health Buddy. This study will last for most of the school year (September – May).

Here is an outline about what you will do for the study:

1. Get your parents’ permission and also give your permission by signing this form. You do not have to be in this study if you do not want to, even if your parents say it is OK.
2. We will measure your height and weight along with the school nurse and this will be in a private room where no one but the nurse and study staff can see this. We will ask you some questions about the food that you eat, and how physically active you are.
3. The study team will give you a small device to wear on your ankle. The device counts how many steps you take. You can take it off to sleep, take a shower or bath, or to swim. You will wear it for 5 days (Monday-Friday) and then return it to your teacher.
4. You will be assigned to one of two groups. Both groups will learn about healthy habits in your classroom. One of the groups will also meet with a high school student (your Health Buddy) during lunch/recess time. Your Health Buddy will talk to you once every other week about ways to have healthy habits. Your Health Buddy might give you some materials like handouts to help you learn about healthy habits. These meetings will go on most of the school year (until May).
5. During December and April, your height, weight and step counts will be measured, just like in the beginning of the school year. You will also be asked the same questions about your diet and physical activity. You will also be asked questions about your meetings with your healthy buddy.
During your participation, you will be given items (such as a pedometer, pencils, stickers, games) in appreciation for the time you spend in this study. If you start the study but stop before finishing the study, you will receive some of these items.

We will keep the information private that you give to us and the high school students as part of being in the study. The study information is kept in the study facility and is entered into a computer by the study investigator. The electronic records on the computer are locked under security pass words. Any written records are stored under lock and key. Study records will not identify you by name, but using a number.

If you do not want to be in this research project, you do not have to say yes or sign your name on this form.

No one will be mad at you if you say no.

________________________________________________________________________
Assent by Child
Date

(Printed name of parent/guardian)

To the professional:

If the child does not sign the form, but you believe the child has actively assented, please document on this form. State the specific behaviors (head shake yes, child said okay after you described the procedure, etc.).

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Researcher
Date
Assent Form to Take Part in a Research Study (High School students)

TITLE: Student Mentoring for Promoting a Healthy Body

Investigators: Lorraine Lanningham-Foster, Randal Foster, Erin Thole, Kai Ling Kong, Shiny Parsai, Megan Barnes, Samantha Kling

ASSENT FORM

You are being asked to be in a research study.

You are being asked to take part in this research study because we want to understand if health activity levels will change if 4th grade students take part in health education in their classroom and work with a partner called your Health Buddy. You will be the Health Buddy for this study and help 4th grade students learn about their health habits. This study will last for most of the school year (September – May).

Here is an outline about what you will do for the study:

1. Get your parents’ permission and also give your permission by signing this form. You do not have to be in this study if you do not want to, even if your parents say it is OK.

2. You will be asked to attend 2-3 lunch time meetings to learn about the Let’s Go 5-2-1-0 Program. A graduate student in Nutritional Sciences will meet with you to talk about the program. You will be given brochures about health habits to share with an elementary school child. You will also learn how to use 3 tools to help elementary students improve their health habits: Readiness Ruler, Goal Setting sheet, and Goal Tracking sheet.

3. After the 4th grade student completes measurements of height, weight, activity, and health habits, you will start working with a 4th grade student. You will work with them on goals for improving diet and/or physical activity.

4. The student pairs will establish a contract together termed “Health Buddy” that includes (a) goals for increasing physical activity and improving nutrition patterns for elementary students, and (b) as often as weekly meetings to implement and evaluate the goals. The exact date and time of the meeting will be coordinated with teachers and will occur during the 4th graders recess/lunch time at school. These visits will take about 30 minutes.

5. At the first meeting, you will talk with your Health Buddy about how ready he or she might be to make changes in his or her diet or physical activity. If the 4th grader wants to make changes, you and the 4th grader will set a goal for making a change. The first meeting will take 30-60 minutes. Your Health Buddy’s goals and progress will be discussed during each meeting.

6. During study months October thru May, you and your 4th grade student will meet every other week. The 4th grade student’s progress on goals will be discussed and recorded. If necessary, there may need to be meetings in 2 consecutive weeks due to holiday breaks (such as Thanksgiving or Spring Break).
During your participation, you will be given items (such as a pedometer, pencils, stickers, games) in appreciation for the time you spend in this study. If you start the study but stop before finishing the study, you will receive some of these items.

