ABSTRACT

Jessica Currie, THE EFFECT OF A TELEPHONE-BASED INTERVENTION ON PHYSICAL ACTIVITY AND COMPONENTS OF THE METABOLIC SYNDROME IN ADOLESCENTS. (Under the direction of Dr. Katrina D. DuBose) Department of Kinesiology, July 2013.

The purpose of this study was to determine the effects of a two month telephone-based intervention in obese adolescents (BMI percentile ≥ 95th percentile) on physical activity habits and motivation to be physically active. A secondary purpose was to assess the effects of the telephone-based intervention on individual components of the metabolic syndrome (i.e., blood pressure, waist circumference, and HDL-cholesterol). The final purpose of the study was to determine clinic follow-up rates of the participants after the intervention. Participants (n=29) were recruited at their initial visit to a medical clinic focusing on pediatric obesity and were randomly placed into a control (n=13) or intervention (n=16) group. Measurements taken included resting blood pressure and heart rate, height, weight, and waist circumference. Blood draws were obtained to measure total cholesterol, HDL-cholesterol and quantify non-HDL-cholesterol. Questionnaires completed included the Youth Risk Behavior Survey, Behavior Regulation of Exercise Questionnaire-2, a physical activity barriers questionnaire, and a demographic survey. The measurements and questionnaires were completed pre and post intervention. All participants received a New Lifestyles NL-800 pedometer and pedometer log to measure their physical activity for one week pre and post intervention. The participants in the intervention group received weekly newsletters and phone calls on various physical activity topics for seven weeks. During the seven week period, the control participants received no contact except for two phone calls to obtain baseline pedometer data and to remind participant of follow-up appointment. A series of 2x2 (group by time) repeated measures ANOVA adjusting for length of time between visits were performed to examine the effect of the intervention on

physical activity levels and specific components of the metabolic syndrome. Pedometer steps did not have significant main or interaction effects and effect sizes were small (ES= -0.03 for controls and ES=0.07 for intervention). A trend for significant time and group interaction effect ($p=0.06$) was seen for BMI z-score where the control group decreased their BMI z-score (ES= -0.96) and the intervention group increased their BMI z-score (ES= 0.43). Waist circumference showed no significant main and interaction effects ($p>0.05$). No main or interaction effects for systolic blood pressure. Diastolic blood pressure had a significant group effect ($p<0.05$), where the diastolic blood pressure was lower among those in the intervention group compared to controls. Significant main or interaction effects were not reported for HDL-cholesterol. Overall, the follow-up rate was 45% (control = 69%, intervention = 36%). In summary, a telephone-based physical activity intervention did not improve either physical activity levels or components of the metabolic syndrome. The intervention did not improve clinic follow-up rates. These results suggest that modifications need to be made to the current study in order to see the desired results. Changes may include a longer duration, a more accurate method of reporting data such as an accelerometer, or changes in the clinic to encourage a higher follow-up rate.

THE EFFECT OF A TELEPHONE-BASED INTERVENTION ON PHYSICAL ACTIVITY AND COMPONENTS OF THE METABOLIC SYNDROME IN ADOLESCENTS

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THE EFFECT OF A TELEPHONE-BASED INTERVENTION IN OBESE ADOLESCENTS ON PHYSICAL ACTIVITY, COMPONENTS OF THE METABOLIC SYNDROME, AND CLINIC FOLLOW-UP RATES

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CHAPTER 1: INTRODUCTION

Between the years 1970-2000, the rate of obese children tripled, where the prevalence increased from 5% to 15% (Ogden, Flegal, Carrol, & Johnson, 2002). The most recent NHANES data shows that the obesity rate of children and adolescents is 16.9% in 2007-2008 and 2009-2010, which seems to have plateaued (Ogden, Carroll, Kit, & Flegal, 2012). Obese youth compared to normal weight youth are more likely to have cardiovascular disease (CVD) risk factors such as, high blood pressure and high cholesterol (Freedman, Khan, Serdula, Dietz, Srinivasan, & Berenson, 2005). As the obesity epidemic continues to increase, metabolic abnormalities have become more prevalent among children and adolescents (Kelishadi et al., 2008). Not only are individual metabolic abnormalities occurring in this population, but a clustering of these abnormalities called the metabolic syndrome has been observed. The metabolic syndrome is defined as having three or more of the following: dyslipidemia, hypertension, high fasting glucose, and high waist circumference. The metabolic syndrome affects approximately one million adolescents in the United States (Cook, Weitzman, Auinger, Nguyen, & Dietz, 2003). The prevalence of the metabolic syndrome directly increases with the degree of obesity among youth (Weiss et al., 2004). The severity of the components of the metabolic syndrome also increases with the degree of obesity.

Regular physical activity helps to reduce the risk of obesity and chronic disease, such as type II diabetes, and cardiovascular disease (U.S. Department of Health and Human Services, 2008). The United States Department of Health and Human Services (2008) recommends that youth accumulate at least 60 minutes of physical activity daily to maintain a healthy lifestyle. Only 11.4% of high school females and 24.8% of high school males accumulated the recommended amount of physical activity in 2009 according to the Youth Risk Behavior Survey

(YRBS) (http://www.cdc.gov/healthyyouth/physicalactivity/facts.htm). Among the high school students surveyed in the YRBS, 23% of participants did not participate in at least 60 minutes of physical activity on any day of the week. A study that used accelerometers showed that 42% of children ages 6-12, 8% of youth ages 12-15, and 7.6% of youth ages 16-19 accumulated the recommended amount of physical activity (Troiano, Berrigan, Dodd, Mâsse, Tilert, & McDowell, 2008). Regardless of the assessment method, few youth are meeting current physical activity recommendations.

Due to the increase in obesity and a lack of physical activity, physical activity interventions are needed to improve the lives of children and adolescents. Treatment of the metabolic syndrome focuses on changes in diet and exercise and lifestyle modifications (Cook et al., 2003). It has been shown that children can benefit from a daily physical activity intervention which has community support (Johnston et al., 2010). Public health interventions that include physical activity should be created in order to prevent overweight adolescents from becoming overweight adults (Herman, Craig, Gauvin, & Katzmarzyk, 2008).

Interventions in children have been found to improve components of the metabolic syndrome (Chen, Roberts, & Barnard, 2005). A two week diet and exercise intervention for children and their families showed a reversal of the metabolic syndrome and improvements in individual components (Chen et al., 2005). Other interventions performed with children (n=321) include increasing the amount of physical activity during the school day (Magnusson, Sigurgeirsson, Sveinsson, & Johannsson, 2011). Improvements were seen in both the minutes of physical activity and counts per minute on the accelerometer when comparing the intervention and control groups at the midpoint; however, no physical activity improvements were seen at post-intervention. Factors such as training of leaders and motivation may play a major role in

the success of interventions. Magnusson et al. (2011) suggests that improvements may not have been seen post-intervention due to the initial motivation of the general teachers diminishing throughout the study. Leaders who are not motivated to fulfill the mission of the intervention may not give their full effort and the intervention may in turn fail at the overall goals.

Telephone based interventions have been performed in adults, but not in the adolescent age group. A study examined the effects of group versus individual telephone calls on weight loss (n=34) and was successful at promoting weight loss (Befort, Donnelly, Sullivan, Ellerbeck, & Perri, 2009). Active for Life (n=2,503) was an intervention that compared the effectiveness of two different physical activity programs (Wilcox et al., 2008). Both interventions showed an increase in physical activity during post-tests. There has been research to show that components of the metabolic syndrome can be improved in adolescents and also that telephone interventions are successful in adults (Johnston et al., 2010, Davis et al., 2011, and Befort et al., 2009). The purpose of this study is to determine the effect of a telephone-based intervention in adolescents on physical activity levels and motivation to be physically active, components of the metabolic syndrome, and clinic follow-up rate. We hypothesize that a telephone-based intervention will increase physical activity, positively impact the participant's motivation to be active, improve triglycerides, high density lipoprotein cholesterol (HDL-C), waist circumference, and blood pressure in obese adolescents and increase clinic follow-up rates.

The significance of this study could be beneficial to improving the health of adolescents in the future. Due to the economy, some youth may not be able to travel to a gym or have money to purchase exercise equipment to perform physical activity. Through a telephone-based intervention, the participants will be able to receive guidance on how to improve their physical activity and still receive the individual attention that is desired.

Delimitations:

1. The participants will reside in Eastern North Carolina.
2. All participants are classified as at least the 95th percentile for obesity. This is a requirement for ECU's Pediatric Healthy Weight Research and Treatment Center.
3. Pedometers will be used to measure physical activity. These monitors will not be able to measure either intensity or duration.

Limitations:

1. All participants will be recruited from ECU's Pediatric Healthy Weight Research and Treatment Center.
2. Cook et al. (2003) will be used for defining the components of the metabolic syndrome in adolescents.

Definitions

1. Metabolic Syndrome: Cook et al. (2003) will be used to describe the metabolic syndrome in adolescents. To be classified as having the metabolic syndrome, youth have to have three or more of the following:

   High triglyceride level (≥ 110 mg/dL),

   Low high density lipoprotein cholesterol (HDL-C) for males and females (≤ 40 mg/dL), Abdominal obesity or waist circumference (≥ 90th percentile),

   *High fasting glucose level (≥ 100 mg/dL), or

   High blood pressure (≥ 90th percentile)

*This value is modified to reflect change in the definition of increase fasting glucose by the medical community (Alberti, Zimmet for the WHO Consultation, 1998).

2. Obesity: The Surgeon General's Recommendations will be used to describe the obesity in adolescents. Adolescents with a weight $\geq 95^{th}$ percentile will be defined as obese. Overweight will be defined as having a weight between 85^{th} and 94^{th} percentile. (http://www.surgeongeneral.gov/library/obesityvision/obesityvision2010.pdf)

3. Physical Activity: The World Health Organization defines physical activity as any bodily movement produced by skeletal muscles that requires energy expenditure. (http://www.who.int/topics/physical_activity/en/)

4. Motivational Interviewing: Resnicow, Davis, & Rollnick (2006) define motivational interviewing as an equal and empathetic "way of being." This is achieved through using techniques such as reflective listening, shared decision making, and agenda setting. The tone of motivational interviewing should be nonjudgmental, empathetic, and encouraging.

CHAPTER 2: REVIEW OF LITERATURE

Physical Activity

The World Health Organization's current physical activity recommendations for youth ages 5-17 years old consist of accumulating 60 minutes per day of moderate to vigorous activity (http://www.who.int/dietphysicalactivity/factsheet_young_people/en/). The United States Department of Health and Human Services published Physical Activity Guidelines for Americans in 2008 which recommended both children and adolescents accumulate a total of 60 minutes or more of moderate or vigorous intensity aerobic physical activity (PA) (U.S. Department of Health and Human Services, 2008). Further, children and adolescents are encouraged to include vigorous activity and muscle and bone strengthening activities at least three days per week (U.S. Department of Health and Human Services, 2008). Troiano et al. (2008) showed that physical activity levels dropped significantly when comparing children ages 6-11 and adolescents ages 12-15. Children (n=597) who accumulated the recommended amount of physical activity among 6-11 year olds were 49% in boys and 35% in girls. In adolescents (n=654) ages 12-15, only 12% of boys and 3% of girls met current physical activity recommendations. For the older group of adolescents, ages 16-19 (n=529), 10% of males and 5% of females met the recommended PA guidelines.

It is unclear if physical activity habits in childhood track into adulthood. One study showed that physical activity tracked from adolescence to adulthood (Fortier, Katzmarzyk, Malina, & Bouchard, 2001). A subsample (n=1909) from the 1981 Canada Fitness Study and the 1988 Campbell's Survey on Well-Being in Canada was used to analyze physical activity habits throughout aging. Inter-age correlations for youth ranged from 0.03 to 0.33 and for adults the inter-age correlations ranged from 0.04 to 0.39. This shows that correlations are very similar

between youth and adults in regards to activity related energy expenditure. However, results from a 22 year longitudinal study which examined the tracking of physical activity from childhood and adolescence (ages 7-18) into adulthood (ages 29-41) showed physical activity and inter-age correlations that were low and non-significant (Herman et al., 2008). A total of 374 participants aged 7-18 years old in the 1981 Canada Fitness Survey were re-evaluated in 2002-2004. Tracking of physical activity that began in children ages 7-9, showed a correlation of 0.2-0.23 which was non-significant as well. The correlation was higher when the first observation (1981) was made when the participant was older, 13-18 years old. This age group had a significant moderate correlation (r=0.38-0.57) in the 1988-2003 follow-ups in which the participants were ages 20-25 in 1988 and ages 35-41 in 2002-04. The participants in this longitudinal study were also placed into quintiles based on their physical activity levels. Individuals in the highest PA quintile in 1981 who remained there in 2003 were 17% of males and 15% of females. On the other end of the spectrum, in the lowest quintile, 15% of males and 22% of females were placed in this quintile at the initial visit and the follow-up. These results highlighted the need for interventions that also encourage participants who are active to remain active.

Physical activity and cardiorespiratory fitness have been associated with lower risks for chronic diseases (Carnethon, Gidding, Nehgme, Sidney, Jacobs, & Liu, 2003). Some of these diseases include cardiovascular disease, the metabolic syndrome, type 2 diabetes, and all cause mortality. Sedentary time during childhood and adolescence is significantly and positively related to blood pressure, fasting glucose, insulin, and clustered metabolic risk (Ekelund, Anderssen, Froberg, Sardinha, Andersen, & Brage, 2007). Adolescents who are inactive and have low cardiorespiratory fitness have a higher prevalence of the metabolic syndrome (Neto et

al., 2011). Moderate to vigorous physical activity (MVPA) has an inverse effect of the previously listed risk factors (Ekelund et al., 2007). This suggests that more time spent in MVPA may have beneficial effects on both metabolic and cardiovascular health.

As children reach adolescence, physical activity decreases to alarming amounts (Troiano et al., 2008). Fortier et al. (2001) found similar correlations between youth and adult physical activity levels however some researchers have found little to no correlation between youth and adult physical activity levels (Herman et al., 2008). More research needs to be performed in this area to determine if physical activity does or does not track from youth into adulthood. Interventions involving youth and adolescents need to be the aim of researchers in order to instill healthy habits at a young age (Herman et al., 2008). A lack of physical activity and cardiorespiratory fitness can lead to chronic diseases which may negatively affect a person's life (Carnethon et al., 2003). This potentially harmful outcome reiterates the need for interventions that encourage physical activity in youth.

Obesity

Since the 1970's, the prevalence of overweight/obesity has been increasing among adolescents. In 1966-1970, the National Health and Nutrition Examination Survey (NHANES) determined the prevalence of adolescents who were overweight to be 4.6%. By 1994 the prevalence was 10.0% and increased to 15.5% by 1999-2000 (Ogden et al., 2002). Changes that may contribute to the increasing overweight in adolescent populations are increasing portion sizes of high-fat foods and an increasing sedentary lifestyle. These habits that start in childhood will most likely continue into adulthood. Despite years of the obesity trend increasing, the most

recent comparison between 2007-2008 and 2009-2010 shows that the obesity rate of youth is leveling off at 16.9% (Ogden et al., 2012).

Overweight and obesity track well from childhood into adulthood. A systematic review of literature was performed to compare studies on the tracking of overweight and obesity beginning in childhood (Singh et al., 2006). The review found that studies consistently reported an increased risk for either overweight or obese youth to remain overweight as adults. A 31 year longitudinal study was performed by Laitenen, Power, and Järvelin (2001) observing the trends of overweight and obese youth (n=6280) and their weight status as adults. This study defined overweight as $\geq 85^{th}$ to $< 95^{th}$ percentile and obesity as $\geq 95^{th}$ percentile for youth. When the participants were tested in adulthood, overweight was considered a BMI $\geq$ 25-29.9 kg/m^2 and obesity was a BMI $\geq$ 30 kg/m^2. During the follow-up period, 56% of males and 42% of females who were overweight as youth became overweight as adults and 25% of males and 22% of females became obese in adulthood. Obese youth became overweight adults 41% in males and 27% in females. If youth were obese, 47% of males and 55% of females became obese adults.

In a similar study by Freedman et al. (2005), follow-up data was collected after 18 years. A total of 2,610 children between the ages of 2-17 years old were followed to ages 18-37 years with the mean follow-up being 17.6 years. Overweight was described as a BMI $\geq 95^{th}$ percentile in youth and obesity was expressed as BMI $\geq$ 30 kg/m^2 in adults. This study examined the age of the initial measurement and the weight status after 18 years. It was determined that 83% of overweight youth who were tested originally between ages 2-5 years were found to be obese in adulthood. Overweight males and females who were tested between ages 9-11 years old initially were 76% and 78% likely to be obese in adulthood. For overweight adolescents between the ages of 15-17, males were 86% and females were 90% likely to be obese as adults. The

percentages between these two studies are similar in the risk of overweight/obese youth becoming overweight/obese adults. These two studies were chosen from the many in this review since their definition for overweight and obesity were similar. They were also chosen because they were representative of the overall findings in the other studies.

Childhood body weight or BMI has been found to be a significant predictor of all cause mortality and cardiovascular disease (Gunnell, Frankel, Nanchahal, Peters, & Smith, 1998). Data from NHANES found that in adolescents, the greatest increase among traits for the metabolic syndrome between the 1988-1994 and the 1999-2000 surveys was waist circumference (de Ferranti et al., 2006). In the 1999-2000 NHANES survey, it was found that 30.5% of participating adolescents (n=1527) had a BMI at or above the 85th percentile which classified these participants as overweight. This was an increase of 18% from the 1988-1994 NHANES data in which the prevalence was of overweight adolescents (n=1960) was 25.9%. de Ferranti et al. (2006) found that the prevalence of the metabolic syndrome will continue to increase as central obesity continues to increase in adolescents.

With the decrease in physical activity levels in both children and adolescents, the rates of obesity are continuing to increase (Neto et al., 2011 and Ogden et al., 2002). An increase of portion sizes, consumption of high fat fast foods, and an increasingly sedentary lifestyle are all contributing to the obesity epidemic now beginning in childhood (Ogden et al., 2002). Overweight children are of particular concern due to the possible long-term association of obesity in adulthood and morbidity (Singh, Mulder, Twisk, van Mechelen, & Chinapaw, 2006) and the development of co-morbid conditions such as the metabolic syndrome.

Metabolic Syndrome

Childhood obesity is associated with increased mortality later in life (Gunnell et al., 1998). Obesity is also associated with an increased risk for development of the metabolic syndrome. A clustering of cardiovascular disease risk factors of at least three of the following, elevated blood pressure, dyslipidemia [high triglycerides and low high density lipoprotein (HDL) cholesterol], insulin resistance, and central obesity is considered the metabolic syndrome. The Metabolic Syndrome has been known as Syndrome X, Insulin Resistance Syndrome, Metabolic Cardiovascular Syndrome, Dysmetabolic Syndrome, and Reaven's Syndrome. Throughout this document, the term metabolic syndrome will be used.

According to Ford and Li (2008), there is no standard definition of the metabolic syndrome for eiither children or adolescents. The definition of the metabolic syndrome used most commonly is adapted from the National Cholesterol Education Program (NCEP or Adult Treatment Panel III [ATP III]) used by Cook et al. (Ford & Li, 2008). To be considered as having the metabolic syndrome, the children would have at least three of the following: high triglyceride level (≥ 110 mg/dL), low high density lipoprotein cholesterol (HDL-C) for males and females (≤ 40 mg/dL), abdominal obesity or waist circumference (≥ 90^{th} percentile), high fasting glucose level (≥ 110 mg/dL), or high blood pressure (≥ 90^{th} percentile) (Cook et al., 2003). Based on this definition, 4.2% of adolescents were classified as having the metabolic syndrome using data from NHANES in 1988-1994. One-third of U. S. adolescents were found to have at least one risk factor for the metabolic syndrome (de Ferranti, Gauvreau, Ludwig, Neufield, Newburger, & Rifai, 2004). de Ferranti et al., (2006) also used NHANES (1988-1994) data, but described the metabolic syndrome as have three or more of the following: waist circumference > 75^{th} percentile, triglycerides ≥ 1.1 mmol/L, HDL cholesterol < 1.3 mmol/L

except in males 15-19 years old in which the cutpoint was < 1.17 mmol/L, blood pressure > 90th percentile, or glucose ≥ 6.1 mmol/L. The prevalence rate of the metabolic syndrome according to this definition was 9.2%. One out of every three overweight or obese children had the metabolic syndrome (de Ferranti et al., 2004). As shown, the prevalence of the metabolic syndrome heavily weighs on the definition and cut points used. Having a standard definition for this age group would facilitate observing this syndrome and comparing results across studies (Ford et al., 2007).

