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iCook 4-H: Report of Accelerometer Derived Physical Activity in 9-10 Year Old Children from Baseline, Post, and Follow-up

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iCOOK 4-H: REPORT OF ACCELEROMETER DERIVED PHYSICAL ACTIVITY IN 9-10 YEAR OLD CHILDREN FROM BASELINE, POST, AND FOLLOW-UP

BY

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This thesis is approved as a creditable and independent investigation by a candidate for the Master of Science in Nutrition, Exercise and Food Science degree and is acceptable for meeting the thesis requirements of this degree. Acceptance of this thesis does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

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ABSTRACT

iCOOK 4-H: REPORT OF ACCELEROMETER DERIVED PHYSICAL ACTIVITY IN 9-10 YEAR OLD CHILDREN FROM BASELINE, POST, AND FOLLOW-UP

CHASE MERFELD

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To examine the relationship between baseline, post, and follow-up accelerometer derived physical activity (PA) in 9-10 year old children participating in iCook 4-H, a 16-week, 5-state, randomized control family centered childhood obesity prevention program. This family focus intervention was designed to promote PA through lifestyle modifications. Between group differences in minutes-per-day and intensity of PA were determined on accelerometer compliant participants. All subjects wore an accelerometer (Actigraph GT3X+) for 7 days at baseline, post, and follow-up intervention assessment. Mean daily minutes of accelerometer derived sedentary time (ST) and PA including light (LPA), moderate (MPA), vigorous (VPA) and moderate-to-vigorous (MVPA) were evaluated during waking hours (7am-9pm). A multivariate test, Wilks' Lambda, was used to determine the between group differences of PA from baseline, post, and follow-up. Statistical significance was set at $p \leq 0.05$. There were no significant differences between groups due to the intervention at any intensity category of PA (mean min/day±SD; p-value). Although there was not a significant increase in any category of physical activity due to the lifestyle intervention, iCook 4-H was able to encourage participants to maintain current activity levels.

CHAPTER 1

INTRODUCTION

Over the past two decades childhood obesity has doubled in adolescence and tripled in teens.[1] Although the trend of childhood obesity has slowed and appears to be on the decline there are still a large amount of children who are overweight and obese.[1,2] According to Green et al. approximately 33.3% of children are overweight in the United States.[1] Unfortunately, children ages 6-11 have shown an increase in childhood obesity from 7% in 1980 to 18% in 2010. There is a need for early intervention for nutrition and physical activity, as obese children have a greater chance of becoming obese adults, which may lead to a lower quality of life.[3]

The effects of childhood obesity have long term consequences related to chronic diseases such as: cardiovascular disease, cancer; type 2 diabetes, sleep apnea, and hypertension. Glickman et al. predict one third of children will develop type 2 diabetes into adulthood due to childhood obesity.[3] Increased caloric intake, reduced physical activity, lack of family involvement, genetics, and environment contribute to these negative health consequences. These negative health consequences can be reduced by increasing the consumption of nutrient dense foods and physical activity.[4]

Atkin et al. recommend that children get a minimum of 60 minutes of physical activity per day.[5] Physical activity can decrease the risk factors of obesity. Physical activity has been associated with increased muscle mass, lower blood pressure, decrease development of type 2 diabetes, and decrease risk for heart disease. Physical activity is essential for a healthy lifestyle and prevention of chronic disease. Atkins et al. reported that children are spending a greater amount of their day in sedentary time.[5] At least 50 %

of children are not meeting the guidelines of 60 minutes per day of physical activity.[5] Sedentary time is defined as an activity in which a person expends a small amount of energy either lying down or sitting.[6]

In 2012, Guinhouya evaluated physical activity behaviors and reported children are increasing sedentary time such as video games and television, while lacking in moderate to vigorous activity.[7] According to the American Academy of Pediatrics children over the age of two should not spend more than two hours per day in sedentary time.[8] However, in a culture surrounded by social media and television, children are spending a great deal more than two hours per day in sedentary time.[8] According to Wethington et al. children ages 8-18 are spending approximately 12 hours per day in front of a television or media including: video games, internet, and movies. The amount of time children are spending in sedentary behavior is increasing.

There is a need for childhood programing to reduce sedentary time and reinforce a healthier diet. Increasing physical activity behavior and healthy dietary choices of children, may decrease development of chronic diseases associated with obesity.[9] In order for children to make a change in their dietary patterns and physical activity, parental involvement is needed. A study conducted in the United Kingdom showed that with an effective 12 week program focusing on nutrition and physical activity can greatly improve the lifestyles of children when parents are involved.[10]

To improve the health behaviors of 9-10 year old children iCook 4-H, a randomized control study being conducted by five states, South Dakota, Nebraska, Maine, Tennessee, and West Virginia, was developed. The purpose of this study is to determine whether a 12-week family orientated cooking and physical activity program

will reduce sedentary timer in children ages 9-10. We aim to increase family involvement through family meal time and show the importance of physical activity. With this in mind, we hypothesize that the iCook 4-H program will reduce sedentary time in children ages 9-10 years old.