We will keep the information private that you give to us as part of being in the study. The study information is kept in the study facility and is entered into a computer by the study investigator. The electronic records on the computer are locked under security pass words. Any written records are stored under lock and key. Study records will not identify you by name, but using a number.

If you do not want to be in this research project, you do not have to say yes or sign your name on this form.

No one will be mad at you if you say no.

________________________________________________________________

Assent by Child  Date

________________________________________________________________

(Printed name of parent/guardian)

To the professional:

If the child does not sign the form, but you believe the child has actively assented, please document on this form. State the specific behaviors (head shake yes, child said okay after you described the procedure, etc.).

________________________________________________________________

________________________________________________________________

________________________________________________________________

________________________________________  Researcher

  Date
APPENDIX F: LET’S GO 5-2-1-0 STUDY RECRUITMENT AND CONTACT MATERIALS

**LET’S GO!**
Eat right. Be active. Get healthy.

In today’s world, eating right and being physically active can be a challenge for kids of even the most health-conscious families. 5-2-1-0 is an easy way to remember some basic health tips that are good for every member of your family.

**Follow these numbers to better health!**

1. **5** Eat at least five servings of fruits and vegetables a day.
2. **2** Limit TV and computer use (not related to school) to two hours or less a day.
3. **1** Get one hour or more of physical activity every day.
4. **0** Drink less sugar. Try water and low fat milk instead of soda and drinks with lots of sugar.

To learn more, visit [www.letsgo.org](http://www.letsgo.org)

This message is brought to you by the Founding Partners of Let's Go! Anthem Blue Cross and Blue Shield Foundation, Hannaford Bros. Co., Maine Medical Center, MaineHealth, TD Banknorth, United Way of Greater Portland, and Unum.
August 17, 2010

Dear Parent,

I am a researcher at Iowa State University. My research focuses on child health and obesity prevention. During the 2010-2011 school year, we will be partnering with Sibley-Ocheyedan Schools to implement a health intervention for 4th grade children. High school students in your community will also take part in the research study.

Your child is being asked to take part in this research study because we want to understand if your child’s health behavior and physical activity levels will change if he/she receives classroom health education and health mentoring. This study will last for most of the school year (September – May). At the beginning of the study your child will have his/her height and weight measured. He/She will answer some questions about their diet and physical activity.

The study team will give your child a small device to wear on his/her ankle. This device counts all of the steps that a person takes while you wear it. For the next week, your child will wear this step counter whenever he/she is awake. Your child can take it off when going to bed or when taking a shower. At the end of the week, your child will return the step counter to school.

Your child will learn about nutrition and physical activity from a study team member during the school day. Your child will also meet with high school students (Health Buddies) during recess and lunch time. The high school student will talk to your child on a regular schedule about goals for better diet and physical activity. The high school student has been given information to share with the elementary student about healthy habits and strategies for setting goals aimed at being healthier. These meetings will go on most of the school year (until May).

During the fourth (December) and last (April) month of the study, your child’s height, weight, and step counts will be measured again as in the first month of the study. Your child will be asked the same questions about diet and physical activity. Your child will also be asked questions about meetings with his/her healthy buddy.

During your child’s participation, he/she will be given items in appreciation for the time spent in this study. If your child starts the study but stops before finishing the entire study, your child will receive some of these items.

We will keep the information private that you and your child gives to us and the high school students as part of being in the study. The study information is kept in the study facility and is entered into a computer by the study investigator. The electronic records
on the computer are locked under security pass words. Any written records are stored under lock and key. Study records will not identify your child by name, but using a number.

If you would like for your child to participate, we will need for you to sign a permission form.

If you would like to speak with me about this project, I would be happy to speak with you and answer any questions. You may contact me using the contact information at the beginning of this letter.

Sincerely yours,

Lorraine Lanningham-Foster

Telephone Script
Student Mentoring for Promoting a Healthy Body IRB#
This script will be used when returning calls to parents.

Good morning/afternoon. This is ____ calling from Iowa State University. May I please speak to ______?