NHANES 1999-2000 data indicates that three or more risk factors were found in 12.7% of adolescents compared to 9.2% in 1988-1994 (de Ferranti et al., 2006). This represents an increase of 38%. It is also noted that 63.4% of adolescents in the United States have at least one metabolic abnormality. Differences in the metabolic syndrome by sex were also found. The prevalence of the metabolic syndrome in males increased from 9.5% to 13.8%. Female prevalence increased from 8.9% to 11.6%. Racial differences in the prevalence for the metabolic syndrome also exist, where the prevalence of the metabolic syndrome among non-Hispanic blacks was three times higher than other ethnic groups. While the authors stated that the finding may be an artifact due to the small sample size, others have shown racial differences in the prevalence in the metabolic syndrome. The prevalence of the metabolic syndrome in Hispanic children was 12% compared to 4% found in non-Hispanic Caucasians and African Americans (DuBose, Stewart, Charbonneau, Mayo, & Donnelly, 2006). Similar findings were reported using NHANES 1988-1994 data, where 5.6% of Hispanic adolescents had the metabolic syndrome compared to 4.8% of Caucasian adolescents and 2.0% of African American adolescents (Cook et al., 2003). Nearly one million adolescents in the United States are affected by the metabolic syndrome.

Through longitudinal studies, researchers have been observing whether components of the metabolic syndrome track from childhood into adulthood. Raitakari, Porkka, Räsänen, Rönnemaa, and Viikari (1994) found that 25% of participants initially at high risk in childhood remained at high risk during adulthood. Eisenmann, Welk, Wickel, and Blair (2004) discovered that components of the metabolic syndrome tracked moderately well into adulthood. Participants (n=48) used in this study were part of the Aerobics Center Longitudinal Study and had one clinical visit during adolescence. In a comparison between Blacks (n=389) and Whites (n=631), the tracking of the metabolic syndrome from childhood to adulthood was examined (Chen et al., 2007). Results of this study showed consistently higher correlations of rates of change in components of the metabolic syndrome in Black versus White individuals. Chen et al. (2007) suggests that genetic basis and lifestyles may have an impact on the clustering of the metabolic syndrome components. The most common variables which tracked from adolescence to adulthood were waist circumference and total cholesterol/high density lipoprotein ratio (Eisenmann et al., 2004). Both glucose and diastolic blood pressure tracked poorly from adolescence to adulthood. It was also found that adolescent waist circumference had a strong positive relationship with adult blood pressure (Eisenmann et al., 2004).

A study involving a short-term diet and exercise intervention was used in overweight children and adolescents (n=16) to evaluate the effects on the metabolic syndrome (Chen et. al, 2005). Youth and their families attended a two week residential lifestyle modification program. This program consisted of prepared meals, education sessions on nutrition and physical activity, and 2-2.5 hours of supervised physical activity daily. There was improvement in systolic blood pressure (130 vs. 117 mmHg), diastolic blood pressure (74.3 vs. 67.2 mmHg), triglycerides (146 vs. 88.1 mg/dL), and insulin (27.2 vs. 18.3 μU/mL) after the two week intervention; however, an

improvement in HDL values (42.3 vs. 40.8 mg/dL) was not observed. Fasting glucose levels were improved in six of nine individuals who started with high fasting glucose measurements. Waist circumference measurements improved from a mean of 103.3 cm to 98.3 cm. At the beginning of the intervention, seven participants were classified as having the metabolic syndrome and all seven had reversed the metabolic syndrome after two weeks. This study shows that components of the metabolic syndrome can be improved through lifestyle changes in youth.

Obesity and the Metabolic Syndrome

A higher prevalence of the metabolic syndrome was found in overweight and obese children when compared to normal weight children (DuBose, Eisenmann, & Donnelly, 2007). A total of 499 children aged 7-9 years old were assessed for the relationship between BMI, aerobic fitness, and the metabolic syndrome. The highest metabolic syndrome score was found in low fit and obese children (MetSyn Score=3.33) whereas the lowest score was in children who were normal weight with high fitness (MetSyn Score=-1.42). Excess weight was found to be positively related to the metabolic score while high fitness was inversely associated with the metabolic score. Pan and Pratt (2008) found that when investigating BMI (n=4,450), the prevalence of the metabolic syndrome in participants with a BMI $\geq 95^{th}$ percentile was 14.5% compared to the prevalence of participants with a BMI $< 85^{th}$ percentile was 0.9%. In another study, the overall prevalence of the metabolic syndrome in moderately obese participants (n=243) was 38.7% while the prevalence in severely obese participants (n=191) was 49.7% (Weiss et al., 2004). The results of these studies showed that the components of the metabolic syndrome are directly related to the degree of obesity in the participants.

In a longitudinal study with participants approximately 11 years old during the first test (n=1,020), then approximately 25-28 years old during the second test, a positive relationship between obesity and the metabolic syndrome was observed (Chen et al., 2007). When examining the clustering of components of the metabolic syndrome, there was a drastic reduction in the degree of clustering when the body mass index was removed. This dramatic change was not seen when examining the change in clustering with insulin resistance. Chen et al. (2007) describes the strong relationship between obesity and the metabolic syndrome. To prevent cardiovascular disease risk factors in youth, the development of aerobic fitness should be stressed during childhood (DuBose et al., 2007). Chen et al. (2007) also describes how both dietary modification and physical activity should be instilled early in life to prevent obesity and potential development of the metabolic syndrome.

The strong association between the degree of obesity and the metabolic syndrome shows that the prevalence of the metabolic syndrome may be more than reported among U.S. youth (Weiss et al., 2004). The prevalence of the metabolic syndrome among adolescents ages 12 to 19 years was 4.2% in the NHANES data set from 1988-1994 (Cook et al., 2003). An increase of the prevalence of the metabolic syndrome in adolescents was found to be 8.6% in the 2001-2006 NHANES (Johnson, Kroon, Greenway, Bouchard, Ryan, & Katzmarzyk, 2009). Components of the metabolic syndrome and obesity have been found to track from childhood to adulthood (Knox et al., 2009 and Singh et al., 2008). The metabolic syndrome is far more common than expected among youth with the rapid increase in obesity rates (Weiss et al., 2004). Obesity is critically important in the development of the metabolic syndrome (Chen, Srinivasan, Li, Xu, & Berenson, 2007).

After an increase of 38% in the rate of the metabolic syndrome in adolescents in the NHANES data sets between 1988-1994 to 1999-2000, public health efforts should be made to encourage healthier lifestyles (de Ferranti et al., 2006). An inverse relationship between the metabolic syndrome and physical activity have recently been reported (Andersen et al., 2006, Ekelund et al., 2007, Ferreira, Twisk, van Mechelen, Kemper, & Stehouwer, 2005). This shows the importance of physical activity in childhood.

Physical Activity and the Metabolic Syndrome

Physical activity has also been considered a preventative measure in regards to the metabolic syndrome. Both physical activity and cardiorespiratory fitness have been found to be important indicators of the risk for developing the metabolic syndrome (Neto et al., 2011). Andersen et al. (2006) recommended that physical activity guidelines should be more than one hour per day for children to prevent clustering of CVD risk factors. It may be necessary for children and adolescents to achieve 90 minutes of physical activity per day to prevent insulin resistance which is considered the main feature for clustering of risk factors. The metabolic syndrome is associated with a 3.0-4.3 fold increased risk for coronary heart disease mortality (Lakka et al., 2002). Adolescents who maintain a high fitness level throughout early adulthood are less likely to develop the metabolic syndrome in later adulthood (Ferreira et al., 2005). When comparing individuals with the metabolic syndrome (n=36) to those without the metabolic syndrome (n=364), those who have been diagnosed are more likely to have a greater increase in total and subcutaneous trunk fat and also a greater decrease in cardiorespiratory fitness level between the ages of 13-36 years old (Ferreira et al., 2005). This increase in total and central fatness has been critical in the development of the metabolic syndrome when transitioning from

adolescence into adulthood. When comparing the 1988-1994 (n=1,960) to the 1999-2000 NHANES (n=1,527) data sets, there was an increase of 25% to 34% in central obesity among adolescents (de Ferranti et al., 2006).

Childhood and adolescence is an important time to develop physical activity habits and aerobic fitness to reduce the risk of obesity related comorbidities (Ferreira et al., 2005). Utilizing community resources such as schools, recreation centers, and parks is one way to begin physical activity program for youth (Johnson et al., 2009). Pan and Pratt (2008) have expressed the need to engage adolescents in both regular physical activity and healthy dietary practices to prevent both weight gain and the potential development of the metabolic syndrome. Weight control interventions should be the main focus to prevent and treat the metabolic syndrome in adolescents (Pan and Pratt, 2008).

Physical Activity Interventions

With the prevalence of the metabolic syndrome continuing to increase, researchers are creating interventions to counteract the chronic diseases that come along with this syndrome (Ekelund et al., 2007). These interventions include physical activity and nutrition, depending on the aim of the researcher. Because a strong correlation between cardiorespiratory fitness and the metabolic syndrome exists, interventions should focus on prevention strategies, enhancing fitness levels and increasing physical activity early in life (Neto et al., 2011). Different approaches to reach youth such as face to face, text messaging, and telephone based interventions have shown improvements in physical activity. School based interventions are common considering the majority of youth are enrolled in school. Other methods to deliver physical activity interventions in children are starting to emerge. This section will review the various methods used to deliver

physical activity interventions focusing on the metabolic syndrome and it's components in adolescents.

Delivery of Physical Activity Interventions

Face to Face. A common method to deliver interventions is through face to face interactions. This method was most commonly used before the vast use of technology. Several face to face interventions will be described in which researchers were studying the effect of physical activity on the components of the metabolic syndrome. A weight management school-based intervention was aimed toward overweight and obese Mexican-American youth between the ages of 10-14 years old (Johnston et al., 2010). The youth were separated into two groups, one who had an instructor led intervention (n=40) and one where the youth received "self-help" from a parent guided manual (n=20). The intervention focused on increasing healthy eating and physical activity. The self-help group participated in a 12 week parent guided manual while the instructor led intervention was daily and lasted 24 weeks. Measurements were collected at baseline, one year and two years. There were significant changes in the instructor led intervention in the participants' zBMI scores with a decrease from 1.55 to 1.35 zBMI units. The reduction of the zBMI scores by 0.2 zBMI units were shown in >79% of youth after one year and 62% in youth after two years. In the self-help group, the majority of the children increased their zBMI scores. Changes were also seen in total cholesterol and triglyceride values in the instructor led group. Total cholesterol decreased approximately 18.4 mg/dL and triglycerides were decreased approximately 19.2 mg/dL. The self-help group did not show these changes. Blood pressure as well as LDL and HDL cholesterol did not show significant changes during the intervention.

An intervention comparing the effectiveness of video game cycling versus cycling with music was performed with overweight and obese adolescents (n=26) (Adamo, Rutherford, & Goldfield, 2010). Non-invasive measurements included exercise adherence, height, weight, body fat, waist circumference. Bloodwork measurements included fasting insulin, blood glucose, triglycerides, low-density cholesterol, high-density cholesterol, and total cholesterol. The participants completed two 60 minutes exercise sessions per week for 10 weeks. The participants were randomized to either cycling with a racing video game or cycling on a stationary cycle with music. While there was not a group effect on total cholesterol, there was a significant reduction in total cholesterol (~7%) among both groups. There was no significant change in body composition except for body fat percentage. There was a small, but statistically significant reduction in body fat percentage after the intervention (43.7% to 42.1% for the music group, 45.2% to 43.5% for the video game group). None of the metabolic syndrome components were improved as result of the intervention. There was an 8-10% increase in fitness observed in both groups.

Another intervention on metabolic syndrome components was performed in overweight and obese Latino adolescents (Davis et al., 2011). This intervention included a control group (n=12) and either circuit training (n=14) or circuit training and motivational interviewing (n=12) for 16 weeks. The circuit training group participated in two training sessions per week for 60-90 minutes per session. The circuit training and motivational interviewing group received the same training sessions as previously described as well as four individual and four group motivational sessions. Post-intervention data showed that circuit training (without motivational interviewing) participants had a 9% lower diastolic blood pressure, 18% lower body weight, and 26% lower body fat compared to the control groups. Both circuit training and circuit training and

motivational interviewing groups showed a 3% decrease in waist circumference while the control group increased by 3%. There was a decrease of 24% in fasting insulin in the circuit training group, but no changes in fasting glucose in any group. Motivational interviewing did not prove to enhance the overall effect in this intervention.

Telephone. In 2010, 75% of adolescents were found to own cell phones (http://pewresearch.org/pubs/1572/teens-cell-phones-text-messages). Calling on a cell phone is still a central function according to Pew Research Central (http://pewresearch.org/pubs/1572/teens-cell-phones-text-messages). As technology is becoming more popular, researchers have incorporated technology into interventions focusing on obesity, diabetes control, cancer preventative techniques, and many other outcomes (Befort et al., 2009, Wilcox et al., 2008, and Crane, Leakey, Rimer, Wolfe, Woodworth, & Warnecke, 1998). After researching on PubMed, one intervention has been found involving improving physical activity in adolescents through telephone-based interventions. This intervention (n=117) combined improving physical activity and nutrition through four methods; no contact, mail only, infrequent telephone and mail, or frequent telephone and mail (Patrick et al., 2001). The telephone counseling was rated more helpful than the mailed materials by the adolescent participants. Participants in the mail only group, the infrequent telephone and mail group, and also the frequent telephone and mail group showed improvements in moderate physical activity, but not in vigorous physical activity. Although improvements were seen, the researchers suggest that teaching the behavior change strategies would have been beneficial through the mailed material and telephone calls. With so many adolescents owning and using cell phones, it would be a practical option for researchers to consider when aiming to improve physical activity in adolescents. Further, using telephones to

increase physical activity levels increases a population who may be otherwise restricted by transportation limitations.

Telephone-based interventions have been conducted in an adult population and a systematic review of telephone interventions showed strong evidence for producing initiation of change in participants in both physical activity and dietary change (Goode, Reeves, & Eakin, 2011). A telephone-based intervention was performed on obese women (n=34) who lived in a rural setting (Befort et al., 2009). The purpose of the study was to determine whether a group telephone call would be more beneficial to weight loss than an individual phone call. The intervention was based around the Social Cognitive Theory consisting of goal-setting, problem-solving, relapse prevention, and several other strategies. All participants had a weekly phone call whether it was in a group setting or on an individual basis for 4 months and then a biweekly phone call for two months. During the phone calls, the participant's logs would be reviewed, participants were able to ask the interviewer any questions, and a new weekly topic would be introduced. The weekly topics consisted of nutrition, physical activity, or cognitive and behavior strategies. At the end of the intervention, 50% of the participants in the individual group had 10% weight loss. Weight loss occurred in 62% of the participants in the group phone call intervention achieved the initial goal of 10% weight loss. While the group phone call did have a higher weight loss percentage, both groups had significant weight loss. With both groups achieving significant weight loss, this shows that participants have individual preferences for the types of treatments that would be most beneficial. This finding should help future researchers in planning and implementing interventions by determining the participants' preferences before the intervention begins.

Another study involving telephone calls encouraging physical activity consisted of two different interventions (Wilcox et al., 2008). The Active Choices group (n=2,503) received one face-to-face visit and up to eight one-on-one phone calls during the six month intervention. The other intervention group was Active Living Every Day (n=3,388) which was a 20 week physical activity intervention where the group met face-to-face. Post-test data for the first year in the Active Choices revealed a significant increase in the number of participants meeting physical activity recommendations, 9.92% to 24.07%. The increases remained through years 3 and 4. In the Active Living Every Day group, the percentage of participants meeting physical activity guidelines increased from 15.36% at baseline to 42.14% after 20 weeks. Those who received small group visits showed larger improvements in physical activity in Year One and Year Two; however, those that received the combination of a face-to-face meeting and phone calls showed greater amounts of physical activity in Year Three and Four.

Text Messaging. Interventions using text messages have been used for diabetes and now starting to be used in physical activity and obesity studies. Adolescents who are participating in a weight loss program may have a difficult time sticking to behavior change recommendations (Woolford et al., 2011). The goal of the intervention was to send text messages to obese adolescents (n=24) 1-3 times/day over a 6-month period. These text messages focused on increasing behaviors such as breakfast consumption, increased consumption of fruits and vegetables, decreased consumption of sweetened beverages, decreased consumption of fast food, decreased screen time, and increased physical activity. The types of messages differed to determine the most effective way to send successful text messages. These types included testimonials, meal/recipe ideas, targeted tips, reflective questions, feedback questions, and

tailored messages. The average change in BMI over a three month period was -1.0 kg/m^2. Participants liked receiving direct messages telling them exactly what to do and messages that were positive and encouraging. Participants admitted that some messages had potential to trigger negative behaviors. The results of the study concluded that it is important to carefully construct the text messages to have a positive effect.

Motivational Interviewing. Motivational interviewing techniques have been found to facilitate behavior change and increase motivation. These techniques can be used to tailor the intervention based on the participant's readiness to change. A study called "New Girls" consisted of 16-18 year old female adolescents (n=41) who attended a weekly physical education class for nine weeks (Flattum, Friend, Neumark-Sztainer, & Story, 2009). The intervention consisted of both physical activity and education sessions. The participants were given an opportunity to meet individually with the intervention coaches. During these personal sessions, the coaches used motivational interviewing techniques to discuss physical activity, nutrition, and social support goals. Twenty participants decided to meet individually with the intervention coaches. At each session, the coach would review the participant's goals to see if they had been achieved. If the goal was achieved, the participant set a new goal and was encouraged to reward themselves. The relationship between the researcher and the participant was considered a partnership compared to an expert-recipient relationship. This worked well with the adolescents in their aim for independence. With giving the adolescent participants a sense of being equal to the researchers, compliance and behavior change can be achieved. This study has shown that using a technique, such as motivational interviewing, can provide participants with a sense of

independence and choice. This in turn can increase intrinsic motivation which leads to long-term behavior changes.

Researchers aimed to increase adolescent girls' moderate to vigorous physical activity by having a school nurse use motivational interviewing techniques (Robbins, Pfeiffer, Maier, LaDrig, & Berg-Smith, 2012a). Two school nurses attended a training workshop provided by an expert on motivational interviewing. The workshop included information on adolescent development and motivational interviewing. A total of 37 racially diverse girls with a mean age of 11.5 participated in the study. The participants were enrolled in two different schools, one of which was used for a control group. Each participant met with the school nurse three times for 20 minute sessions during the six month intervention. Counseling sessions were audio recorded for evaluation. Spirit, empathy, and direction were rated. The percentage of adherent versus nonadherent statements, open-ended to close-ended questions, complex to simple reflections, and ratio of reflections to questions were calculated. Improvements were seen in adherent versus nonadherent statements and open-ended to closed-ended questions when comparing sessions three to sessions one. The 2-day training workshop and regular evaluation of the audiotaped sessions resulted in success and improvements in motivational interviewing by the school nurses. This study has shown that continuous training and evaluation can lead to effective motivational interviewing.

A pilot study was performed with a total of 69 sixth and seventh grade girls were recruited to attempt to increase their daily MVPA (Robbins, Pfeiffer, Maier, Lo, & LaDrig, 2012b). The participants in the intervention group were offered access to a 90 minute after-school activity club five days per week for six months. In addition to the exposure to activity, a face-to-face counseling session was offered every other month for six months. The counseling

sessions were led by a school nurse who used motivational interviewing techniques to increase the participants desire to be physically active. The participants in the control group were offered a 90 minute workshop once a month which focused on topics such as fashion, sun and food safety, and building self-esteem. This group also received a face-to-face session with the school nurse in which the workshop topics were discussed. The intervention group had greater improvements for minutes of MVPA (0.43 hour vs. 0.07 hour), BMI (0.41 vs. 0.74 kg/m^2 increase), BMI z-score (0.06 vs. 0.12 increase), percentage of body fat (0.48% vs. 0.89 % increase), and waist circumference (0.87 cm vs. 0.48 cm decrease). With all improvements considered, only seven girls in the intervention group had a weekly MVPA average on three days per week or more. The use of motivational interviewing in the counseling sessions gave the participants an opportunity to establish trust and open communication with the school nurse. Trust and open communication contributed to the participants wanting to attend and participate in the study.