Statement of the problem

With obesity rates tripling in the past three decades and sedentary behavior increasing, the need for family orientated classes has been greatly increased.

Significance of the Study

It is obvious that childhood obesity has become a problem not only in the United States, but around the world. Focusing on family orientated programs that target childhood obesity may be beneficial in the future. By reducing childhood obesity, health consequences such as cardiovascular disease, type 2 diabetes, and hypertension can be decreased into adulthood. The iCook 4-H Intervention Program focuses on physical activity and family centered meal times to help increase knowledge of nutrition and the importance of being physically active.

Variables

1. Independent Variables
    a. Nutrition and physical activity classes-12 week intervention vs. control group
2. Dependent Variables
    a. Sedentary time- decrease in sedentary time due to the iCook-4H Food and Fitness Study
    b. Block Physical Activity Screener Tool - self-reporting of physical activity

c. Accelerometer output- measurement of physical activity over a course of 7 days

Limitations

1. Seasonal variability
2. Accelerometer use- children may increase physical activity while wearing accelerometers
3. EFNEP population- limited recruiting area and eligibility
4. Convenience sample
5. Participants have to have internet access at home to be active on the iCook 4-H website

Delimitations

1. Population- focusing on only 9-10 year old children
2. Multi state Study
3. Intervention group vs. control group
4. Training on accelerometers for campus coordinators and assistants
5. Participants must be free from any food allergies
6. Free from and physical or medical limitations restricting participation
7. Instruments- accelerometers are the only tool being utilized to measure physical activity directly
8. Block Physical Activity Screener Tool- measuring self-reported physical activity.

Assumptions

1. Children will not increase their physical activity while wearing the accelerometers
2. Accelerometers will actually measure physical activity

3. Children will self-report honestly and accurately from the block tool
4. Assume they will participate and show up to 6 sessions
5. Complete study from beginning to end

Definition of Terms

1. Accelerometers- measuring levels of physical activity over an extended period of time[11]
2. Childhood overweight/obesity- excess amount of body fat, children over the 85th and 95th percentile[12,13]
3. Sedentary time- activities that require little to no energy expenditure[6]

Research Hypothesis

Aim 1: We hypothesize that iCook 4-H Program will decrease sedentary behavior in children ages 9-10 compared to that of the control group as measured accelerometers.

Aim 2: We hypothesize that participants in the iCook 4-H program that self-report a higher quality of life will correlate with higher levels of measured physical activity with accelerometers.

CHAPTER 2

LITERATURE REVIEW

A review of literature was conducted to understand the need for childhood obesity interventions while describing the current trends and impacts of obesity. The literature focuses on several key components of childhood obesity such as: understanding the impact and trends of childhood obesity, physical activity and sedentary patterns in children, the best way to measure physical activity in children, physical activity programs defining sedentary behavior, and how family orientated intervention focusing on nutrition and physical activity help build a healthier environment.

Childhood Obesity

The Center for Disease Prevention (CDC) defines childhood overweight and obesity using body mass index as a standard. Children are defined as overweight if they are above the 85th percentile and obese if they are above the 95th percentile on the CDC growth charts.[3] Historically, heavier children were recognized as being healthy; however, today's understanding of childhood obesity has drastically changed and evidence has shown that childhood obesity leads to increase risk of a large range of chronic diseases.[14] With the dramatic increase in childhood obesity in the United States and developing countries over the past three decades, today's children will be the first generation to not outlive their parents.[9] Childhood obesity awareness emerged in the mid-1990s.[3] Since that time statistics have shown that childhood obesity has tripled over the past three decades, and over 33.3% of children are at risk for obesity in the United States.[12] Research provided by Demattia and Denney found that approximately 17% of children, in the United States, have a body mass index above the 95 percentile labeling them

obese.[12] Glickman et al. have found that the prevalence of overweight and obesity in children ages 2-19 was as high as 32% in boys and 31% in girls.[3] Although the importance of controlling and decreasing the prevalence of childhood obesity has been recognized, there are still a large amount of children who are overweight and obese.[4] Children who are obese are more likely to be obese as adults, leading to a wide range of health consequences.[4]

Negative Health Consequences: Childhood obesity has been associated with chronic disease and lower quality of life in childhood and into adulthood.[3] Chronic diseases such as sleep apnea, hypertension, liver disease, and type 2 diabetes have been linked with a shorter lifespan for obese children.[3,12] Type 2 diabetes will have dire effects on obese children, and at least one third of all children will develop type 2 diabetes in their life time.[3] Physical, psychosocial, emotional, and social functions are significantly lowered in obese children compared to their normal weight peers. Glickman et al. found that lowered quality of life is five and a half times greater in obese children.[3] High rates of childhood obesity is associated with lowered physical activity and increased energy intake which contribute to the increase risk of chronic diseases.[3]