I am contacting you in response to your interest in our research study which is a health intervention for elementary school children and also involves high school students.

Your child is being asked to take part in this research study because we want to understand if your child’s health behavior and physical activity levels will change if he/she receives classroom health education and health mentoring. This study will last for most of the school year (September – May). At the beginning of the study your child will have his/her height and weight measured. He/She will answer some questions about their diet and physical activity.

The study team will give your child a small device to wear on his/her ankle. This device counts all of the steps that a person takes while you wear it. For the next week, your child will wear this step counter whenever he/she is awake. Your child can take it off when going to bed or when taking a shower. At the end of the week, your child will return the step counter to school.

Your child will be assigned to one of two groups. Both groups will learn about nutrition and physical activity from a study team member during the school day. One group will also meet with high school students (Health Buddies) during recess and lunch time. The high school student will talk to your child on a regular schedule about goals for better diet and physical activity. The high school student has been given information to share with the elementary student about healthy habits and strategies for setting goals aimed at being healthier. These meetings will go on most of the school year (until May).

During the fourth (December) and last (April) month of the study, your child’s height, weight, and step counts will be measured again as in the first month of the study. Your child will be asked
the same questions about diet and physical activity. Your child will also be asked questions about meetings with his/her healthy buddy.

During your child’s participation, he/she will be given items in appreciation for the time spent in this study. If your child starts the study but stops before finishing the entire study, your child will receive some of these items.

We will keep the information private that you and your child gives to us and the high school students as part of being in the study. The study information is kept in the study facility and is entered into a computer by the study investigator. The electronic records on the computer are locked under security pass words. Any written records are stored under lock and key. Study records will not identify your child by name, but using a number.

Are you still interested in your child participating in this study?”

NO:
“Thank you for your interest and time.”

YES:

Do you have any questions I can answer at this point?

My name is ______. You can call me if you have any questions regarding this study. My number is ______. Or you may email me at _________.
Thank you for your time and interest.”
I __________________________ here by certify my responsibility as____________________ Health Buddy for the 2010-2011 school year.

Date: __________
**Food for Thought**

**What is a serving?**

**Adults**
- A whole fruit the size of a tennis ball
- 1/2 cup of chopped fruit or veggies
- 1 cup of raw, leafy greens
- 1/4 cup of dried fruits

**Kids**
- Size of the palm of their hand

**Choose with the seasons**
- Buy fruits and veggies that are in season.
- Don't forget that frozen fruits and veggies are always available and are a healthy choice.

**Family mealtime**
- Do not underestimate the importance of family mealtime; take 10-15 minutes to sit down together.
- Get your family involved with meal planning.

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**Turn on the Fun!**

Life is lots more fun when you join in! Try these activities instead of watching TV.

- Ride a bike
- Go on a nature hike
- Put together a puzzle
- Turn on the music and dance
- Read a book or magazine
- Spend time catching up with your family
- Take your kids to the park or beach
- Play board games
- Walk, run, or jog
- Start a journal
- Play ball (basketball, catch, soccer, etc.)
- Go to the library
- Explore gyms in your community
- Rollerblade
- Charades
- Snow, ski, or snowshoe
Use physical activity as a reward

The Good Behavior Game:
- Write a short list of good behaviors on a chart. Mark the chart with a star every time you see the good behavior.
- After your child has earned a small number of stars, give him or her a reward.
- Give your child extra play time before or after meals as a reward for finishing homework.
- Avoid giving your child extra time in front of the screen as a reward.
- Choose fun, seasonal activities.
- Encourage your child to try a new sport or join a team.

Put limits on Juice

- Juice products labeled “ads,” “drink,” or “punch” often contain 5% juice or less. The only difference between these “juices” and soda is that they’re fortified with Vitamin C.
- Always try to choose whole fruits over juice.
- If you choose to serve juice, buy 100% juice.
- Each day, juice should be limited to:
  - 4-6 ounces for children 1-6 years old
  - 8-12 ounces for children 7-18 years old
  - 0 juice for children 6 months and under
- Make changes slowly by adding water to your child’s juice.
- Suggest a glass of water or low fat milk instead of juice.
Healthy Lifestyle Goal Setting Worksheet

It is important for your medical team to know how ready you are to make changes to improve your health. The following information can help you and your provider talk about steps you can take to move toward a healthier lifestyle for you and your family.