Interventions with Different Races. Many interventions have been geared toward Hispanic individuals who have components of the metabolic syndrome (Johnston et al., 2010 and Davis et al., 2011). Some studies (n=375) have found that Hispanic adolescents, compared to other races, have the largest percentage of individuals with components of the metabolic syndrome (DuBose et al., 2006). Another study found that the prevalence of the metabolic syndrome in non-Hispanic blacks has tripled when comparing NHANES data from 1988-1994 to data in 1999-2000 (de Ferranti et al., 2006). According to the 2001-2005 NHANES study, 11.2% of Hispanic adolescents, 8.9% of Caucasian adolescents, and 4.0% of African American adolescents were found to have the metabolic syndrome (Johnson et al., 2009). The low

prevalence found in all components among African American adolescents suggests that this ethnic group has a delayed onset of the metabolic syndrome. A study found Mexican American participants (n=60) had significant improvements in BMI z-scores (0.2 zBMI units), total cholesterol (15.4 mg/dL), triglycerides (12.4 mg/dL), and tricep skinfold (5.6 mm) after participating in an instructor led intervention versus a self help guide that the control group received (Johnston et al., 2010). Latina adolescents (n=38) participating in a circuit training intervention had improvements in waist circumference (3% decrease), adipose tissue (26% decrease), fasting insulin (24% decrease) and insulin resistance (21% decrease) (Davis et al., 2011). With the metabolic syndrome increasing in Hispanic and non-Hispanic adolescents, interventions geared toward both populations are needed. Successful interventions have been created for Hispanic population to improve components of the metabolic syndrome. Non-Hispanic populations also need to be given the opportunity to improve their health with interventions. With the possibility of the African American population having a delayed onset of the metabolic syndrome, researchers need to focus on providing successful intervention options.

Key Messages. In regards to the previous studies described, some key messages have been noted in showing both success and what could be improved. The first key message was involving the study by Johnston et. al (2010) regarding the instructor led intervention and the self-help manual. Adolescents may benefit most from instructors or leaders who are not their parents. Adolescence is a time in which rebelling may occur against parents. Another explanation for the self-help manual group not being as successful is that the parents may not have been confident in passing the information along to their children. Future research studies or interventions could focus on more knowledgeable individuals to deliver the information.

Another important key message was to incorporate behavior change strategies such as goal setting, problem-solving, and relapse prevention. The study using telephone calls to promote weight loss (Befort et. al, 2009) showed success in both groups. All participants received behavior change strategies in either an individual or group setting. The cycling study by Adamo et. al (2010) did not show improvements in components of the metabolic syndrome. This study involved only cycling twice a week. Behavior change strategies were not taught to participants. To increase physical activity outside of face-to-face interactions, behavior change strategies should be taught to participants to give them the skills needed when conflict arises.

Proper motivational interviewing techniques should be followed when using this method with participants. Adolescents have found motivational interviewing to create a sense of equality between themselves and the researcher (Flattum et. al, 2009). Participants have also reported independence and autonomy through motivational interviewing techniques. The study involving circuit training and motivational interviewing did not show that the motivational interviewing technique to be beneficial. Researchers reported that the motivational interviewing sessions were either held before exercise or immediately after. This could have been at a time when the participants were tired and not ready to fully engage in the method. An alternative could have been to use a phone call with motivational interviewing at a different time during the week to strive for more engagement and better focus. Another option could be to schedule another follow-up several months later. Flattum et. al (2009) suggests that motivational interviewing may create more long-term changes versus short-term.

In review, there have been many interventions focusing on face to face interventions; however, little emphasis has been placed on telephone interventions in adolescents who have

components of the metabolic syndrome. There have been telephone-based interventions in adults, but few have been performed with an adolescent population. Telephone-based interventions have been shown in previous studies to increase physical activity and to promote weight loss in middle aged adults. With the success in adults, this method should be investigated in adolescents to hopefully increase the amount of physical activity that they accumulate. Future research should emphasize the effect of physical activity interventions that use technology in the adolescent population. There have been limited interventions performed with African American adolescents. More physical activity interventions should be aimed toward African Americans since this race has an increased risk for comorbidities. With adolescents not meeting physical activity guidelines, it is necessary to try new types of interventions to change the habits of this young population.

Summary

The rapid increase of adolescent obesity is leading towards serious health problems such as cardiovascular disease, metabolic syndrome, and all cause mortality. Adolescents who are overweight or obese have a high likelihood that they will also become overweight or obese adults. The prevalence of the metabolic syndrome is becoming more common among adolescents due to increased obesity and a decrease of physical activity. Physical activity has been shown to be a preventative measure in regards to components of the metabolic syndrome. Interventions are needed that incorporate physical activity into the lives of adolescents. Further, interventions that focus on at risk populations (i.e., different minority groups) and incorporate current technology are needed.

The purpose of this study is to determine the effects of a telephone-based physical activity intervention on:

1. Amount of physical activity and motivation to be physically active.
    a. Hypothesis: The participants in the intervention group will have significantly more steps or minutes of physical activity after the two month intervention, showing that the individuals who received the weekly newsletters and weekly phone calls using motivational interviewing were more active. Regarding motivation to be physically active, it is hypothesized that motivation, external, and introjected motivation will decrease while identified and intrinsic motivation will increase.
2. Components of the Metabolic Syndrome in obese adolescents including HDL cholesterol, blood pressure, and waist circumference.
    a. Hypothesis: Participants who have been randomly placed in the intervention group will show improvement in HDL cholesterol, blood pressure, and waist circumference.
3. Clinic follow-up rates.
    a. Hypothesis: By having weekly contact, intervention participants will show a greater follow-up rate than control participants.

CHAPTER 3: METHOD

Participants

Participants were recruited through East Carolina University-University Health Systems (ECU-UHS) Pediatric Healthy Weight Research and Treatment Center (PHWRTC). A pre-requisite of the center is that clients have a BMI $\geq 95^{th}$ percentile and referred to the PHWRTC from a pediatrician for obesity treatment. This ensures that all participants are classified as obese. The majority of clients seeking treatment at PHWRTC reside in eastern North Carolina. A total of 29 participants were recruited between the ages of 12-18 years old. The majority of participants at the PHWRTC were African American. Participants have not been excluded by gender or race. Exclusion criteria for this study included if the participant did not speak English, did not own or have access to a phone, if he/she were taking a cholesterol lowering medication or Metformin, or if the physician did not recommend physical activity for the individual.

Design

This study was a randomized clinical trial that was conducted between October 2012-May 2013. Randomization was performed with a block on gender, because past research has shown that males are more active than females (Trioano et al., 2008). The participants were randomly assigned to either a control or intervention group for a two month duration. The randomization was completed by an independent individual. Prior to randomization being revealed to participant and researcher, all participants had height, weight, waist circumference, blood pressure, and resting heart rate measured, and a fasting blood sample was obtained. Participants also completed a physical activity questionnaire, behavior regulation questionnaire, youth risk behavior survey, and barriers to physical activity questionnaire. The physician rated sexual maturity based on the Tanner staging of puberty. After all measurements and

questionnaires/surveys were completed, the participant opened a sealed envelope to reveal the group they had been randomized into. The envelopes were prepared by the independent individual. The intervention duration was for two months. After approximately two months, participants returned to the PHWRTC for a follow-up visit. At this visit, all participants completed the physical activity questionnaire, the behavior regulation questionnaire, the youth risk behavior survey, and the barriers to physical activity questionnaire once again. Participants also had height, weight, waist circumference, blood pressure, and resting heart rate measured, and a second blood sample was obtained. The blood sample at this visit was not fasting since the follow-up visits are scheduled in the afternoon. Intervention and control participants also received an NL-800 pedometer to use during the two months. Baseline data was obtained from both the intervention and control group by wearing the pedometers for one week. Participants recorded the daily pedometer step count results for baseline data in their pedometer logs. After the first week of recording baseline pedometer data, all participants were called by the researcher to obtain pedometer step counts. All participants also received a phone call a week prior to their follow-up appointment as a reminder. During this phone call, each participant was reminded to wear their pedometer and record the data for the last week for post-test results. Participants in the control group received a maximum of two phone calls. As a token of appreciation, each participant received a $10 gift card at their follow-up appointment. Since these participants were minors, as an appreciation of support from the parents/guardians, they also received a $10 gift card at the follow-up visit. Figure 1 shows the outline of the study and the differences the intervention and control participants received.

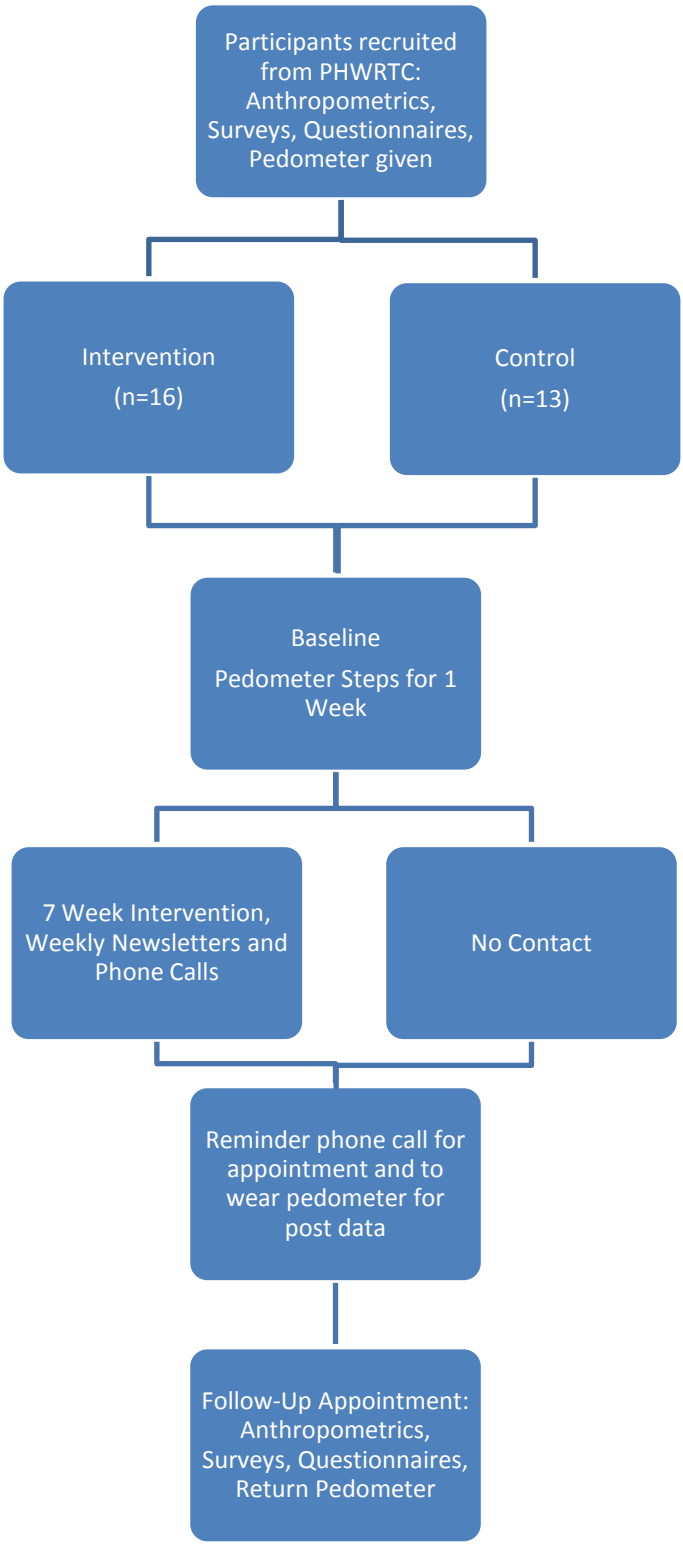


Figure 1. Flow Chart of Study

Standard Care at PHWRTC

At the PHWRTC, each client was given standard care during their treatment. This standard care at the initial appointment consisted of a one hour consult with a physician, a one hour consult with a nutritionist, and access to a family therapist when needed. The family therapist observed the participant and their family during the physician's assessment. Height and weight measurements were taken at each visit. Blood work was completed on an individual basis and per request of the physician. The Tanner Staging of Puberty was performed by the physician during the initial visit. During the appointment, physical activity was briefly discussed by the physician and the participant was given a basic pedometer. Each client was given a notebook with physical activity goals, nutrition handouts, and various other papers depending on the individual. The client was then scheduled for a two to three month follow-up appointment and was asked to bring the notebook to each follow-up visit. At subsequent office visits patients meet with the physician, nutritionist, and family therapist for a shorter length of time. The control group continued to receive the standard care at the PHWRTC, but received minimal contact within the two month period. This contact consisted of two phone calls. The first phone call consisted of obtaining pedometer step counts and the second phone call reminded the participant of their appointment and to wear the pedometer for the last week.

Physical Activity Intervention

Those randomized to the intervention group received the standard care plus the following items aimed at increasing physical activity levels. The participants were given a weekly pedometer log to track their number of steps if their goal focused on steps versus frequency and duration. Each week during the intervention, a newsletter was sent to each participant in the

intervention group with information regarding the topic that was to be discussed that week. These topics include increasing physical activity, eliminating barriers to physical activity, setting personal goals, progressing exercise safely, benefits of physical activity, and how to make physical activity more enjoyable. The intervention group also received weekly one-on-one phone calls that lasted an average of 8:32 minutes. The goal was for the participant to review the newsletter before receiving the weekly phone call from the researcher. Motivational interviewing techniques were used to ask the participant open-ended questions during the phone calls. This counseling style is more participant focused and goal-oriented compared with non-direct counseling. The participant was encouraged to identify aspects of their behavior that they would like to change (Flattum et al., 2009). Once these aspects were determined, the participant was encouraged to determine the benefits and barriers to making this change. The researcher's role in this technique was to assist the participant in thinking of realistic goals and how to overcome difficulties. In the pilot study by Flattum et al. (2009), it was found that motivational interviewing seemed to enhance behavior change as well as maintained compliance. The intervention continued for two months and during this time all participants continued to receive the standard care at the PHWRTC. The following is a list comprised from multiple studies to ensure successful motivational interviewing.

Figure 2. Checklist for Successful Motivational Interviewing

- Provide a non-confrontational and supportive environment. (Flattum et. al, 2009)
- Give participant active role of choosing and attaining personal goal (Flattum et. al, 2009)
- Use the participant-centered approach. This helps with adolescents' aim for independence. (Flattum et. al, 2009)
- Gently and respectfully guide positive change. Avoid lecturing or advising on negative behavior. (Robbins et. al, 2012a)
- Use mainly open-ended questions to encourage participant to explore more possibilities. (Robbins et. al, 2012a)
- Use reflections to duplicate what participant has said and emphasize key points. (Robbins et. al, 2012a)
- Affirm or praise personal strengths and previous successes. (Robbins et. al, 2012a)

Intervention Theory

The Self-Determination Theory provides potential reasons why people adopt and maintain certain behaviors (Verloigne et al., 2011). The self-determination theory describes that physical activity can be amotivated, extrinsically motivated, or intrinsically motivated. Amotivation is described as having no motivation to participate in physical activity. Extrinsic motivation is defined as a person who engages in a behavior to receive outcomes that are separate from the behavior itself. Physical activity can also be performed to receive intrinsic motivation. Intrinsic motivation can be defined as the most self-determined type of motivation. People with intrinsic motivation engage in activity because they find it enjoyable, interesting, and challenging. These types of motivation are especially important when it comes to determining what motivates adolescents to become and maintain physically active. Autonomous motivation includes identified and integrated regulation and intrinsic motivation. People with autonomous motivation have been associated with greater commitment to physical activity. In this study, it was important to enhance the autonomous motivation in the adolescents who are participating. Increasing this motivation occurred by supporting psychological freedom while

physically active, reinforcing competence and being socially connected. By encouraging personal growth in each of these areas, the adolescent participants are more likely to increase and maintain physical activity habits.

Instrumentation

Pedometer

New Lifestyles NL-800 pedometers were used to monitor physical activity in this study. This model of pedometer has a piezoelectric strain gauge and is considered the predecessor of the NL-2000 pedometer (New-Lifestyles, 2006). An advantage of this model of pedometer was the ability to continue to count step when the instrument is tilted due to abdominal adiposity (Smith & Schroeder, 2010). This pedometer is small, silent, and has eliminated the clicking noise; this will help with compliance rates among adolescents (New Lifestyles, 2006). Further, data was stored for 7 days in the NL-800. The data storage was helpful when recording the weekly pedometer logs. Research has shown that the NL-800 and the Yamax Digiwalker SW-701 pedometers were considered to be very accurate in measuring steps while participants were walking (Schneider, Crouter, Lukajic, & Bassett, 2003). Schneider et al. (2003) used NL-2000 pedometers in this study which has the same internal mechanism as the NL-800. Both the NL-800 and SW-701 have been found to underestimate step counts while participants were skipping, galloping, and sliding (Smith & Schroeder, 2010). The NL-2000 was found to have less than 3% error, 95% of the time (Schneider et al., 2003). With past research showing high accuracy in counting steps including on obese individuals, this pedometer model showed accuracy with the participants in this study.

Log Book

The pedometer logs were designed to record daily step counts and/or number of minutes of MVPA. The log book had the option of recording the type of activity. Participants in both the control and intervention group completed the pedometer log books for one week for baseline data. Recording pedometer steps for the duration of the intervention was on an individual basis depending on the personal goals of each participant. Another week of recording pedometer steps was included during the last week of the two month duration for each participant.

Behavior Regulation Exercise Questionnaire-2 (BREQ-2)

The adolescents' motivation was assessed by using the Behavior Regulation Exercise Questionnaire-2 (BREQ-2). The original questionnaire (BREQ) was developed to evaluate external, identified, introjected, identified, and intrinsic regulations (Mullan, Markland & Ingledew, 1997). These different types of behavior regulations were used in exercise contexts. Markland and Tobin (2004) assessed the validity of the BREQ with the addition of amotivation. The new questionnaire is now known as the BREQ-2. The addition of amotivation to the BREQ-2 showed to have an excellent fit to the data. The BREQ-2 was found to provide a complete assessment of motivation from the self-determination perspective.

A total of 194 participants completed the BREQ-2 to analyze the reliability of the various types of motivations and the respective questions for each (Markland & Tobin, 2004). The Cronbach's alpha reliabilities are as follows: Amotivation (0.83), External Regulation (0.79), Introjected Regulation (0.80), Identified Regulation (0.73) and Intrinsic Regulation (0.86). These reliabilities are classified as acceptable to good. The BREQ-2 has shown to be a reliable resource for measuring motivation in relation to exercise.

Youth Risk Behavior Survey (YRBS) Questionnaire

To further assess the participants' amount of daily physical, each participant completed a Youth Risk Behavior Survey. This survey was designed to assess health risk behaviors that can contribute to mortality, morbidity, and social problems among youth and adults (Brener, Kann, McManus, Kinchen, Sundberg & Ross, 2002). A study was performed to assess the reliability of the YRBS that consisted of 4619 adolescents (Brener et al., 2002). Each participant completed the survey on two separate occasions approximately two weeks apart. Almost all items on the YRBS questionnaire were found to be moderately reliable. The mean kappa among items was 60.7% with a median kappa of 60.0%. Physical activity topics had a mean kappa of 55.2%. This survey was a reliable source in determining the frequency of physical activity.

Physical Activity Barriers Questionnaire

To determine barriers to physical activity, each participant completed a physical activity barriers questionnaire. This questionnaire was created to assess perceived barriers to physical activity in overweight youth in comparison to nonoverweight youth in a clinical setting (Zabinski, Saelens, Stein, Hayden-Wade & Wilfley, 2003). The overweight sample reported body-related concerns most frequently. The authors also reported that overweight children found more barriers to physical activity than the nonoverweight youth.

Tanner Staging of Puberty

The stage of puberty for each participant was evaluated using the Tanner Staging of Puberty. The physician at the PHWRTC assessed the participant's sexual development. The

physician performed a visual assessment of breast, genital and pubic hair development (Marshall & Tanner, 1969 and Marshall & Tanner, 1970). Based on the assessment, the physician assigned a stage number reflecting the adolescent's development. The Tanner Staging of Puberty has been found to be a reliable and valid method to assess puberty in adolescents.