On a scale of 0 (not ready) to 10 (very ready) how ready are you to consider making a change?
0—1—2—3—4—5—6—7—8—9—10  
(please circle appropriate number)

### Ideas for Change

| 5  | Eat at least 5 servings of fruits and vegetables on most days.  
|    | Try one new vegetable or fruit each week  
|    | Add fruit to my cereal everyday  
|    | Choose a fruit for a snack  
|    | Change from fruit juice to whole fruit  
|    | Switch sweets to fruit  
| 2  | Reduce screen time to 2 hours or less every day  
|    | Plan my TV time  
|    | Take the TV out of my bedroom  
|    | Don’t eat in front of the TV  
| 1  | Participate in at least 1 hour or more of physical activity every day  
|    | Take a walk or enjoy a family walk after dinner  
|    | Play my favorite sport or physical activity  
|    | Wear a pedometer & walk 10,000 steps a day  
|    | Obtain physical activity equipment to try something new  
| 0  | Limit soda, sugar sweetened drinks and whole milk  
|    | Drink no soda  
|    | Limit fruit and sports drinks  
|    | Switch to low-fat or skim milk  
|    | Drink more water  
|    | Other: Familiarize myself with portion sizes  
|    | Eat two family meals together each week  
|    | Eat breakfast  
|    | Eat no fast / junk food  
|    | Limit snacks after dinner  

Name______________________________

Date______________________________

My personal health goal is
to:________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Tips and reminders about your pedometer

Thank you for participating in this research study and for wearing the pedometer! Your pedometer is called a Stepwatch. It counts the number of steps that you take when you wear it on your ankle.

- Please DO wear your pedometer:
  - each day this school week (Monday - Friday, insert dates).
  - on the outside of your right ankle or on the inside of your left ankle.
  - with your name facing out and the rounded part pointing up (see picture).
  - all day long. You may take the pedometer off at night when you sleep but remember to put the pedometer back on each morning.

- Please DO NOT wear your pedometer
  - when you take a shower or bath.
  - when you go swimming.
  - during a sport or activity if you think it might hurt you.

Please remember to bring the pedometer back to class on Friday so that you can turn it in!

THANK YOU!!!!
If you have questions, you may call: Dr. Lorraine Foster at 515-294-4684.
**Goal Tracker**

Circle the number of fruits & vegetables that you ate today. One serving equals a medium-sized fruit (apple, banana, pear, etc), a 1/2 cup of cut fruit or cooked veggies (about the size of a tennis ball), or 1 cup of raw veggies (about the size of a softball).

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*My favorite fruit or vegetable that I ate this week was:*

* A new fruit or vegetable that I want to try next week is:

Adapted from the Harvard Prevention Research Center

**Goal Tracker**

Circle the number of hours that you were moderately or vigorously physically active today. This includes any activities that you participated in such as sporting events, family walks or bike rides, outdoor activities, etc. where you broke into a sweat.

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*My favorite physical activity that I did this week was:*

* A new physical activity that I can try next week is:

Adapted from the Harvard Prevention Research Center
Goal Tracker

Circle the number of glasses of water that you drank today. 1 serving equals 8 ounces or 1 cup.

Monday: 1 2 3 4 5 6 7 8
Tuesday: 1 2 3 4 5 6 7 8
Wednesday: 1 2 3 4 5 6 7 8
Thursday: 1 2 3 4 5 6 7 8
Friday: 1 2 3 4 5 6 7 8
Saturday: 1 2 3 4 5 6 7 8
Sunday: 1 2 3 4 5 6 7 8

* Water makes me feel good because:

My Goal Is To Drink More Water & Less Soda and Juice.

Date:

Tips:
- Mix half water and half juice. This way you can enjoy the flavor with only half of the sugar.
- Pass on the soda. Don’t have it around. It has no nutritional value, adds calories to your diet, increases the occurrence of cavities, and may increase your risk for bone fractures later in life.
- Water is the best choice! Not only is it the most healthful drink, it is also the cheapest.