Anthropometrics

The participant's height was measured using a stadiometer by a nurse at the PHWRTC. The height was measured to the nearest 0.1 centimeters while the participant had their shoes removed. A nurse also used a digital scale to measure the participant's weight in kilograms to the nearest 0.1 kilogram. The participant was wearing light clothing with their shoes removed. Body mass index was calculated by dividing the weight in kilograms by the height in meters squared. Waist circumference was measured by the researcher using a Gulick retractable ergonomic measuring tape. The measurement was taken with participant standing, arms at the side, feet together, with the abdomen relaxed (ACSM GETP, 2009). A horizontal measurement was taken at the narrowest part of the waist. This placement was above the umbilicus and below the xiphoid process. Once the tape was placed around the waist, the spring loaded handle was extended to the same marking with each trial. The measurement was taken at the end of a normal exhalation. Two measures were taken at the waist. The average of these two measurements was calculated as long as the measurements are within 5mm of each other.

Blood Collection

Fasting venous blood samples were collected via finger stick during the initial consultation by a trained nurse or phlebotomist at the PHWRTC. Participants were asked to fast

for ≥ 12 hours before the blood sample was collected. Blood samples were analyzed using Cholestech for total cholesterol, HDL cholesterol, triglycerides, and fasting glucose levels. A non-fasting blood sample was collected via finger stick at the two month follow-up visit. This blood sample was analyzed for total cholesterol, and HDL cholesterol. Non-HDL cholesterol was calculated by subtracting the HDL cholesterol from the total cholesterol value (Gardner, Winkleby, & Fortmann, 2000). Chemical analysis of the blood was performed at the PHWRTC, Greenville, NC.

Blood Pressure and Heart Rate

The researcher measured resting blood pressure after the participant had been sitting quietly in a chair for at least five minutes (ACSM GETP, 2009). The researcher measured the circumference of the upper arm to ensure the correct size blood pressure cuff was used. The blood pressure cuff was wrapped firmly around the upper arm and was aligned with the brachial artery. The bell of the stethoscope was placed in the antecubital space above the brachial artery. The cuff was inflated to 20 mmHg above the first Korotkoff sound. The pressure was released at a rate equal to 2-5 mmHg per second. The systolic blood pressure was defined as the first of two or more Korotkoff sounds and the diastolic blood pressure was the last Korotkoff sound heard. A total of three blood pressure measurements were taken at least five minutes apart to ensure a true resting blood pressure. Resting heart rate was taken manually at the radial artery by the researcher. The researcher counted for 10 seconds and multiplied that value by six for a total resting heart rate value for one minute.

Clinic Follow-Up Rates

Participants in this study are also assessed to determine if they continue their treatment at the PHWRTC. All participants, both control and intervention, received a phone call as a reminder for their follow-up appointments. This phone call took place approximately 1 week prior to the scheduled appointment. Participants were reminded to wear their pedometer for the following week, to bring their pedometer log and notebook to their appointment, and the date and time of their follow-up visit. The number of days between the initial visit and the follow-up visit were analyzed to determine follow-up rates.

Statistical Analysis

Descriptive statistics were calculated at baseline for all participants for age, height, weight, BMI, BMI z-score, BMI percentile, resting heart rate, waist circumference and resting systolic and diastolic blood pressure. Blood sample data analyzed for descriptive statistics at baseline include total cholesterol, triglycerides, HDL cholesterol, non-HDL cholesterol, glucose, and A1C. Descriptive statistics were also calculated for baseline pedometer steps. Frequencies were calculated for race, gender, and Tanner Staging of Puberty. To determine if differences existed between groups in regards to descriptive variables, an independent samples t-test was performed. In regards to the frequencies, chi-square analysis was performed to determine if differences existed between the groups.

To account for missing data, intent to treat analysis was used. A worst case scenario was used for BMI z-score, height, weight, waist circumference, pedometer steps, and physical activity motivation factors. This method consisted of taking the average change value calculated from the control group and imputed the data for participants who either dropped out or were lost

to follow-up in the control and intervention groups. Baseline data was carried forward from baseline to post for resting heart rate, blood pressure, total cholesterol, HDL cholesterol, and non-HDL cholesterol for those who dropped out or were lost to follow-up in either group. Two different methods of intent to treat were used due to the increased likelihood of change in some variables compared to others. These variables included BMI z-score, height, weight, waist circumference, pedometer steps, and physical activity motivation factors. Further, maintaining a value from baseline to follow-up could be interpreted as a positive outcome (e.g., the intervention was effective) in this population, so carrying baseline values forward could have influenced the results. Resting heart rate, blood pressure, total cholesterol, HDL cholesterol, and non-HDL cholesterol were not expected to show significant change considering the length of the intervention and no change is not seen as a positive outcome. For those who did not have baseline blood work, follow-up blood work data was not used.

A 2 x 2 (group & time) repeated measures ANOVA was used to evaluate differences in height, weight, waist circumference, BMI z-score, total cholesterol, HDL cholesterol, non-HDL, blood pressure, resting heart rate, pedometer steps, and physical activity motivation factors. The ANOVAs were then adjusted by length of time from visit one to visit two since this varied among participants. Effect sizes were calculated for values that were adjusted for length of time between visits. Effect sizes were only completed for the adjusted data since the length of time between visits was found to be a significant confounder. Values for effects sizes were analyzed as follows: >.8 is a large effect, around .5 is a medium effect and <.2 is a small effect (Cohen, 1998). Clinic follow-up rates were analyzed by using an independent samples t-test.

The exit survey was analyzed by calculating the frequencies of each answer for all items on the survey. For the final item, chi-square analysis was performed to see if there was a

difference in preference for the method to receive future information between the two groups. A chi-square analysis was also performed to assess if any differences were present between the percentages of control versus intervention that participated in a follow-up appointment. The alpha level was set at $p < 0.05$. The statistics program used was IBM SPSS Statistics 20.

CHAPTER 4: RESULTS

Participants

Thirty-four adolescents were given the opportunity to participate, two declined to learn more about the study when the physician initially approached them, one declined after talking with the research staff, and two were ineligible due to health conditions as determined by the physician. A total of 29 obese adolescents participated in the study. Five participants dropped out during the intervention and eleven (7 intervention, 4 control) participants were lost to follow-up. The five participants who dropped out did so in the first four weeks of the intervention (Figure 3).

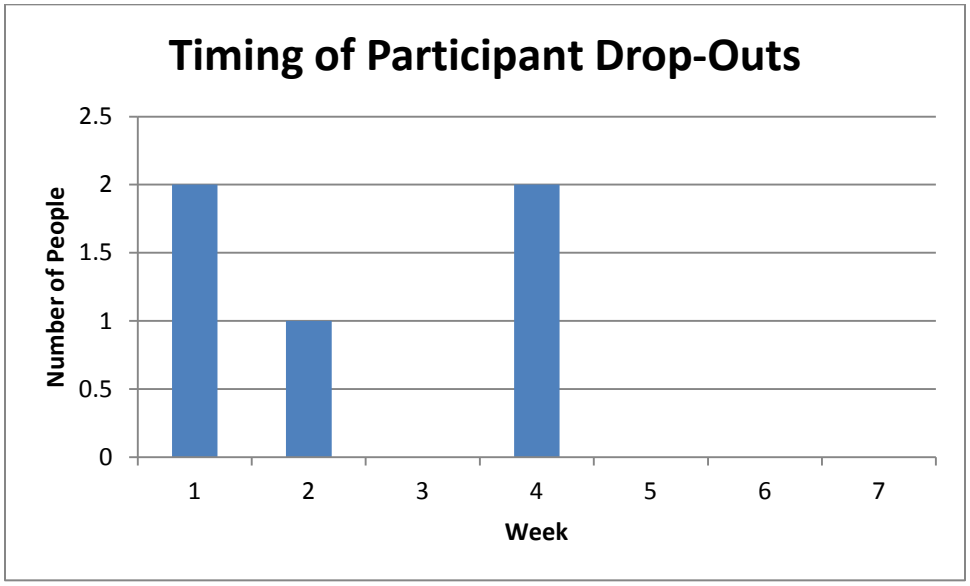


Figure 3. Timing of Participant Drop-Outs

Participant demographics at baseline are shown in Table 1 & 2. The average age of all participants was 14.1 ± 1.81 years old, the intervention participants were 13.5 ± 1.75 years old, and the control participants were 14.8 ± 1.69 years old. Participants from both groups did not differ on demographic data. There was no difference in gender amongst groups. The majority of all participants were female (62.1%). Approximately 75% of the participants were African

American, 14% non-Hispanic White, 7% Hispanic and 3% Native American. Participants' average sexual maturity was slightly above a Tanner Stage of 4 for pubic hair. Tanner Stage 4 refers to adult-like hair quality that extends across the pubis, but sparing the medial thighs. The average BMI percentile was 98.9 which is classified as obese. There were no significant differences among the group regarding heart rate, systolic blood pressure, or diastolic blood pressure. The participants had baseline pedometer steps well below 11,500 steps/day which is the recommended level for adolescents (Adams, Johnson, & Tudor-Locke, 2011). After assessing the physical activity barriers questionnaire, there were several barriers that participants rated as stopping them from being active very often. These included no one to be physically active with, lack of equipment, homework, self-conscious while doing physical activities, and do not want people to see their body while being active. Each of these items were tied for the highest percentage at 15.4% (data not presented).

Table 1

Frequency Characteristics of Participants by Group at Baseline

Variable	Intervention Group (n=16) %	Control Group (n=13) %	All Participants (n=29) %
Gender			
Male	38	39	38
Female	63	62	62
Race			
African American	81	69	76
Non-Hispanic White	6	23	14
Hispanic	6	8	7
Asian	0	0	0
Native American	6	0	3
Tanner Staging of Puberty - Pubic Hair			
Tanner Stage 1	0	15	7
Tanner Stage 2	0	0	0
Tanner Stage 3	13	8	10
Tanner Stage 4	25	8	17
Tanner Stage 5	63	69	66

Table 2
Demographics of Participants by Group at Baseline

Variable	Intervention Group (n=16) Mean ± SD	Control Group (n=13) Mean ± SD	All Participants (n=29) Mean ± SD
Age (years)	13.5 ± 1.75	14.8 ± 1.69	14.1 ± 1.81
Height (cm)	167.5 ± 8.12	164.8 ± 6.71	166.3 ± 7.51
Weight (kg)	104.3 ± 14.57	112.9 ± 28.60	108.1 ± 21.99
Waist Circumference (cm)	102.48 ± 8.07	107.94 ± 11.86	104.93 ± 10.14
BMI (kg/m^2)	37.0 ± 3.62	41.3 ± 9.02	38.9 ± 6.82
BMI Percentile	98.9 ± 0.50	98.8 ± 0.38	98.9 ± 0.44
BMI Z-score	2.47 ± 0.19	2.47 ± 0.25	2.47 ± 0.21
Pedometer Steps/Day	6215.0 ± 3337.0	4845.2 ± 2701.0	5592.3 ± 3073.5
HR (bpm)	75.88 ± 12.16	75.69 ± 9.27	75.79 ± 10.77
Systolic BP (mmHg)	117.44 ± 11.70	118.49 ± 9.43	117.91 ± 10.57
Diastolic BP (mmHg)	76.02 ± 6.02	81.44 ± 10.06	78.44 ± 8.39

BMI= Body mass index

Values from the baseline blood sample are listed in Table 3. On average, fasting glucose, A1C, total cholesterol, and triglyceride values were normal, but HDL cholesterol was considered low. Total cholesterol and triglyceride concentrations were higher among control participants than intervention participants. No other differences were seen among the blood sample data.

Table 3
Blood Work Characteristics by Group at Baseline

Blood Factors	Intervention Group (n=16) Mean ± SD	Control Group (n=13) Mean ± SD	All Participants (n=29) Mean ± SD
Total Cholesterol (mg/dL)	138.0 ± 22.74*	169.8 ± 47.22	152.6 ± 38.76
Triglycerides (mg/dL)	85.2 ± 35.36*	130.4 ± 61.19	105.9 ± 53.00
HDL Cholesterol (mg/dL)	38.8 ± 10.65	41.3 ± 7.46	40.0 ± 9.21
Non-HDL Cholesterol (mg/dL)	99.2 ± 19.83	128.5 ± 49.36	112.6 ± 38.58
Fasting Glucose (mg/dL)	95.2 ± 12.01	91.1 ± 8.35	93.3 ± 10.48
A1C (%)	5.6 ± 0.23	5.6 ± 0.50	5.6 ± 0.37

*$p < 0.05$

Tables 4 & 5 show the results from the YRBS at baseline in regards to physical activity and screen time, respectively. Overall, the participants' physical activity levels were low and their screen time habits are higher than recommendations. Only 24% engaged in moderate physical activity for 30 minutes at least 5 days/week. Just 34% reported at least 20 minutes of vigorous physical activity 3 days/week. Only 17% reported engaging in 5 days of physical activity for 60 minutes per day. A total of 58.5% and 41.3% reported watching television for 2 hours or less per school day and weekend day, respectively. In regards to computer/video games, 65.4 % and 58.5% reported $\leq$ 2 hours per day on school days and weekend days, respectively.

Table 4

Physical Activity Results from YRBS at Baseline

Physical Activity Level	Intervention Group (n=16) %	Control Group (n=13) %	All Participants (n=29) %
Moderate Days			
0	6.3	30.8	17.2
1	6.3	0	3.4
2	12.5	0	6.9
3	31.3	30.8	31.0
4	12.5	23.1	17.2
5	12.5	15.4	13.8
6	12.5	0	6.9
7	6.3	0	3.4
Vigorous Days			
0	6.3	30.8	17.2
1	25.0	30.8	27.6
2	31.3	7.7	20.7
3	12.5	0	6.9
4	0	0	0
5	12.5	7.7	10.3
6	6.3	7.7	6.9
7	6.3	15.4	10.3
60 min Days			
0	25	30.8	27.6
1	0	7.7	3.4
2	18.8	23.1	20.7
3	18.8	7.7	13.8
4	12.5	7.7	10.3
5	18.8	15.4	17.2
6	6.3	0	3.4
7	0	7.7	3.4

Table 5

Screen Time Results from YRBS at Baseline

Screen Time	Intervention Group (n=16) %	Control Group (n=13) %	All Participants (n=29) %
Hours of TV on School Day			
0	18.8	15.4	17.2
< 1	12.5	0	6.9
1	18.8	15.4	17.2
2	18.8	15.4	17.2
3	6.3	23.1	13.8
4	12.5	7.7	10.3
5+	12.5	23.1	17.2
Hours of Computer/Video Games on School Day			
0	12.5	23.1	17.2
< 1	12.5	15.4	13.8
1	25.0	23.1	24.1
2	18.8	0	10.3
3	12.5	7.7	10.3
4	12.5	7.7	10.3
5+	6.3	23.1	13.8
Hours of TV on Weekends			
0	0	7.7	3.4
< 1	0	0	0
1	12.5	15.4	13.8
2	25.0	23.1	24.1
3	31.3	0	17.2
4	6.3	15.4	10.3
5+	25.0	38.5	31.0
Hours of Computer/Video Games on Weekend			
0	0	23.1	10.3
< 1	18.8	0	10.3
1	6.3	7.7	6.9
2	31.3	30.8	31.0
3	12.5	15.4	13.8
4	12.5	0	6.9
5+	18.8	23.1	20.7

Unadjusted Analysis

Unadjusted analysis results are shown in Table 6. There were no group or time effects for BMI z-score; however, there was a significant interaction effect for time and group with BMI z-score. A decrease was seen in the control participants' BMI z-score and an increase was seen

in the intervention participants' BMI z-score. Resting heart rate also showed a significant time effect. An increase in resting heart rate was seen in control participants while the intervention participants' resting heart rate remained relatively stable. Significant time and group effects were found for systolic blood pressure. The control group had a higher systolic blood pressure than the intervention group. Systolic blood pressure for the control group increased while it remained the same for the intervention group between visit 1 and 2. The interaction effect for systolic blood pressure was not significant (p=0.06); however, the trend was heading in the appropriate direction. A group effect was seen for diastolic blood pressure and total cholesterol where the control group was higher than the intervention group. No other significant group, time, or interaction effects were found among the other variables.

Table 6

Unadjusted Results from Repeated Measure ANOVA for Demographics and Blood Work

	Control Group		**Intervention Group**	
	Pre	**Post**	**Pre**	**Post**
	Mean ± SD	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**
BMI Z-score	2.5 ± 0.90	2.4 ± 1.01∞	2.5 ± 0.72	2.6 ± 0.64
Waist Circumference (cm)	107.9 ± 42.81	107.5 ± 44.22	102.5 ± 32.38	103.4 ± 37.2
Height (cm)	164.8 ± 24.22	164.9 ± 23.75	167.5 ± 32.48	167.5 ± 33.08
Weight (kg)	112.9 ± 103.25	112.4 ± 105.56	104.3 ± 58.28	104.8 ± 63.2
Heart Rate (bpm)	75.7 ± 33.46	80.2 ± 35.41≠	75.9 ± 48.64	76.6 ± 40.56
Systolic Blood Pressure (mm/Hg)	118.5 ± 34.04	123.4 ± 39.24≠,*	117.4 ± 46.84	117.7 ± 46.92
Diastolic Blood Pressure (mm/Hg)	81.4 ± 36.32	81.4 ± 27.51*	76.0 ± 24.08	75.0 ± 22.84
Total Cholesterol (mg/dL)	169.8 ± 170.50	168.0 ± 180.50*	138.0 ± 91.00	138.0 ± 88.04
HDL Cholesterol (mg/dL)	41.3 ± 26.93	41.1 ± 31.33	38.8 ± 42.6	37.7 ± 39.20
Non-HDL Cholesterol (mg/dL)	108.8 ± 238.37	107.4 ± 240.10	80.6 ± 174.92	81.5 ± 176.36
Pedometer Steps/Day	4845.2 ± 9750.47	4699.5 ± 15275.39	6214.9 ± 13347.88	6508.3 ± 17635.36

BMI=Body Mass Index, * $p < 0.05$ for group effect, ≠ $p < 0.05$ for time effect
∞ $p < 0.05$ for interaction effect

Adjusted Analysis

The repeated measures ANOVA analyses were adjusted for length of time between visits and are presented in Table 7. For BMI z-score, there was not a significant difference for group, or time, or time and group interaction. However, the group and interaction effects were heading towards significance (p=0.06 for both). Even though the repeated measures ANOVA did not show a statistically meaningful difference, effect sizes indicated a large effect was seen in the control group while the intervention group had a moderate effect. Meaning, the BMI z-score decreased in the control participants, but increased in the intervention participants. A significant difference was seen between groups for waist circumference. The control group had a higher waist circumference than the intervention group. Time and interaction effects were not observed with waist circumference. Effect size analysis showed small effects for both control (ES=-0.04) and intervention groups (ES=0.09). Participants in the control group decreased their waist circumference as the participants in the intervention group increased their waist circumference. Systolic blood pressure did not show significant main or interaction effects after adjusting for visit length. Effect size analysis showed a moderate increase for the control group and a small effect for the intervention group. There was a significant group difference for diastolic blood pressure where the control participants had higher diastolic blood pressure than intervention participants. Time and interaction effects were not observed for diastolic blood pressure. Effect sizes were small for both groups. Total cholesterol and HDL cholesterol showed a significant difference between groups but no time effects. The control group had higher total cholesterol and HDL cholesterol levels compared to the intervention group. While no interaction effect was observed, effect size analysis for total cholesterol revealed a negative, small effect for the control group and no effect in the intervention group. Group, but not either time or interaction effects

were found for HDL-C. HDL levels were lower in the intervention than the control group. Both groups showed a small effect size for HDL cholesterol. Regarding physical activity, significant main or interaction effects did not exist for pedometer steps. Effect size analysis showed a small effect size for the control and intervention. No other significant main or interaction effects were found among other variables.

Table 7

Adjusted Results from Repeated Measure ANOVA for Demographics and Blood Work

	Control Group			Intervention Group		
	Pre	Post		Pre	Post	
	Mean ± SD	Mean ± SD	ES	Mean ± SD	Mean ± SD	ES
BMI Z-score	2.5 ± 0.22	2.3 ± 0.22	0.96	2.5 ± 0.24	2.6 ± 0.24	0.43
Waist Circumference (cm)	108.6 ± 88.04	108.2 ± 88.04*	0.04	102.0 ± 10.40	102.9 ± 10.40	0.09
Height (cm)	164.6 ± 7.73	164.6 ± 7.73	0	167.9 ± 7.68	167.9 ± 7.68	0
Weight (kg)	113.3 ± 22.96	112.8 ± 22.96	0.02	104.0 ± 22.88	104.5 ± 22.88	0.02
Heart Rate (bpm)	75.3 ± 2.97	79.7 ± 2.97	0.43	76.2 ± 10.68	77.0 ± 10.68	0.08
Systolic BP (mm/Hg)	119.2 ± 11.19	124.1 ± 11.19	0.46	116.9 ± 11.16	117.1 ± 11.16	0.02
Diastolic BP (mm/Hg)	81.5 ± 7.58	81.5 ± 7.58*	0	75.9 ± 7.56	74.9 ± 7.56	0.14
Total Chol (mg/dL)	170.4 ± 41.12	168.6 ± 41.15*	0.05	137.5 ± 41.84	137.5 ± 41.84	0
HDL Chol (mg/dL)	42.6 ± 9.24	42.4 ± 9.24*	0.02	37.7 ± 9.40	36.6 ± 9.40	0.12
Non-HDL Cholesterol (mg/dL)	108.9 ± 56.50	107.6 ± 56.50	0.02	80.4 ± 56.24	81.3 ± 56.24	0.02
Pedometer Steps/Day	4664.2 ± 1207.88	4518.5 ± 1207.88	0.03	6365.8 ± 4399.72	6659.2 ± 4399.72	0.07

BMI=Body Mass Index, * $p < 0.05$ for group effect, ≠ $p < 0.05$ for time effect

Psychological Factors

There were no significant main or interaction effects found for the unadjusted or adjusted results for the psychological factors related to intrinsic motivation towards exercise (Tables 8 &

9). However, after the repeated measures ANOVA analyses were adjusted for length of time between visits, one trend was observed for the intervention group that was heading towards significance in the appropriate direction. The result for between groups for amotivation showed a trend toward significance (p=0.07). Amotivation increased in the control group while it decreased in the intervention group. Effect size analysis showed that amotivation for the control group had a moderate effect while the intervention group showed a small effect. A decrease in amotivation is ideal. No other trends towards significance were observed. External and identified regulation did not show significant results; however, they seem to be going in the desired direction for both the intervention and control groups. In regards to interjected motivation, both group decreased in this type of motivation which is not optimal. When observing intrinsic motivation, the control group had a larger decrease than the intervention group. An increase in intrinsic motivation is a positive result.

Table 8

Unadjusted Results from Repeated Measure ANOVA for BREQ-2

	Control Group		**Intervention Group**	
	Pre	**Post**	**Pre**	**Post**
	Mean ± SD	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**
Amotivation	0.4 ± 2.13	0.8 ± 3.25	0.3 ± 2.68	0.1 ± 0.56
External Regulation	1.1 ± 2.85	1.0 ± 3.21	1.2 ± 4.48	0.8 ± 2.40
Introjected Regulation	1.8 ± 4.58	1.6 ± 4.73	1.7 ± 4.84	1.6 ± 4.76
Identified Regulation	2.5 ± 3.83	2.2 ± 3.03	3.0 ± 2.92	2.8 ± 2.28
Intrinsic Regulation	2.4 ± 5.34	2.5 ± 4.91	2.8 ± 3.92	3.4 ± 1.96

Table 9

Adjusted Results from Repeated Measure ANOVA for BREQ-2

	Control Group			Intervention Group		
	Pre Mean ± SD	**Post Mean ± SD**	**ES**	**Pre Mean ± SD**	**Post Mean ± SD**	**ES**
Amotivation	0.4 ± 0.69	0.8 ± 0.83	0.55	0.3 ± 0.85	0.1 ± 1.20	0.22
External Regulation	1.2 ± 0.90	1.1 ± 1.08	0.18	1.2 ± 0.92	0.7 ± 1.64	0.40
Introjected Regulation	2.3 ± 1.23	2.4 ± 1.48	0.06	2.8 ± 1.24	3.4 ± 2.16	0.36
Identified Regulation	2.5 ± 0.87	2.2 ± 1.05	0.33	3.0 ± 0.88	2.8 ± 1.56	0.17
Intrinsic Regulation	1.9 ± 1.26	1.7 ± 1.52	0.15	1.7 ± 1.28	1.6 ± 2.28	0.06

Follow-Up Rates

Overall, the follow-up rate for the second visit was 45%. The follow-up rate between the control (69%) and intervention (36%) participants showed no significant difference. On average, the length of time between visit one and two was 68.4 ± 5.56 days. There was also no difference found in the number of days between visit one and visit two between the two groups (control = 66.87 ± 1.28 days and intervention 70.4 ± 8.02 days). The control group had an average of 9.5 weeks between visits while the intervention group had an average of 10 weeks. When comparing demographics between those who showed up and those who didn't, there were no significant differences among gender, race, household income, and BMI z-score. A trend towards significance was found between groups with race (p=0.06). Those who returned for follow-up were more likely to be non-African American. A total of 81.3% of the participants who did not return for follow-up were African American while of those who did return for a follow-up visit 69.2% of those were African American.

Process Measures

Phone Calls

The number of attempted phone calls ranged from 1-6 calls per weekly topic depending on the availability of the participant. The researcher called the intervention participants approximately 1.79 ± 1.03 times per week to reach the participant. Intervention participants' phone calls lasted on average 8:32 ± 2:42 minutes and ranged from 3:00 to 17:00 minutes. The number of weeks the participants were reached for phone calls averaged 5.7 ± 0.90 weeks with a range between 5-7 weeks. For the weeks that participants were not reached, the missing topic would be discussed in addition to the current topic the following week.

Exit Survey

An exit survey was given to the intervention participants who completed visit two (n=4). This survey was used to indicate the quality of the intervention and can be found in Appendix H. Questions focused on the professionalism of the research staff, perceived benefits and usefulness of the intervention, and desired method for obtaining information about physical activity. Overall the participants viewed the intervention positively. Half of the questions had a combination of agreed and strongly agreed and the other half were answered as strongly agreed. The preference for receiving physical activity information in the future was asked to everyone who completed visit two (intervention and controls). The desired method for receiving information was similar between the two groups. The most common preference was to receive information by text message.

Completers Only

An exploratory analysis (means and standard deviation only) was conducted to examine the effect of the intervention on those with complete pre and post data (Table 10). BMI z-score was similar between pre and post in both groups. The control group did have an increase in systolic blood pressure and the intervention group remained the same. The intervention group decreased diastolic blood pressure while the control group did not show any change. For those that completed, there was a large difference in HDL cholesterol between groups. The intervention group decreased in HDL cholesterol while the control group remained the same. In regards to pedometer steps per day, the control group increased approximately 300 steps/day while the intervention decreased by 400 steps/day. While small changes were observed in the groups, overall it can be concluded that no meaningful change in physical activity, as measured by steps, occurred. For the psychological components, the control group showed an increase in amotivation which is not ideal; however, a decrease in introjected regulation, and an increase in intrinsic motivation were seen which are in the desired direction. The amotivation scores were similar pre and post in the intervention group; however, their scores were very low at baseline and low scores are ideal. The intervention group had a decrease in external motivation which is desired; however, decreases were also seen in identified regulation and intrinsic motivation which are not considered improvements.

Table 10

Results from Completers

	Control Group		Intervention Group	
	Pre	**Post**	**Pre**	**Post**
	Mean ± SD	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**
BMI Z-Score	2.4 ± 0.24	2.4 ± 0.28	2.5 ± 0.23	2.5 ± 0.21
Systolic BP (mm/Hg)	117.3 ± 9.17	124.3 ± 11.42	111.2 ± 3.75	112.3 ± 5.78
Diastolic BP (mm/Hg)	79.0 ± 9.87	79.0 ± 5.68	79.8 ± 4.16	75.6 ± 4.92
Total Chol (mg/dL)	175.1 ± 52.82	172.3 ± 58.36	157.0 ± 14.53	157.0 ± 3.61
HDL Chol (mg/dL)	43.3 ± 8.60	43.0 ± 10.40	52.3 ± 0.58	47.3 ± 8.33
Non-HDL Cholesterol (mg/dL)	131.6 ± 55.99	129.3 ± 58.27	104.7 ± 14.57	109.7 ± 7.37
Pedometer Steps/Day	5933.0 ± 2157.5	6208.2 ± 4778.6	5463.5 ± 1672.00	5024.8 ± 1288.03
Amotivation	0.4 ± 0.61	0.8 ± 0.90	0 ± 0	0.1 ± 0.13
External Regulation	1.1 ± 0.76	1.0 ± 0.89	1.1 ± 1.11	0.6 ± 0.52
Introjected Regulation	1.9 ± 1.36	1.6 ± 1.31	1.9 ± 1.29	1.8 ± 1.32
Identified Regulation	2.3 ± 1.18	2.2 ± 0.84	3.3 ± 0.35	2.6 ± 0.49
Intrinsic Regulation	2.3 ± 1.47	2.5 ± 1.36	3.5 ± 0.46	3.2 ± 0.38

BMI=Body Mass Index

CHAPTER 5: DISCUSSION

The purpose of this study was to determine if physical activity levels and motivation to be physically active could be increased in obese adolescents through a telephone-based intervention. The second purpose of this study was to examine the effects of this intervention on components of the metabolic syndrome including HDL cholesterol, blood pressure and waist circumference. The final purpose of the study was to examine the effect of a telephone-based physical activity intervention on

clinic follow-up rates among the adolescents.

When analyzing physical activity among the participants, no significant findings were found in the pedometer steps. These results are similar to those found in the PACE+ study which was a 16 week physician based physical activity intervention in adolescents (Patrick et al., 2001). Patrick et al. (2001) reported no change in self-reported physical activity after the intervention compared to the control participants. While no significant findings were observed, effect size analysis showed that there was a 17% increase reported in moderate physical activity for the PACE+ study and only 5% step increase for the present study. A possible reason for the difference between the two studies could be the intervention length. The current intervention lasted for 7 weeks while the PACE+ intervention lasted 16 weeks. Perhaps if our study had lasted longer, we may have had a larger percentage of increase in physical activity. Another main difference between the two studies is that the PACE+ study offered an interactive computer program prior to physician counseling. Physical activity levels and nutrition intake were assessed through the computer program. The participants were encouraged to set one physical activity and one nutrition goal. Handouts were provided on each goal before receiving counseling by the physician. This aspect of the study may have also had an impact on the

increase of physical activity compared to the current study. In the current study, the information provided was not based on the participants' goals, which may have hindered the overall results.

A group and time interaction approached significance for BMI z-score; however, it is important to note that the intervention group increased in their BMI z-score, while the control group's BMI scores decreased. These results are similar to previous studies (Davis et al., 2011; Adamo et al., 2010). In a study using circuit training for obese Latino adolescents, no significant changes were found in BMI z-scores among either the intervention or control participants (Davis et al., 2011). Another study using cycling in obese adolescents showed similar results with no significant changes in either BMI or BMI percentile (Adamo et al., 2010). Even though significant changes were not seen in these studies, BMI z-score changes were not increased in the intervention group as it did in our study. With both the circuit training and cycling studies interacting with adolescents face to face, it may have had more of an impact on maintaining BMI levels and BMI percentile changes. These two studies also lasted longer, which may have had a positive impact. The participants in the cycling study met twice a week for 16 weeks and the participants in the circuit training study met twice a week for 10 weeks. Exercise intensities in the studies that provided face to face guidance varied between 70-100% maximum heart rate (Davis et al., 2011; Adamo et al., 2010). In the current study, exercise heart rates were not measured; however, after the reviewing pedometer logs, it is highly possible that the participants in the current study did not exercise at an intensity comparable to the cycling and circuit training studies. With participants exercising at a higher intensity, different results in BMI levels may have been observed.

Waist circumference changes were similar among this study when compared with the study by Adamo et al. (2010), showing no significant effects. However, Davis et al. (2011)

found a significant effect in waist circumference with the intervention group decreasing by 3% and the control group increasing by 3%. This effect may have occurred due to having exercise led by instructors whereas this intervention gave verbal guidance, but did not have face to face instruction. In a controlled setting, such as the two week diet and exercise intervention performed by Chen et al. (2006), waist circumference was significantly reduced. By controlling what the participants were eating and providing many opportunities for exercise, researchers were able to see a significant reduction in waist circumference along with many other physical and metabolic characteristics.

The intervention did not affect resting heart rate, systolic or diastolic blood pressure. These results are different from results by Chen et al. (2006). They observed an 11.6% decrease in heart rate after a two week diet and exercise intervention. The adolescents in the intervention group were involved in 2-2.5 hours of supervised physical activity daily for the two weeks. Similar to heart rate, Chen et al. (2006) found significant effects for both diastolic (10.6% decrease) and systolic (10.4% decrease) blood pressures.

Total cholesterol, HDL cholesterol, and non-HDL cholesterol did not significantly change as a result of the telephone intervention. However, there was a group effect with the control group having higher total cholesterol and HDL cholesterol values than the intervention group. In contrast, changes in cholesterol values have been reported after interventions in obese adolescents (Chen et al., 2006; Adamo et al., 2010). With the exception of HDL cholesterol, after the two week intervention, total cholesterol and non-HDL cholesterol improved (Chen et al., 2006). HDL cholesterol actually decreased after the two week diet and exercise intervention. Adamo et al. (2010) found similar results during the cycling intervention with improvement in both total and non-HDL cholesterol, but no change was reported with HDL cholesterol. With the

biggest improvements in cholesterol values seen in a study that involved both diet and exercise, it seems that the best improvements may be related with diet based changes in addition to exercise. Since we did not monitor food intake of participants, it's hard to know if they were making healthy choices. A major difference in the current study and previous research is the amount and intensity of the physical activity. When reviewing at the notes from the weekly phone calls with the intervention participants, self-report data shows much lower physical activity levels than the Chen et al. (2006) and Adamo et al. (2010) studies. The current study averaged 30-45 minutes per day, 3-4 days per week compared to 2-2.5 hours per day, 7 days per week. Activities reported by participants in the current study vary from walking, jogging, dancing, or even playing with puppies. A major factor to consider in the difference between studies in intensity is that those in the current study were unsupervised. Participants are more likely to exercise at a higher intensity in supervised situations. Based on these conclusions, the amount of time and intensity of physical activity in the current study was less than what has been previous reported.

In regards to motivation to be physically active among obese adolescents, significant results were not found in the current study. However, the changes in the different types of motivation are encouraging. The results for intervention participants' amotivation decreased while the control participants' amotivation increased. External regulation decreased more and intrinsic regulation decreased less in the intervention group when compared to the control group. In ideal situations, participants should decrease extrinsic motivation and increase intrinsic motivation. In a 10 month residential obesity treatment program, researchers found increases in autonomous forms of motivation such as intrinsic and identified regulation (Verloigne et al., 2011). The main difference in the Verloigne et al. (2011) study and the current study is that the

adolescents were provided with a supportive environment for 10 months, which allowed for increases in motivation and also physical activity. The current study provided autonomy, competence and relatedness like in Verloigne et al. (2011), so the duration of a supportive environment may be important for eliciting changes in one's motivation for physical activity. Even though the current study did not specifically analyze the change among each individual, as a whole, we did see an increase in motivation with an increase in physical activity among the intervention participants.

There seems to be a common trend to have low follow-up rates among this population in previous research (Patrick et al., 2001, Davis et al., 2011, Zeller, Kirk, Claytor, Khoury, Grieme, et al., 2004). In the current study, the number of participants who either dropped out (n=5) or were lost to follow up (n=11) was rather high. The intervention group had a 36% follow-up rate while the control group had a 69% follow-up rate. Similar results were seen in the PACE+ study by Patrick et al. (2001). This study had a 73% recruitment rate and a 21% attrition rate over the four month study. It was noted that the participants who dropped out were significantly more likely to be from low socioeconomic statuses. In the current study, 69% of participants' families had an annual household income of less than $35,000 per year. The socioeconomic status of the participants in the current study may explain the low follow-up rate. Another study had 20 out of 64 participants drop out before pre-testing after they had previously consented to participate in the study (Davis et al., 2011). After the 16 week intervention, six participants either dropped out or had inadequate data to be analyzed. In a study observing predictors of attrition rates among a pediatric weight management program, researchers found that 55% of participants either dropped out or were lost to follow-up (Zeller et al., 2004). This study showed that common predictors of withdrawing from a program may be socioeconomic status, transportation, and African

Americans. This may be similar results to the current study with low income statuses of participants which may also result in lack of transportation. After observing the trends among this age group, the current study seems to have similar follow-up rates compared to other studies.

When examining at the results of the current study, it is important to consider the participants' opinion of the survey and also their preferences for future studies. The intervention participants were satisfied with the study and either agreed or strongly agreed with all items on the exit survey. It is important to remember that only four intervention participants completed this survey at their follow-up appointment. In the PACE+ study, participants were also given a likert scale to rate the program and their satisfaction with several parts of the study such as the computer program, mailed materials, and telephone calls (Patrick et al., 2001). Participants rated the mailed materials as 3.31 out of a possible 5 and the telephone calls as 3.67 out of a possible 5 when considering how helpful they were. In the current study, the participants rated the newsletters and telephone calls as 5 out of 5 for helpfulness. The last item on the exit survey was asking about preferences for receiving future information. Participants preferred to receive information via text message in the future (45% of completed surveys). The next preferred method was telephone calls (27% of completed surveys). In a study performed with adolescents to analyze types of text messages, adolescents had positive views of receiving text messages (Woolford et al., 2011). When analyzing the content in text messages, it was found that the types of text messages such as those that might trigger unhealthy behavior may need to be eliminated or revised. However, text messages with direct messages were found to be most preferred by adolescents. If the current study is revised and completed again in the future, it is important to remember to carefully construct text messages. Another option could be to provide

a survey at the beginning of the study to determine the participants' preference of how to receive information.

When working with adolescents, there are many confounding factors that could affect results or limit the amount of progress the participant is able to make. Some of these factors could include little to no social support, limited finances for a gym membership, or buying exercise equipment, and healthy food options, and a desire to fit in with peers. After observing appointments at the clinic and talking to participants on the phone, it became obvious that not all adolescents receive the same social support from their family in their efforts to live a healthier lifestyle. It may be unrealistic to hold the participant accountable for changes when they are unable to drive to safe places to engage in physical activity and do not make household food purchases. The majority of participants and their families in this study were low income and may not have been aware of how to make healthy choices that were within their budget. When working with low income families, it is important to consider the neighborhood they live in and if it is safe for them to be active outside. Some parents would not allow adolescents outside because of safety concerns; therefore, alternative methods had to be created to try to increase physical activity. Adolescence in general is a tough time to adjust to bodily changes and also trying to fit in with peers. It would be a difficult task for an adolescent to make a healthy food choice while with peers and being tempted with unhealthy choices. Many of the participants felt uncomfortable with their body and were concerned with exercising around peers, making finding activities for them to do where they will feel comfortable being active very challenging.

When considering the results of the current study, it is important to note that a couple of participants influenced the overall results with considerable improvements in BMI z-score, blood pressure, and cholesterol values. These participants' results may have given a false impression

for the changes that were actually made by the other participants. Another factor to consider is the order in which participants were seen at the clinic. Most participants were seen by the physician before being recruited for this study. During the physician's visit, the importance of physical activity is discussed with the participant. This may have had an impact on the pre assessment results of the BREQ-2, which assessed motivation toward being active. Since participants received psychological counseling regarding physical activity, they may not have scored the amotivation questions the same as if the BREQ-2 was completed before seeing the physician. Both groups showed low levels of amotivation; however, at post assessment, the control group increased while the intervention group decreased in amotivation.

There are several limitations to the current study. Even though pedometers were used to measure physical activity, participants were expected to record daily steps and report to the researcher. After examining the results and speaking with participants at their follow-up appointments, some of the steps reported may not have been accurate and the pedometer was not always worn properly. Another limitation was relying on parents for transportation and communication. With participants ages 12-18, most had to rely on their parents for transportation to the clinic. This could have had a negative effect on the follow-up rate. Some of the participants did not have access to either a home phone or their own cell phone. In these instances, communication with the participants had to be based around the parent's schedule. Another limitation is that some participants (including those in the control group) were given information on a couch to 5K program. Not everyone was given this information and it is unknown the number of intervention versus control participants that received this information. An additional limitation is that the participants in the control group had lower Tanner Staging of Puberty which could have an effect on lipid values. A higher percentage of non-Hispanic White

were in the control group which may have also had an effect on follow-up rates. This may have had an impact on the overall results given the method used to handle missing post data and most of the missing data was in the intervention group.