Adapted from the Harvard Prevention Research Center

Goal Tracker

Circle the number of hours that you had any type of screen time. This includes watching TV, movies, playing video games, or using the computer.

Monday: 1 2 3 4 5 6 7 8
Tuesday: 1 2 3 4 5 6 7 8
Wednesday: 1 2 3 4 5 6 7 8
Thursday: 1 2 3 4 5 6 7 8
Friday: 1 2 3 4 5 6 7 8
Saturday: 1 2 3 4 5 6 7 8
Sunday: 1 2 3 4 5 6 7 8

* Instead of watching TV this week, I:

* Another activity that I could do other than watch TV is:

My Goal Is To Watch Less TV.

Date:

Tips:
- Turn off the tube. Substitute physical activity for one hour of TV viewing each day.
- Try something new. Pick a new activity that you can enjoy a week instead of watching TV. Trips to the library, museums, local pool, or farmers market are great ideas.
- Turn in dinner not the TV. Do not watch TV during mealtimes. Instead focus on eating together as a family.
- Keep it out of the bedroom. Do not have a TV in your bedroom.

Adapted from the Harvard Prevention Research Center
Healthy Habits Survey

Name: ___________________________ Age: _______ Today's Date: _______

1. How many servings of fruits or vegetables do you eat a day?
   One serving is most easily identified by the size of the palm of your hand.
   ___________________________

2. How many times a week do you eat dinner at the table together with your family?
   ___________________________

3. How many times a week do you eat breakfast?
   ___________________________

4. How many times a week do you eat takeout or fast food?
   ___________________________

5. How many hours a day do you watch TV/movies or sit and play video/computer games?
   ___________________________

6. Do you have a TV in the room where you sleep?
   Yes ☐ No ☐

7. Do you have a computer in the room where you sleep?
   Yes ☐ No ☐

8. How much time a day do you spend in active play (faster breathing/heart rate or sweating)?
   ___________________________

9. How many 8-ounce servings of the following do you drink a day?
   100% Juice _______ Fruit drinks or sports drinks _______ Soda or punch _______
   Water _______ Whole milk _______ Nonfat or reduced fat milk _______

10. Based on your answers, is there ONE thing you would be interested in changing now? Please check one box.
   ☐ Eat more fruits & vegetables.
   ☐ Take the TV out of the bedroom.
   ☐ Play outside more often.
   ☐ Switch to skim or low fat milk.
   ☐ Spend less time watching TV/movies and playing video/computer games.
   ☐ Eat less fast food/takeout.
   ☐ Drink less soda, juice, or punch.
   ☐ Drink more water.

LET'S GO!
Eat right. Be active. Get healthy.
Health Buddy Questionnaire

Name________________ Health Buddy____________________ Date______________

This questionnaire contains items that are related to your visits with your health buddy. We would like to know more about how you have felt about your visits with your health buddy. Your responses are confidential.

1. I feel that my healthy buddy has provided me choices and options.
   1 2 3 4 5 6 7
   strongly disagree neutral strongly agree

2. I feel understood by my healthy buddy.
   1 2 3 4 5 6 7
   strongly disagree neutral strongly agree

3. I am able to be open with my healthy buddy at our meetings.
   1 2 3 4 5 6 7
   strongly disagree neutral strongly agree

4. I feel that my healthy buddy accepts me.
   1 2 3 4 5 6 7
   strongly disagree neutral strongly agree

5. My healthy buddy encourages me to ask questions.
   1 2 3 4 5 6 7
   strongly disagree neutral strongly agree

6. I feel a lot of trust in my healthy buddy.
   1 2 3 4 5 6 7
   strongly disagree neutral strongly agree
7. My healthy buddy answers my questions fully and carefully.

1 2 3 4 5 6 7
strongly neutral strongly disagree agree

8. My healthy buddy listens to how I would like to do things.

1 2 3 4 5 6 7
strongly neutral strongly disagree agree

9. I don't feel very good about the way my healthy buddy talks to me.

1 2 3 4 5 6 7
strongly neutral strongly disagree agree

10. My healthy buddy tries to understand how I see things before suggesting a new way to do things.

1 2 3 4 5 6 7
strongly disagree neutral strongly agree
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