In addition to several limitations, this study also consisted of some strengths. When considering health status and follow-up rates, this sample was a great representation of the clinical population. The recruitment rate was very high. Overall, 85% of those approached agreed to participate in the study. The recruitment rate was 91% after removing the two patients who due to medical reasons could not participate in the study. These are much higher than the 73% recruitment rate reported in PACE+ (Patrick et al., 2001). The results are generalizable to other studies that use obese clinical populations. Even though significant changes were not found among BMI z-scores and psychological components, positive changes were seen, in a short time frame, which would be considered clinically relevant.

Several lessons have been learned for future studies. A critical components of a telephone-based intervention being successful in the adolescent population is developing a rapport with the participants. This was the most challenging aspect of the current study. With a seven week intervention, there was not enough time for all the participants to feel comfortable talking on the phone and in turn receive all the benefits. The researcher who completed the phone calls recruited nine out of 16 intervention participants. Those nine participants seemed to be more open than those who did not meet the researcher that was calling them on a weekly basis. A study examining the impact telephone calls have on weight loss maintenance found that those who received frequent telephone calls were able to maintain their weight (Deforche, de Bourdeauhuij, Tanghe, Debode, Hills& Bouckaert, 2005). However, the research team had developed a rapport with participants who had completed a 10-month residential lifestyle

program prior to the maintenance study. In future studies, it would be beneficial to take the time to develop the relationship with participants in the adolescent population so that they will feel comfortable during telephone calls and can receive the maximum benefits from the study. While a rapport is necessary to be developed prior to the phone calls, this study suggests that one meeting may be enough to establish a relationship.

Another component to consider in future studies would be to address some of the frequently reported barriers to physical activity. To address the barrier of not having anyone to be active with, the study could involve parents/guardians to encourage not only the adolescent, but family members involved to be more active. Physical activity ideas at home that do not use equipment would be great to give to participants. Even though some of these ideas were used in the current study, it may make more of an impact with parents/guardians involved. Improving time management skills is another topic that would need to be discussed in further detail to eliminate the barrier of lack of time. It would be beneficial to customize newsletters or telephone topics after the physical activity barriers questionnaire has been analyzed to tailor the information to participants. Not only is it important to tailor the physical activity information to specific physical activity barriers, it is also important to make the information culturally relevant as well. Assessing what types of activities African American, Hispanic and Caucasian adolescents do and incorporating that information in the newsletter or telephone topics could also improve the intervention.

In conclusion, this telephone-based physical activity intervention did not yield the desired results. Overall, small changes were seen. With the low follow-up rate and the low percentage of participants correctly completing and returning information, effects of the current study may have been different. Having an intervention delivery method catered towards the adolescents'

needs and desires may create more positive changes. A pre-intervention survey could be given to determine the participants' preferences on methods of delivery and also what they need out of the intervention. This in turn could improve physical activity levels, components of the metabolic syndrome and clinic follow-up rates.

References

Adamo, K. B., Rutherford, J. A., & Goldfield, G. S. (2010). Effects of interactive video game cycling on overweight and obese adolescent health. *Applied Physiology, Nutrition, and Metabolism, 35*, 805-815.

Adams, M. A., Johnson, W. D. & Tudor-Locke, C. (2013). Steps/day translation of the moderate-to-vigorous physical activity guideline for children and adolescents. *International Journal of Behavioral Nutrition and Physical Activity, 10,* 93-102.

Alberti, K. G. M. M. & Zimmet, P. Z. for the WHO Consultation, (1998). Definition, diagnosis and classification of diabetes mellitus and its complications. Part 1: Diagnosis and classification of diabetes mellitus provisional report of a WHO consultation. *Diabetic Medicine, 15*, 539-553.

Andersen, L. B., Harro, M., Sardinha, L. B., Froberg, K., Ekelund, U., Brage, S., ...Anderssen, S. A. (2006). Physical activity and clustered cardiovascular risk in children: A cross-sectional study (the European Youth Heart Study). *Lancet, 368*, 299-304.

Andersen, L. B., Wedderkopp, N., Hansen, H. S., Cooper, A. R., & Froberg, K. (2003). Biological cardiovascular risk factors cluster in Danish children and adolescents: the European Youth Heart Study. *Preventative Medicine, 37*, 363-367.

Befort, C. A., Donnelly, J. E., Sullivan, D. K., Ellerbeck, E. F., & Perri, M. G. (2010). Group versus individual phone-based obesity treatment for rural women. *Eating Behaviors, 11*, 11-17.

Brener, N. D., Kann, L., McManus, T., Kinchen, S. A., Sundberg, E. C., & Ross, J. G. (2002). Reliability of the 1999 Youth Risk Behavior Survey (YRBS) questionnaire. *Journal of Adolescent Health, 31,* 336-342.

Carnethon, M. R., Gidding, S. S., Nehgme, R., Sidney, S., Jacobs, D. R. Jr., & Liu, K. (2003). Cardiorespiratory fitness in young adulthood and the development of cardiovascular disease risk factors. *The Journal of the American Medical Association, 290*, 3092-3100.

Centers for Disease Control. (November 4, 2011). *Adolescent and School Health.* http://www.cdc.gov/healthyyouth/physicalactivity/facts.htm

Chen, A. K., Roberts, C. K., & Barnard, R. J. (2005). Effect of a short-term diet and exercise intervention on metabolic syndrome in overweight children. *Metabolism Clinical and Experimental, 55*, 871-878.

Chen, W., Srinivasan, S. R., Li, S., Xu, J., & Berenson, G. S. (2007). Clustering of long-term trends in metabolic syndrome variables from childhood to adulthood in Blacks and Whites: The Bogalusa Heart Study. *American Journal of Epidemiology, 166*, 527-533.

Cohen J. (1998). *Statistical power analysis for the behavioral sciences* (2nd ed.) Hillsdale, NJ: Erlbaum.

Cook, S., Weitzman, M., Auinger, P., Nguyen, M., & Dietz, W. H. (2003). Prevalence of a metabolic syndrome phenotype in adolescents: Findings from the third national health and nutrition examination survey, 1988-1994. *Archives of Pediatrics & Adolescent Medicine, 157,* 821-827.

Crane, L. A., Leakey, T. A., Rimer, B. K., Wolfe, P., Woodworth, M. A. & Warnecke, R. B. (1998). Effectiveness of a telephone outcall intervention to promote screening mammography among low-income women. *Preventive Medicine, 27,* 39-49.

Davis, J. N., Gyllenhammer, L. E., Vanni, A. A., Meija, M., Tung, A., Schroeder, E. T. ...Goran, M. I. (2011). Startup circuit training program reduces metabolic risk in Latino adolescents. *Medicine and Science in Sports and Exercise, 43,* 2195-2203.

de Ferranti, S. D., Gauvreau, K., Ludwig, D. S., Neufeld, E. J., Newburger, J. W., & Rifai, N. (2004). Prevalence of the metabolic syndrome in American adolescents: Findings from the third national health and nutrition examination survey. *Circulation, 110,* 2494-2497.

de Ferranti, S. D., Gauvreau, K., Ludwig, D. S., Newburger, J. W., & Rifai, N. (2006). Inflammation and changes in metabolic syndrome abnormalities in US adolescents: Findings from the 1988-1994 and 1999-2000 national health and nutrition examination surveys. *Clinical Chemistry, 52,* 1325-1330.

Deforche, B., De Bourdeaudhuij, I., Tanghe, A., Debode, P., Hills, A. P. & Bouchaert, J. (2005). Post-treatment phone contact: a weight maintenance strategy in obese youngsters. *International Journal of Obesity, 29,* 543-546.

DuBose, K. D., Eisenmann, J. C., & Donnelly, J. E. (2007). Aerobic fitness attenuates the metabolic syndrome score in normal-weight, at-risk-for-overweight, and overweight children. *Pediatrics, 120,* e1262-8.

DuBose, K. D., Stewart, E. E., Charbonneau, S. R., Mayo, M. S., & Donnelly, J. E. (2006). Prevalence of the metabolic syndrome in elementary school children. *Acta Paediatrica, 95,* 1005-1011.

Eisenmann, J. C., Welk, G. J., Wickel, E. E., Blair, S. N., & Aerobics Center Longitudinal Study (2004). Stability of variables associated with the metabolic syndrome from adolescence to adulthood: The aerobics center longitudinal study. *American Journal of Human Biology, 16,* 690-696.

Ekelund, U., Anderssen, S. A., Froberg, K., Sardinha, L. B., Andersen, L. B., Brage, S. & the European Youth Heart Study Group (2007). Independent associations of physical activity and cardiorespiratory fitness with metabolic risk factors in children: The European youth heart study. *Diabetologia, 50,* 1832-1840.

Ferreira, I., Twisk, J. W., van Mechelen, W., Kemper, H. C., & Stehouwer, C. D. (2005). Development of fatness, fitness, and lifestyle from adolescence to the age of 36 years: Determinants of the metabolic syndrome in young adults: The Amsterdam growth and health longitudinal study. *Archives of Internal Medicine, 165*, 42-48.

Flattum, C., Friend, S., Neumark-Sztainer, R., & Story, M. (2009). Motivational interviewing as a component of a school-based obesity prevention program for adolescent girls. *American Dietetic Association, 109,* 91-94.

Ford, E. S., & Li, C. (2008). Defining the metabolic syndrome in children and adolescents: Will the real definition please stand up? *The Journal of Pediatrics, 152,* 160-164.

Fortier, M. D., Katzmarzyk, P. T., Malina, R. M., & Bouchard, C. (2001). Seven-year stability of physical activity and musculoskeletal fitness in the Canadian population. *Medicine and Science in Sports and Exercise, 33,* 1905-1911.

Freedman, D. S., Khan, L. K., Serdula, M. K., Dietz, W. H., Srinivasan, S. R., & Berenson, G. S. (2005). The relation of childhood BMI to adult adiposity: The Bogalusa heart study. *Pediatrics, 115*, 22-27.

Gardner, C. D., Winkleby, M. A., & Fortmann, S. P. (2000). Population frequency distribution of non-high-density lipoprotein cholesterol (Third National Health and Nutrition Examination Survey [NHANES III], 1988-1994). *The American Journal of Cardiology, 86*, 299-304.

Goode, A. D., Reeves, M. M., & Eakin, E. G. (2011). Telephone-delivered interventions for physical activity and dietary change: An updated systematic review. *American Journal of Preventive Medicine, 42,* 81-88.

Gunnell, D. J., Frankel, S. J., Nanchahal, K., Peters, T. J., & Smith, G. D. (1998). Childhood obesity and adult cardiovascular mortality: A 57-y follow-up study based on the Boyd Orr cohort. *The American Journal of Clinical Nutrition, 67,* 1111-1118.

Herman, K. M., Craig, C. L., Gauvin, L., & Katzmarzyk, P. T. (2009). Tracking of obesity and physical activity from childhood to adulthood: The physical activity longitudinal study. *International Journal of Pediatric Obesity, 4*, 281-288.

Janz, K. F., Lutuchy, E. M., Wenthe, P., & Levy, S. M. (2008). Measuring activity in children and adolescents using self-report: PAQ-C and PAQ-A. *Medicine & Science in Sports & Exercise, 40,* 767-772.

Johnson, W. D., Kroon, J. J. M., Greenway, F. L., Bouchard, C., Ryan, D., & Katzmarzyk, P. T. (2009). Prevalence of risk factors for metabolic syndrome in adolescents; National Health and Nutrition Examination Survey (NHANES), 2001-2006. *Arch Pediatr Med, 163,* 371-377.

Johnston, C. A., Tyler, C., Fullerton, G., McFarlin, B. K., Poston, W. S., Haddock, C. K. ...Foreyt, J. P. (2010). Effects of a school-based weight maintenance program for Mexican-American children: Results at 2 years. *Obesity, 18,* 542-547.

Kelishadi, R., Gouya, M. M., Adeli, K., Ardalan, G., Gheiratmand, R., Majdzadeh, R. ... the CASPIAN Study Group (2008). Factors associated with the metabolic syndrome in a national sample of youth: CASPIAN study. *Nutrition, Metabolism & Cardiovascular Diseases, 18,* 461-470.

Knox, G., Baker, J. S., Davies, B., Faulkner, S., Rance, J., Rees, A. ...Thomas, N. (2009). A cross-curricular physical activity intervention to combat cardiovascular disease risk factors in 11-14 year olds: 'Activity Knowledge Circuit.' *BMC Public Health, 9,* 466-474.

Kolt, G. S., Oliver, M., Schofield, G. M., Kerse, N., Garrett, N., & Latham, N. K. (2006). An overview and process evaluation of TeleWalk: a telephone-based counseling intervention to encourage walking in older adults. *Health Promotion International, 21,* 201-208.

Kowalski, K. C., Crocker, P. R. E., & Donen, R. M. (2004). The physical activity questionnaire for older children (PAQ-C) and adolescents (PAQ-A) manual.

Laitinen, J., Power, C., & Jarvelin, M. R. (2001). Family social class, maternal body mass index, childhood body mass index, and age at menarche as predictors of adult obesity. *The American Journal of Clinical Nutrition, 74,* 287-294.

Lakka, H. M., Laaksonen, D. E., Lakka, T. A., Niskanen, L. K., Kumpusalo, E., Tuomilehto, J. ...Salonen, J. T. (2002). The metabolic syndrome and total and cardiovascular disease mortality in middle-aged men. *The Journal of the American Medical Association, 288,* 2709-2716.

Leone, M. & Comtois, A. S. (2007). Validity and reliability of self-assessment of sexual maturity in elite adolescent athletes. *Journal of Sports Medicine and Physical Fitness, 47,* 361-365.

Magnusson, K. T., Sigurgeirsson, I., Sveinsson, T., & Johannsson, E. (2011). Assessment of a two-year school-based physical activity intervention among 7-9 year old children. *International Journal of Behavioral Nutrition and Physical Activity, 8,* 138-151.

Markland, D. & Tobin, V. (2004). A modification to the behavior regulation in exercise questionnaire to include an assessment of amotivation. *Journal of Sport & Exercise Psychology, 26,* 191-196.

Marcus, B. H., Selby, V. C., Niaura, R. S., & Rossi, J. S. (1992). Self-efficacy and the stages of behavior change. *Research Quarterly for Exercise and Sport, 63,* 60-66.

Marshall, W. A. & Tanner, J. M. (1969). Variations in the pattern of pubertal changes in girls. *Archives of Disease in Childhood, 44,* 291-303.

Marshall, W. A. & Tanner, J. M. (1970). Variations in the pattern of pubertal changes in boys. *Archives of Disease in Childhood, 45,* 13-23.

Mullan, E., Markland, D. & Ingledew, D. K. (1997). A graded conceptualization of self-determination in the regulation of exercise behavior: Development of a measure using confirmatory factor analysis. *Personality and Individual Differences, 23,* 745-752.

Neto, A. S., Sasaki, J. E., Mascarenhas, L. P. G., Boguszewski, M. C. S., Bozza, R., Ulbrich, A. Z. ...de Campos, W. (2011). Physical activity, cardiorespiratory fitness, and metabolic syndrome in adolescents: A cross-sectional study. *BMC Public Health, 11:674,* 1-7.

New Lifestyles. (retrieved June 19, 2012). *New-Lifestyles NL-800 Pedometer*. http://www.thepedometercompany.com/nl800.html

Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2012). Prevalence of obesity and trends in body mass index among US children and adolescents, 1999-2010. *The Journal of the American Medical Association, 307,* 483-490.

Ogden, C. L., Flegal, K. M., Carroll, M. D., & Johnson, C. L. (2002). Prevalence and trends in overweight among US children and adolescents, 1999-2000. *The Journal of the American Medical Association, 288,* 1728-1732.

Pan, Y. & Pratt, C. A. (2008). Metabolic syndrome and its association with diet and physical activity in U.S. adolescents. *American Dietetic Association, 108,* 276-286.

Patrick, K., Sallis, J. F., Prochaska, J. J., Lydston, D. D., Calfas, K. J., Zabinski, M. F. ...Brown, D. R. (2001). A multicomponent program for nutrition and physical activity change in primary care. *Archives of Pediatric Adolescent Medicine, 155,* 940-946.

Pew Research Center Publications (retrieved June 7, 2012). *Teens, Cell Phones, and Texting.* (http://pewresearch.org/pubs/1572/teens-cell-phones-text-messages).

Raitakari, O. T., Porkka, K. V., Rasanen, L., Ronnemaa, T., & Viikari, J. S. (1994). Clustering and six year cluster-tracking of serum total cholesterol, HDL-cholesterol and diastolic blood pressure in children and young adults. The cardiovascular risk in young Finns study. *Journal of Clinical Epidemiology, 47,* 1085-1093.

Resnicow, K., Davis, R., & Rollnick, S. (2006). Motivational interviewing for pediatric obesity: conceptual issues and evidence review. *American Dietetic Association, 106,* 2024-2033.

Robbins, L. B., Pfeiffer, K. A., Maier, K. S., LaDrig, S. M., & Berg-Smith, S. M. (2012a). Treatment fidelity of motivational interviewing delivered by a school nurse to increase girls' physical activity. *The Journal of School Nursing, 28,* 70-78.

Robbins, L. B., Pfeiffer, K. A., Maier, K. S., Lo, Y. J., & LaDrig, S. M.W. (2012b). Pilot intervention to increase physical activity among sedentary urban middle school girls: a two-group pretest-posttest quasi-experimental design. *The Journal of School Nursing*, 1-14.

Schneider, P. L., Crouter, C. E., Lukajic, O., & Bassett, D. R. Jr. (2003). Accuracy and reliability of 10 pedometers for measuring steps over a 400-m walk. *Medicine & Science in Sports & Exercise, 35,* 1779-1784.

Singh, A. S., Mulder, C., Twisk, J. W., van Mechelen, W., & Chinapaw, M. J. (2008). Tracking of childhood overweight into adulthood: A systematic review of the literature. *Obesity, 9,* 474-488.

Smith, J. D. & Schroeder, C. A. (2010). Pedometer accuracy in elementary school children while walking, skipping, galloping, and sliding. *Measurement in Physical Education and Exercise Science, 14,* 92-103.

Thompson, W. R., Gordon, N. F. & Pescatello, L. S. (Eds.). (2009). American College of Sports Medicine: Guidelines for Exercise Testing and Prescription, Eighth Edition. Baltimore, MD: Lippincott Williams & Wilkins, 45-65.

Troiano, R. P., Berrigan, D., Dodd, K. W., Masse, L. C., Tilert, T., & McDowell, M. (2008). Physical activity in the United States measured by accelerometer. *Medicine and Science in Sports and Exercise, 40,* 181-188.

U.S. Dept. of Health & Human Services. 2008 PA Guidelines for Americans. ODPHP publication NA V0036. Oct. 2008.

U.S. Department of Health and Human Services. (January 2010). *The Surgeon General's Vision for a Healthy and Fit Nation 2010*. http://www.surgeongeneral.gov/library/obesityvision/obesityvision2010.pdfs

Verloigne, M., De Bourdeaudhuij, I., Tanghe, A., D'Hondt, E., Theuwis, L., Vansteenkiste, M. ...Deforche, B. (2011). Self-Determined motivation towards physical activity in adolescent treated obesity: an observational study. *International Journal of Behavioral Nutrition and Physical Activity, 8, 1-11.*

Weiss, R., Dziura, J., Burgert, T. S., Tamborlane, W. V., Taksali, S. E., Yeckel, C. W. ... Caprio, S. (2004). Obesity and the metabolic syndrome in children and adolescents. *The New England Journal of Medicine, 350,* 2362-2374.

Wilcox, S., Dowda, M., Leviton, L. C., Bartlett-Prescott, J., Bazzarre, T., Campbell-Voytal, K. ...Wegley, S. (2008). Active for life: Final results from the translation of two physical activity programs. *American Journal of Preventive Medicine, 35,* 340-351.

Woolford, S. J., Barr, K. L. C., Derry, H. A., Jepson, C. M., Clark, S. J., Strecher, V. J. ...Reniscow, K. (2011). OMG do not say LOL: obese adolescents' perspectives on the content of text messages to enhance weight loss efforts. *Obesity, 19,* 2382-2387.

World Health Organization. 2011. *Physical Activity.* http://www.who.int/dietphysicalactivity/pa/en/index.html

World Health Organization. 2011. *Physical Activity and Young People.* http://www.who.int/dietphysicalactivity/factsheet_young_people/en/

Zabinski, M. F., Saelens, B. E., Stein, R. I., Hayden-Wade, H. A., Wilfley, D. E. (2003). Overweight children's barriers to and support for physical activity. *Obesity Research, 11, 238-246.*

Zeller, M., Kirk, S., Claytor, R., Khoury, P., Grieme, J., et al. (2004). Predictors of attrition from a pediatric weight management program. *The Journal of Pediatrics,144,* 466-471.

APPENDIX A

INSTITUTIONAL REVIEW BOARD APPROVAL LETTER

EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board Office
4N-70 Brody Medical Sciences Building· Mail Stop 682
600 Moye Boulevard · Greenville, NC 27834
Office **252-744-2914** · Fax **252-744-2284** · **www.ecu.edu/irb**

Notification of Initial Approval: Expedited

From: Biomedical IRB
To: Jessica Currie
CC: Katrina DuBose
Date: 9/30/2012
Re: UMCIRB 12-001479
A Telephone Intervention on Physical Activity n Adolescents

I am pleased to inform you that your Expedited Application was approved. Approval of the study and any consent form(s) is for the period of 9/28/2012 to 9/27/2013. The research study is eligible for review under expedited category #2, #5 and #7. The Chairperson (or designee) deemed this study no more than minimal risk.

Changes to this approved research may not be initiated without UMCIRB review except when necessary to eliminate an apparent immediate hazard to the participant. All unanticipated problems involving risks to participants and others must be promptly reported to the UMCIRB. The investigator must submit a continuing review/closure application to the UMCIRB prior to the date of study expiration. The Investigator must adhere to all reporting requirements for this study.

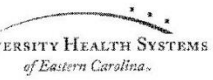
The approval includes the following items:

Name	Description
Adult HIPAA Authorization | History	HIPAA Authorization
Barriers to Physical Activity Questionnaire | History	Surveys and Questionnaires
Barriers to Physical Activity Questionnaire-Adults | History	Surveys and Questionnaires
BREQ-2 | History	Surveys and Questionnaires
Demographics | History	Surveys and Questionnaires
Informed Assent | History	Consent Forms
Informed Consent | History	Consent Forms
Parent HIPAA Authorization | History	HIPAA Authorization
Physical Activity Log | History	Surveys and Questionnaires
Protocol Summary | History	Study Protocol or Grant Application
Recruitment Flyer | History	Recruitment Documents/Scripts
Thesis Proposal | History	Study Protocol or Grant Application
Youth Risk Behavior Survey | History	Surveys and Questionnaires

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

APPENDIX B

INFORMED CONSENT



East Carolina University

Informed Consent to Participate in Research

Information to consider before taking part in research that has no more than minimal risk.

Title of Research Study: A telephone-based physical activity intervention in obese adolescents

Principal Investigator: Jessica Currie
Faculty Supervisor: Katrina DuBose
Institution/Department or Division: Department of Kinesiology
Address: Activity Promotion Lab, East Carolina University, Greenville, NC 27858
Telephone #: 910-506-0790

Researchers at East Carolina University (ECU) study problems in society, health problems, environmental problems, behavior problems and the human condition. Our goal is to try to find ways to improve the lives of you and others. To do this, we need the help of volunteers who are willing to take part in research.

Why is this research being done?

The purpose of this research is to study the effectiveness of a telephone based physical activity intervention has on increasing physical activity levels in adolescents. The decision to take part in this research is yours to make. By doing this research, we hope to learn better ways to motivate adolescents to become physically active and also to determine if incorporating physical activity into the current treatment methods aids with improving health risk factors.

Why am I being invited to take part in this research?

You are being invited to take part in this research because your child is being treated at the ECU Pediatric Healthy Weight Research and Treatment Center. If you volunteer for your child to take part in this research, they will be one of about 20 people to do so.

Are there reasons I should not take part in this research?

I understand that my child should not volunteer for this research study if they are under 12 years old, have any condition that limits their ability to perform physical activity or if a physician recommends my child not to participate.

What other choices do I have if I do not take part in this research?

You can choose not to participate.

Where is the research going to take place and how long will it last?

The research procedures will be conducted at the ECU's Pediatric Healthy Weight Research and Treatment Center. You will need to come to ECU Pediatric Healthy Weight Research and Treatment Center twice during the study. These visits will coincide with your child's normally scheduled doctor visits. The total amount of time you will be asked to volunteer for this study is 4 hours over the next 2 months.

What will I be asked to do?
Your child is being asked to do the following:
Two (2) research study visits that are two (2) months apart.

On the 1st visit you will complete a questionnaire which has questions about general demographics and your child's health. We will measure your child's resting blood pressure and heart rate. We will also look at your child's medical records to get his/her current weight, height, cholesterol values, growth and development, and any medication he/she may be taking.

A blood sample via finger stick will be obtained as part of standard procedure for the Pediatric Healthy Weight Clinic. We will obtain cholesterol values from this blood sample.

Your child will complete questionnaires to determine their current physical activity level and possible barriers to physical activity.

Your child will be randomized to either a control or intervention condition. The control condition will last 2 months include standard care by the physician. Your child will also be asked to wear a pedometer for a total of 2 weeks during this time and record his/her steps on a daily basis. Your child may receive a total of 2 phone calls during the 2 month period to obtain daily pedometer steps and to remind your child of their follow-up appointment. The intervention condition will last 2 months include standard care by the physician, weekly phone calls by a member of the research study to your child and a weekly newsletter that will be sent to your house. During these phone calls the research study staff will discuss physical activity goals and barriers to physical activity with your child. The phone class will last about 15-20 minutes. Your child will also be asked to wear a pedometer for a total of 2 weeks during this time and record his/her steps on a daily basis.

Please note, in order to provide feedback and training to the research staff some of the telephone calls will be randomly selected for recording. Please let us know if you are willing to allow us to do this. Your child may remain in the study even if you choose not to allow us to record the phone call(s).

_____ Yes, I will allow you to record the call(s) from the research staff.
_____ No, I will NOT allow you to record the call(s) from the research staff.

No matter which group your child is randomized to they will receive a pedometer to keep for 2 months. Your child can choose to wear the pedometer every day during the 2 months if he/she desires. Research staff will explain how to wear and use the pedometers.

This visit will take about 30 minutes and will be incorporated with your child's initial appointment at the clinic.

On the 2nd visit, weight, height, and current medication usage will be obtained from your child's medical records again. Waist circumference will be measured around the smallest part of your child's waist. We will also measure your child's resting blood pressure and heart rate. A second blood sample will be taken via finger stick to obtain cholesterol values. There will be no cost for the additional blood sample. Your child will complete questionnaires to determine their current physical activity level and possible barriers to physical activity. This visit will take about 15 minutes.

What possible harms or discomforts might I experience if I take part in the research?
It has been determined that the risks associated with this research are no more than what you would experience in everyday life.

What are the possible benefits I may experience from taking part in this research?
Other people who have participated in this type of research have experienced increases in physical activity levels, improved weight loss, and felt better about themselves. By participating in this research study, your child may also experience these benefits.

Will I be paid for taking part in this research?
A $10 gift card will be presented to both your child and yourself as a token of appreciation at the follow-up visit.

What will it cost me to take part in this research?
It will not cost you any money to be part of the research. The sponsor of this research will pay the costs of: the pedometers and mailing documents.

Who will know that I took part in this research and learn personal information about me?
To do this research, ECU and the people and organizations listed below may know that you took part in this research and may see information about you that is normally kept private. With your permission, these people may use your private information to do this research:

- The University & Medical Center Institutional Review Board (UMCIRB) and its staff, who have responsibility for overseeing your welfare during this research, and other ECU staff who oversee this research.

How will you keep the information you collect about me secure? How long will you keep it?
Only the investigators and personnel associated with this study will have access to the data obtained. No identifying information will be released. An unique id will be assigned to your child and only the primary investigator and key research personnel will have access to the code and name of the child. Data will be secured in a locked filing cabinet in the primary investigator's laboratory. These measures will protect the identity of your child. The data will be kept for 7 years. Any data that is presented in papers or at conferences will be done so as group data with no identification of individual children.

What if I decide I do not want to continue in this research?
If you decide you no longer want to be in this research after it has already started, you may stop at any time. You will not be penalized or criticized for stopping. You will not lose any benefits that you should normally receive.

Who should I contact if I have questions?
The people conducting this study will be available to answer any questions concerning this research, now or in the future. You may contact the Principal Investigator, Jessica Currie at 910-506-0790.

If you have questions about your rights as someone taking part in research, you may call the UMCIRB Office at phone number 252-744-2914 (days, 8:00 am-5:00 pm). If you would like to report a complaint or concern about this research study, you may call the Director of UMCIRB Office, at 252-744-1971

I have decided I want to take part in this research. What should I do now?
The person obtaining informed consent will ask you to read the following and if you agree, you should sign this form:

- I have read (or had read to me) all of the above information.
- I have had an opportunity to ask questions about things in this research I did not understand and have received satisfactory answers.
- I know that I can stop taking part in this study at any time.
- By signing this informed consent form, I am not giving up any of my rights.
- I have been given a copy of this consent document, and it is mine to keep.

Title of Study: A Telephone Intervention on Physical Activity in Adolescents

Participant's Name (PRINT)	Signature	Date

Person Obtaining Informed Consent: I have conducted the initial informed consent process. I have orally reviewed the contents of the consent document with the person who has signed above, and answered all of the person's questions about the research.

Person Obtaining Consent (PRINT)	Signature	Date

Principal Investigator (PRINT)	*Signature*	*Date*

(If other than person obtaining informed consent)

APPENDIX C

INFORMED ASSENT FORM

East Carolina University

1907-2007
CENTENNIAL

Assent Form

Things You Should Know Before You Agree To Take Part in this Research

IRB Study #__12-001479_____

Title of Study: A telephone based physical activity intervention in obese adolescents

Principal Investigator: Jessica Currie
Faculty Supervisor: Katrina DuBose
Institution/Department or Division: Department of Kinesiology
Address: Activity Promotion Lab, East Carolina University, Greenville, NC 27858
Telephone #: 910-506-0790
Study contact E-mail Address: curriej03@students.ecu.edu

People at ECU study ways to make people's lives better. These studies are called research. This research is trying to find out how to get adolescents to be more physically active.

Your parent(s) needs to give permission for you to be in this research. You do not have to be in this research if you don't want to, even if your parent(s) has already given permission.

You may stop being in the study at any time. If you decide to stop, no one will be angry or upset with you. Your doctors will still continue to take good care of you.

Why are you doing this research study?

The reason for doing this research is that adolescents do not do enough physical activity to be healthy. Obesity is increasing in youth and physical activity helps them from gaining weight and losing weight. Not getting enough physical activity can lead to other health issues.

Why am I being asked to be in this research study?

We are asking you to take part in this research because you are getting medical care for weight loss.

How many people will take part in this study?

If you decide to be in this research, you will be one of about 20 people taking part in it.

What will happen during this study?

- There will be two (2) research study visits that are two (2) months apart. All visits will be at the ECU Pediatric Healthy Weight Research and Treatment Center during your normal doctor's visits.

Visit 1

- We will measure around your belly with a tape measure. We will measure your resting blood pressure and heart rate. We will also look at your records to get you current weight, height, cholesterol values, growth and development, and any medication you may be taking. As a part of standard procedure of the clinic, you will have a finger pricked for a blood sample. This tells us how healthy you are.

- You will be asked some questions about the current activities that you do and why do may not do physical activity. You will also complete some surveys to let us know more detail about your physical activity habits. This will tell us what your activity habits are and how you spend your free time.

- Then you will be selected to be in either a control or intervention group. If you are chosen for the control condition it will last 2 months and includes standard care by the doctors. If you are chosen for the intervention condition it will last 2 months and includes standard care by the physician, weekly phone calls and newsletters. The phone calls will be weekly for 2 months by a member of the research study. During these phone calls we talk about physical activity goals and why you may be having a hard time being active. The newsletters will give you information on how to be more active. The phone calls will last about 15-20 minutes.

- Please note, in order to provide feedback and training to the research staff some of the telephone calls will be randomly selected for recording. Please let us know if you are willing to allow us to do this. Your child may remain in the study even if you choose not to allow us to record the phone call(s).

  _____ Yes, I will allow you to record the call(s) from the research staff.
  _____ No, I will NOT allow you to record the call(s) from the research staff.

- No matter which group you are chosen to be in you will receive a pedometer to keep for 2 months and record your steps on a daily basis for 2 weeks, one at the beginning and one at the end of the study. We will explain how to use the pedometer and the physical activity tracking sheet.

- This visit will take about 30 minutes.

- Before Visit 2, you will receive a phone call reminder of your follow-up appointment. You will also be reminded to wear your pedometer for the next week and record your steps. This will also be a chance for you to ask any questions about the surveys that you will fill out before the appointment.

Visit 2

- We will measure around your belly and resting blood pressure and heart rate. We will also look at your records for your current height, weight and medications. We will prick your finger for a second blood sample to measure your cholesterol values.

- We will ask you questions about current activities that you do and reasons why you may not be physically active. This will tell us what your activity habits are and how you spend your free time. These will be mailed to you ahead of time so that you may begin working on them ahead of time.

- This visit will take about 15 minutes.

This study will take place at ECU Pediatric Healthy Weight Research and Treatment Center and will last for a total of 2 months.

Who will be told the things we learn about you in this study?
Only those working on this study will know about your information. This will include the person in charge of the study, and the people who you talk to either in the office or on the phone about the study. Because most of the measurements are taken at the doctor's office you parent/legal guardian will know this information was well. A summary of your physical activity levels will be reviewed at the second visit and your parent/legal guardian will also hear this information.

What are the good things that might happen?
Sometimes good things happen to people who take part in research. These are called "benefits." The benefits to you of being in this study may be learning about how active you are and learning new ways to be physically active.

What are the bad things that might happen?
Sometimes things we may not like happen to people in research studies. These things may even make them feel bad. These are called "risks." These are the risks of this study are very small and often happens when someone begins being active. You may be more tired than normal and your body might be sore or ache for a few days when you being more active. You may or may not have these things happen to you. Things may also happen that the researchers do not know about right now. You should report any problems to your parents and to the researcher.

Will you get any money or gifts for being in this research study?
At your follow-up visit in 2 months, both you and your parent/guardian will each receive a $10 gift card as a token of appreciation for being a part of this study.

Who should you ask if you have any questions?
If you have questions about the research, you should ask the people listed on the first page of this form. If you have other questions about your rights while you are in this research study you may call the Institutional Review Board at 252-744-2914.

If you decide to take part in this research, you should sign your name below. It means that you agree to take part in this research study.

_____ _____
Sign your name here if you want to be in the study Date

_____
Print your name here if you want to be in the study

_____ _____
Signature of Person Obtaining Assent Date

_____
Printed Name of Person Obtaining Assent

APPENDIX D

DEMOGRAPHIC FORM

ID #: _____ Date: _____

Visit: Baseline Post RA: _____

Telephone Physical Activity Intervention Study

Demographic & Health Information

I would like to ask you about your child's family background – your child's age, your education, the work you do, your marital status, and family's health status.

1. How old was your child on his/her last birthday? ____ ____ years [TPAI0201]

2. When is your child's birthday? ____ ____/____ ____/____ ____ [TPAI0202]

3. What is your child's sex? (check one) [TPAI0203]

____ 1. Female
____ 2. Male

4. What is your child's race/ethnicity? (check one) [TPAI0204]

____ 1. African American ____ 3. Hispanic ____ 5. Native American

____ 2. Non-hispanic white ____ 4. Asian ____ 6. Other _____ (describe)

5. Which best reflects your highest level of education? (check one) [TPAI0205]

____ 1. Did not complete high school
____ 2. Graduated from high school or earned GED
____ 3. Attended college or vocational school
____ 4. Earned a college degree (Bachelor's)
____ 5. Earned a graduate degree (Masters, Doctoral, Professional)
____ 7. Don't know/refused

6. Do you work for a living? [TPAI0206]

___ 1. No (go to question 9)
___ 2. Yes
___ 7. Don't know/ Refused

7. Which best describes the hours you work? [TPAI0207]

___ 1. Part time
___ 2. Full time
___ 7. Don't know/ Refused

8. What type of work do you do? [TPAI0208]

_____ Leave blank: _____

9. Which best describes your marital status? (check one) [TPAI0209]

____ 1. Married
____ 2. Living as married
____ 3. Widowed
____ 4. Divorced
____ 5. Never married/single
____ 6. Separated
____ 7. Don't know/refused

10. Which best describes the place you live? (check one) [TPAI0210]

____ 1. Large city [>100,000 people; like Raleigh, NC]
____ 2. Medium city [30,000-100,000 people; like Greenville, NC]
____ 3. Rural city [<30,000 people; like New Bern, NC]
____ 4. Small city [<1,000 people]
____ 5. In the country, no city
____ 7. Don't know/refused

11. Which best describes your household income in the past year? (check one) [TPAI0211]

____ 1. < $15,999
____ 2. $16,000 to $24,999
____ 3. $25,000 to $34,999
____ 4. $35,000 to $49,999
____ 5. $50,000 to $74,999
____ 6. $75,000 and greater
____ 7. Don't know/refused

12. During the past month, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise? (parent's activity level) [TPAI0212]

___ 1. No
___ 2. Yes
___ 7. Don't know/ Refused

13. Do you currently smoke cigarettes? (parent's smoking status) [TPAI0213]

___ 1. No
___ 2. Yes
___ 7. Don't know/ Refused

Has a health care provider every told anyone in your family (e.g. yourself, biologic parent(s), a sibling) that they have any of the following conditions?

		No (1)	Yes (2)	Don't know/refused (7)	Relation (mother, father, etc)
14.	Diabetes (high sugar)	___	___	___	_____ [TPAI0214]
15.	High blood pressure	___	___	___	_____ [TPAI0215]
16.	High cholesterol	___	___	___	_____ [TPAI0216]
17.	Heart disease	___	___	___	_____ [TPAI0217]
18.	Stroke	___	___	___	_____ [TPAI0218]
19.	Cancer	___	___	___	_____ [TPAI0219]
20.	Arthritis or joint pain	___	___	___	_____ [TPAI0220]
21.	Overweight	___	___	___	_____ [TPAI0221]
22.	Breathing problems	___	___	___	_____ [TPAI0222]

23. Would you say that in general your child's health is [TPAI023]

____ 1. Excellent
____ 2. Very good
____ 3. Good
____ 4. Fair
____ 5. Poor
____ 7. Don't know/refused

24. Compare to others your child's age, is your child's health [TPAI0224]

____ 1. Excellent
____ 2. Very good
____ 3. Good
____ 4. Fair
____ 5. Poor
____ 7. Don't know/refused

25. Now, thinking about your child's physical health, which includes physical illness and injury, have there been any days in the past 30 days that your child's physical health was not good? [TPAI0225]

___ 1. No (go to question 29)
___ 2. Yes
___ 7. Don't know/ Refused

26. How many days in the past month was your child's health not good?
_____ [TPAI0226]

27. During the past 30 days, were there any days that poor physical health kept your child from doing her usual activities, such as going to school, doing chores, or playing with friends? [TPAI0227]

___ 1. No (go to question 29)
___ 2. Yes
___ 7. Don't know/ Refused

28. How many days in the past month was your child unable to do their usual activities?
_____ [TPAI0228]

29. Compared with others your child's own age and sex, how do you rate their level of physical strength? [TPAI0229]

____ 1. Much more than others
____ 2. More than others
____ 3. About as much as others
____ 4. Less than others
____ 5. Much less than others
____ 7. Don't know/refused

30. Compared with others your child's own age and sex, how do you rate their level of physical activity? [TPAI0230]

____ 1. Much more than others
____ 2. More than others
____ 3. About as much as others
____ 4. Less than others
____ 5. Much less than others
____ 7. Don't know/refused

31. Who completed the survey? [TPAI0231]

_____ 1. Mother
_____ 2. Father
_____ 3. Legal guardian other than parent
_____ 4. Other _____ (state who: grandparent, aunt etc.)

APPENDIX E

YOUTH RISK BEHAVIOR SURVEY

Telephone Physical Activity Intervention Study

Youth Risk Behavior Survey
Physical Activity

1. On how many of the past 7 days did you participate in physical activity for **at least 20 minutes that made you sweat and breathe hard,** such as basketball, soccer, running, swimming laps, fast bicycling, fast dancing, or similar aerobic activities? [TPAI1101]

____ 0 days
____ 1 day
____ 2 days
____ 3 days
____ 4 days
____ 5 days
____ 6 days
____ 7 days

2.On how many of the past 7 days did you participate in physical activity for **at least 30 minutes** that did **not** make you sweat or breathe hard, such as fast walking, slow bicycling, skating, pushing a lawn mower, or mopping floors? [TPAI1102]

____ 0 days
____ 1 day
____ 2 days
____ 3 days
____ 4 days
____ 5 days
____ 6 days
____ 7 days

3. During the past 7 days, on how many days were you physically active for a total of **at least 60 minutes per day? (**Add all of the time you spend in any kind of physical activity that increases your heart rate and makes you breathe hard some of the time.) [TPAI1103]

____ 0 days
____ 1 day
____ 2 days
____ 3 days
____ 4 days
____ 5 days
____ 6 days
____ 7 days

4. On an average school day, on how many hours do you watch TV? [TPAI1104]

____ I do not watch TV on an average school day
____ Less than 1 hour per day
____ 1 hour per day
____ 2 hours per day
____ 3 hours per day
____ 4 hours per day
____ 5 or more hours per day

5. On an average school day, how many hours do you play video or computer games or use a computer for something that is not school work? (Include activities such as Nintendo, Game Boy, PlayStation, Xbox, computer games, and the Internet.) [TPAI1105]

____ I do not play video or computer games or use a computer for something that is not school work
____ Less than 1 hour per day
____ 1 hour per day
____ 2 hours per day
____ 3 hours per day
____ 4 hours per day
____ 5 or more hours per day

6. During the weekend, on how many hours per day do you watch TV? [TPAI1106]

____ I do not watch TV on an average school day
____ Less than 1 hour per day
____ 1 hour per day
____ 2 hours per day
____ 3 hours per day
____ 4 hours per day
____ 5 or more hours per day

7. During the weekend, how many hours per day do you play video or computer games or use a computer for something that is not school work? (Include activities such as Nintendo, Game Boy, PlayStation, Xbox, computer games, and the Internet.) [TPAI1107]

____ I do not play video or computer games or use a computer for something that is not school work
____ Less than 1 hour per day
____ 1 hour per day
____ 2 hours per day
____ 3 hours per day
____ 4 hours per day
____ 5 or more hours per day

8. In an average week when you are in school, on how many days do you go to physical education (PE) classes? [TPAI1108] (If answer 1 then skip to Question 10)

____ 1. I do not take PE
____ 2. 1 day
____ 3. 2 days
____ 4. 3 days
____ 5. 4 days
____ 6. 5 days

9. During an average physical education (PE) class, how many minutes do you spend actually exercising or playing sports? [TPAI1109]

____ 1. Less than 10 minutes
____ 2. 10 to 20 minutes
____ 3. 21 to 30 minutes
____ 4. 31 to 40 minutes
____ 5. 41 to 50 minutes
____ 6. 51 to 60 minutes
____ 7. More than 60 minutes

10. During the past 12 months, on how many sports teams did you play? (Include any teams run by your school or community groups) [TPAI1110]

____ 0 teams
____ 1 team
____ 2 teams
____ 3 or more teams

APPENDIX F

BARRIERS TO PHYSICAL ACTIVITY

Barriers to Physical Activity Questionnaire

How often do the following things **prevent you from getting physical activity**?

	None	Rarely	Sometimes	Often	Very Often
1. Self conscious about my looks when I do activities [TPAI1301]	1	2	3	4	5
2. Lack of interest in physical activity [TPAI1302]	1	2	3	4	5
3. Lack of time [TPAI1303]	1	2	3	4	5
4. I do not have anyone to do physical activities with me [TPAI1304]	1	2	3	4	5
5. Lack of equipment [TPAI1305]	1	2	3	4	5
6. Lack of skills [TPAI1306]	1	2	3	4	5
7. Lack of knowledge on how to do physical activities [TPAI1307]	1	2	3	4	5
8. Lack of convenient place to do physical activities [TPAI1308]	1	2	3	4	5
9. I am too overweight [TPAI1309]	1	2	3	4	5
10. My friends don't like to do physical Activity [TPAI1310]	1	2	3	4	5
11. My friends tease me during exercise or Sports [TPAI1311]	1	2	3	4	5
12. I'm chosen last for teams [TPAI1312]	1	2	3	4	5
13. The weather is too bad [TPAI1313]	1	2	3	4	5
14. Homework [TPAI1314]	1	2	3	4	5
15. Self conscious about my body when I do physical activity [TPAI1315]	1	2	3	4	5
16. I do not want people to see my body when I do physical activity [TPAI1316]	1	2	3	4	5
17. I do not have anyone at my skill level to do physical activities with me [TPAI1317]	1	2	3	4	5
18. I do not like the way my body feels when I do physical activity [TPAI1318]	1	2	3	4	5
19. Physical activity is too hard [TPAI1319]	1	2	3	4	5
20. Being active makes me physically Uncomfortable [TPAI1320]	1	2	3	4	5
21. Physical activity is too much work [TPAI1321]	1	2	3	4	5

APPENDIX G

BEHAVIOR REGULATION EXERCISE QUESTIONNAIRE - 2

EXERCISE REGULATIONS QUESTIONNAIRE (BREQ-2)

WHY DO YOU ENGAGE IN EXERCISE?

We are interested in the reasons underlying peoples' decisions to engage, or not engage in physical exercise. Using the scale below, please indicate to what extent each of the following items is true for you. Please note that there are no right or wrong answers and no trick questions. We simply want to know how you personally feel about exercise. Your responses will be held in confidence and only used for our research purposes.

		Not true for me		Sometimes true for me		Very true for me
1	I exercise because other people say I should [TPAI2101]	0	1	2	3	4
2	I feel guilty when I don't exercise [TPAI2102]	0	1	2	3	4
3	I value the benefits of exercise [TPAI2103]	0	1	2	3	4
4	I exercise because it's fun [TPAI2104]	0	1	2	3	4
5	I don't see why I should have to exercise [TPAI2105]	0	1	2	3	4
6	I take part in exercise because my friends/family/partner say I should [TPAI2106]	0	1	2	3	4
7	I feel ashamed when I miss an exercise session [TPAI2107]	0	1	2	3	4
8	It's important to me to exercise regularly [TPAI2108]	0	1	2	3	4
9	I can't see why I should bother exercising [TPAI2109]	0	1	2	3	4
10	I enjoy my exercise sessions [TPAI2110]	0	1	2	3	4

		Not true for me		Sometimes true for me		Very true for me
11	I exercise because others will not be pleased with me if I don't [TPAI2111]	0	1	2	3	4
12	I don't see the point in exercising [TPAI2112]	0	1	2	3	4
13	I feel like a failure when I haven't exercised in a while [TPAI2113]	0	1	2	3	4
14	I think it is important to make the effort to exercise regularly [TPAI2114]	0	1	2	3	4
15	I find exercise a pleasurable activity [TPAI2115]	0	1	2	3	4
16	I feel under pressure from my friends/family to exercise [TPAI2116]	0	1	2	3	4
17	I get restless if I don't exercise regularly [TPAI2117]	0	1	2	3	4
18	I get pleasure and satisfaction from participating in exercise [TPAI2118]	0	1	2	3	4
19	I think exercising is a waste of time [TPAI2119]	0	1	2	3	4

Thank you for taking part in our research

APPENDIX H

EXIT SURVEY

Telephone Physical Activity Intervention Study

Exit Survey

	Strongly Disagree		Agree		Strongly Agree
The research staff was professional	1	2	3	4	5
I benefited from participating in the program	1	2	3	4	5
I received helpful information that will help me be more physically active	1	2	3	4	5
I feel confident to use the information I received in my own life	1	2	3	4	5
I enjoyed being a part of this program	1	2	3	4	5
I would recommend this program to friends/family members	1	2	3	4	5
The newsletters were helpful	1	2	3	4	5
The phone calls were helpful	1	2	3	4	5

If you were to receive information about physical activity in the future, which method would you like the best? (circle one)

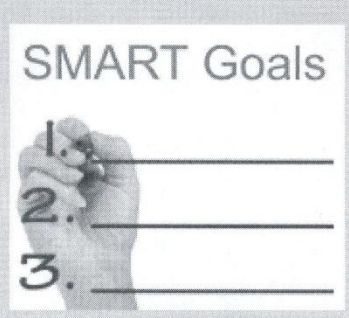
1. Telephone
2. Mail
3. Email
4. Internet
5. Text Message

APPENDIX I

NEWSLETTERS

Telephone Physical Activity Study

Weekly Newsletter
Volume 1, Issue 2



Keep your goals S.M.A.R.T

SMART Goal Setting

- **S**pecific- Specify exactly what you are going to accomplish
- **M**easurable- Your progress towards you goal can be measured
- **A**ction Oriented- The goal is connected with something you do and deals with behaviors you will use to achieve desired outcomes
- **R**ealistic- Set goals that are within your reach
- **T**ime Frame- Long term goals give you direction, but short term goals get you to your destination

How to set SMART Goals

- **Specific goals** focus on changing a specific behavior not an outcome
  - Ex. I'm going to walk more
- **Measurable goals** can be measured in some way
  - Ex. My goal is to get 8,000 steps on my pedometer 4 out of 7 days this week.
- **Action oriented goals** state what you plan to do to reach your goals.
  - Ex. I'm going to take a 20 minute walk at the park 4 out of 7 days during the week
- **Realistic** goals are challenging yet realistic.
  - ***Unrealistic goal***: I'm going to run 10 miles on Saturday without any rest breaks.
  - ***Realistic goal***: I'm going to walk a total of 10 miles by the end of the week (~2000 steps equals 1 mile)
- Set a **Time Frame** for you goals. People are more likely to take action when there is a deadline. *Would you stay up late doing homework if it wasn't due the next day!?*
  - Ex. I'm going to be able to run for 15 mins straight in 2 weeks

GOAL SETTING WORKSHEET

- This week I am going to

  _____

  _____

  _____

  _____

  _____

  _____

  (type and amount of activity)

- for _____ minutes or

  _____ steps

- I am going to do this _____ days this week

- What strategies will you use to help make your goal a reality?

  _____

  _____

  _____

  _____

  _____

  _____

  _____

  _____

***Remember to record information in your activity log . You'll never know if you're improving unless you track your progress.**

Activity Promotion Lab

EAST CAROLINA UNIVERSITY

Promoting Active Lifestyles

East Carolina University

For more information on goal setting, check out these websites:

American Council of Exercise
www.acefitness.org

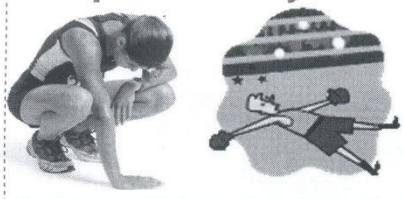
LiveStrong.com
http://www.livestrong.com

NC Eat Smart Move More Website
http://www.eatsmartmovemorenc.com

The President's Challenge
http://www.presidentschallenge.org

Telephone Physical Activity Study

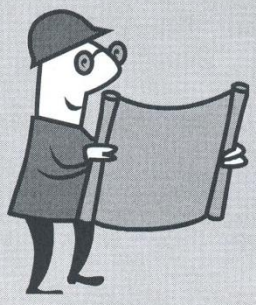
Weekly Newsletter
Volume 1, Issue 3



Overcoming your barriers

Roadblocks to Physical Activity

- No matter how much we want to change, many of us will experience roadblocks as we try to become more physically active
  - This means that some days we will feel something is standing in our way when we try to be active
- The first step in overcoming these barriers is finding out what your barriers are
- After you identify the barriers you'll have to come up with a plan to overcome them



Common Barriers and Common Solutions

- **Lack of time**
  - Reduce time spent with TV, video games, or computers.
  - Try to exercise in small 10 min. bouts
  - Do jumping jacks, pushups or sit ups while you watch TV
- **Lack of motivation**
  - Do it for 5 or 10 mins and see if you want to keep going after you finish that short period
  - Find a friend or family member to participate with you
- **Lack of skill**
  - Try activities that require little skill like walking, jogging, and dancing
  - Ask a friend to teach you a new activity
  - By continuing to be physically active, you will improve your skills and it will become easier
- **Lack of equipment**
  - Try activities that require little equipment
  - Ask a friend who has a equipment to participate with you or go to a YMCA
  - Find websites and free apps that provide workouts you can do at home
- **Too big to be active**
  - Everyone can be active no matter what size they are
  - Tyr walking or dancing
  - Start with 10 mins and slowly build up the time
- **Self-conscious about looks**
  - Try being active at your home with an exercise video or Wii game
  - Try exercising with supportive friends
  - Try doing activities that you feel comfortable participating in

MAKE A PLAN

- People who have a plan on how to overcome their obstacles have an easier time staying active compared to those who do not make a plan in advance.
- *Attack **one** barrier at a time! You don't want to become overwhelmed*

YOUR BARRIERS AND PLAN

Make a list of your barriers and under them develop a plan to help you overcome your barriers

1. Barrier:_____

   _____

   Plan:_____

   _____

   _____

   _____

2. Barrier: _____

   _____

   Plan:_____

   _____

   _____

   _____

3. Barrier:_____

   _____

   Plan:_____

   _____

   _____

   _____

***** Remember to record information in your activity log. You'll never know if you're improving unless you track your progress.***

Activity Promotion Lab

EAST CAROLINA UNIVERSITY

Promoting Active Lifestyles

East Carolina University

More information can be found at:
Centers for Disease Control and Prevention Website
http://www.cdc.gov/physicalactivity/everyone/getactive/barriers.html

Mayo Clinic
http://www.mayoclinic.com/health/fitness/smo0085_d

Free Apps:
Daily Workouts by Daniel Miller
Fit Quest Lite
Map My Run
My Fitness Pal
Nike Training Club

APPENDIX J

PHONE SCRIPTS

Week 2 Interview Questions:

1. Small talk suggestions:
    a. How are you doing?
    b. What did you do last week?
    c. How was wearing the pedometer/ recording in log book?
        i. If they had a hard time remembering to wear/record, ask them to think of a place they can put them so that they remember to wear and record information

2. Today we are doing to review your steps for the week and talk about goal setting. This call will last about 20 minutes
    a. Find out steps for each day
    b. Find out how did they do with their goal for last week
        i. Praise any success no matter how small (e.g. able to wear pedometer 1 day this week)

3. Review the components of goal setting (see newsletter issue 2)
    a. SMART: briefly go over the components and an example
    b. Importance of goal setting
        i. Give you something to work towards and motivation
        ii. Lets you see progress in a short period of time
        iii. Helps you get back on track if obstacles/barriers appear
        iv. Increases the likelihood of success
    c. Identifying SMART goal setting items
        i. How would you make this goal more specific?
            1. I'm going to do more physical activity/exercise.
                a. What type of PA would you do?
        ii. For the example that I give you how is the goal being measured (how do you know if the goal is met)?
            1. My goal is to get 10,000 steps on my pedometer 5 out of 7 days
        iii. Which example goal is action oriented?
            1. I'm going to play more basketball (pick an activity that the person likes) this week
            2. I'm going to basketball (pick an activity that the person likes) for 30 minutes 3 days this week
        iv. How would you make this goal more realistic?
            1. I'm going to walk 10 miles on Saturday?
            2. I'm going to play football for 15 hours on Saturday?
        v. Which example is the time frame set (what is the time frame)?
            1. I'm going to be able to swim more
            2. I'm going to be able to swim continuously for 30 minutes in 4 weeks

4. Goals (Based on how they did last week):
    a. What was easy for you to do (what worked)
        i. Why do you think you were able to do _____?
    b. What has hard for you to do (what didn't work)
        i. What was it about _____ that was hard for you?

ii. What would have made _____ easier?

c. What do you think would be a good goal for you this week?
   i. Frequency
   ii. Time/number of steps
d. OR What do you think you would be able to do this week?
   i. Frequency
   ii. Time/number of steps

- If they give values that are unrealistic try and get them to a realistic value
  - Example: 10,000 steps per day (baseline is 1,000) 5 days. Let them know that 30 minutes of activity (walking) is about 2,000 steps and have them figure out how much time they would need to be active. Then ask what would you do to get this many steps or meet this duration? Do you think you can do this amount every day for 5 days? What is more realistic?

5. Summary:
   a. You stated that you are going to [re-state the persons goal] _____?
   b. Remind them to wear pedometer every day and record in logbook
   c. We will talk again next week
      i. Verify phone numbers
      ii. Identify which number is best to call
      iii. Decided on a time and the day that is good for them to have the call
   d. End with some type of praise about what they have done with last week's goals and something good with the phone call

Other Useful Information:

- Try and make sure the child is in a place where distractions are low. If they are not; ask then to move to another room, turn off TV, video game etc.
- We want the child to come up with the goals and types of activities they will complete; your job is just to help guide them in this process, NOT provide them with answers.

Week 3 Interview Questions:

6. Small talk suggestions:
    a. How are you doing?
    b. What did you do last week?
    c. How was wearing the pedometer/ recording in log book?
        i. If they had a hard time remembering to wear/record, ask them to think of a place they can put them so that they remember to wear and record information

7. Today we are doing to review your steps for the week and talk about barriers and how to overcome them. This call will last about 20 minutes
    a. Find out steps for each day of minutes of PA depending on their goal
    b. Find out how did they do with their goal for last week
        i. Praise any success no matter how small

8. Barriers (see newsletter issue 3)
    a. While you are making very good progress and working very hard at increasing your physical activity levels to help you improve even more we need to find out what is still not working for you and making increasing physical activity hard.

       Once these things are identified we can start working on them

    b. Based on what they said earlier you can use reflective listening to re-state how things went
        i. Earlier you said that you had troubles _____. Why do you think you had trouble with doing _____?
        ii. What are some other things that are making physical activity (or meeting your goals) hard for you _____?
        iii. If they have many barriers find out which one or two are the biggest problems.
        iv. Or if those are too big for them to deal with find out which ones they think would be easier to work on

9. Barrier Solutions (see newsletter issue 3)
    a. Ok we have identified _____ barriers, but this week I want you to only work on one.
    b. Which one do would you be able work on? (review barriers identified if needed)
    c. Can you think of ways to overcome this barrier?
        i. If needed give 1 example solution and then see if they think that will work AND how they would implement that solution in their life.
        ii. See if they can think of another strategy
    d. On a scale of 1-10 where 1 is not at all and 10 is very confident how confident are you that you can _____ (whatever the barrier is or the solution given) ?
        i. If give a high value ask them why they gave that value instead of a lower number?
        ii. If they give a lower number ask them what would make them more confident to make this change?
        iii. Regardless of the score: what are some practical things you would need to do to achieve this goal? Follow-up if needed do any sound achievable?

10. Goals (Based on how they did last week):
    a. What do you think would be a good goal for you this week?
        i. Frequency
        ii. Time/number of steps
    b. OR What do you think you would be able to do this week?
        i. Frequency
        ii. Time/number of steps

- If they give values that are unrealistic try and get them to a realistic value
    - Example: 10,000 steps per day (baseline is 1,000) 5 days. Let them know that 30 minutes of activity (walking) is about 2,000 steps and have them figure out how much time they would need to be active. Then ask what would you do to get this many steps or meet this duration? Do you think you can do this amount every day for 5 days? What is more realistic?

11. Summary:
    a. You stated that you are going to [re-state the persons goal] _____?
    b. Remind them to wear pedometer every day and record in logbook
    c. We will talk again next week
        i. Verify phone numbers
        ii. Identify which number is best to call
        iii. Decided on a time and the day that is good for them to have the call
    d. End with some type of praise about what they have done with last week's goals and something good with the phone call

Other Useful Information:

- Try and make sure the child is in a place where distractions are low. If they are not; ask then to move to another room, turn off TV, video game etc.
- We want the child to come up with the goals and types of activities they will complete; your job is just to help guide them in this process, NOT provide them with answers.