Factors Predisposing Children to Obesity: Obesity is defined by a greater intake of calories and a lower energy expenditure.[15] The predictors of childhood obesity are associated with many factors: caloric intake (energy input and output), environment, genetics, as well as physiological and psychological aspects.[15] Caloric intake has been affected by increasing portion sizes, lower cost for processed foods, taste, and availability.[3,5,15] We are seeing an increase in the availability of energy dense foods at a lower cost with higher portion sizes. Today's diets contain more fat than those of our

ancestors and significantly less fiber.[15] In a study taken from Ali At reported that people are consuming as much as 37.8% of energy from fat, more than the recommended less than 30%.[15] The traditional family meal setting has all but been eliminated in today's culture. Fewer families are eating together, which is contributing to unhealthy food choices and increased caloric intake.[5] Children who regularly eat fast food or outside the home have a tendency to consume increased saturated fats and sodium and decreased amounts of vitamins and minerals.[5] Another factor influencing childhood obesity is low-socioeconomic status of families. Low socioeconomic families tend to have a higher body mass index (BMI) than their middle or high socioeconomic counter parts.[15,16] Children from low socioeconomic families are at greater risk for becoming obese adults.[16] Low socioeconomic families may also have little to no access to healthier foods defining them as food insecure.[15] Genetic factors can also predispose children to obesity. More and more research is being done to understand how genetics play a role in obesity. Research has found that at least 300 genes, markers, and chromosomes can be related back to obesity.[15] It has also been estimated that between 30-70% of variance in BMI can be related back to genetics.[15] Along the lines of environment and genetic factors, psychological factors can also have a profound impact on childhood obesity. People tend to have negative eating patterns when dealing with stress and emotions.[15] Depression and other neurological disorders can also impact a child's eating habits causing them to overeat.[15] Although there are many factors that predispose children to obesity that can be moderated by a change in behavior such as increase physical activity and a decrease sedentary behavior.[7,17]

Physical Activity in Children

Healthier lifestyle habits can significantly reduce chronic diseases associated with obesity. Healthy eating and physical activity are essential in the development and growth of children.[1,9] Physical activity maintains metabolic function and helps prevent chronic diseases associated with obesity.[9] Physical activity has been defined by Glickman and colleagues as additional energy expenditure caused by movement or an activity requiring skeletal muscles.[3]

Physical Activity Guidelines: Currently children are not meeting the recommendations of physical activity.[3,18-20] Children need at least 60 minutes a day of moderate to vigorous physical activity in order to reduce the risk of chronic disease and maintain a healthy lifestyle.[3,7] Schuna et al. found that approximately 42% of children between the ages of 6-11 are not meeting the requirements for physical activity.[18] Moderate to vigorous physical activity allows children to attain the positive health effects that come from exercise such as increased energy expenditure, muscle and bone development, skill enhancement, reduction in stress, and improved self-esteem.[21] Increasing physical activity and decreasing the amount of sedentary behavior in children will assist in declining the current trends of childhood obesity. Programs focusing on nutrition and physical activity need to be incorporated early into childhood to prevent children becoming obese as adults.[4] With low levels of moderate and vigorous levels of physical activity children need to adhere to the guidelines of 60 minutes per day to help combat childhood obesity.[7]

Benefits of Physical Activity: Since today's youth are becoming more inactive there is an increased risk for negative health consequences such as cardiovascular disease

and diabetes.[3] Routine physical activity has been shown to protect against the negative health consequences associated with obesity.[22] Physical activity has been shown to improve body composition by lowering a person's BMI. Enhanced lipid profiles, improved glucose homeostasis and insulin sensitivity and reduction in blood pressure have all been shown as a positive in routine physical activity.[22] Children who participate in 60 minutes or more of moderate to vigorous activity have been shown to increase physical fitness, bone health, cardiovascular and metabolic function, as well as decrease body fat, anxiety, and depression.[3]

Sedentary Behavior in Children

The lack of physical activity and an increase in sedentary behaviors such as: video games, social media, and television, trends of childhood obesity have significantly risen.[3] This rise of childhood obesity has been shown to have a direct effect on the sudden decrease in physical activity among children and increase in sedentary behavior.[3] Colley et al. have defined sedentary behavior as an activity that requires low amounts of energy such as sitting or reclining.[11] The American Academy of Pediatrics recommended that children over the age of 2 should not spend more than 2 hours per day in sedentary time.[8] Between the ages of 8-18 years children spend approximately 7.5 hours per day in sedentary time, far more than 2 hours per day.[8] According to Wethington et al., the majority of sedentary time is spent, approximately 4.5 hours, watching television.[8] Excessive sedentary time has been associated with increased health risks.[11] Colley et al. found that sedentary time increased waist circumference and body mass index in boys and girls between the ages of 6-14 years.[11]

Measuring Physical Activity & Sedentary Behavior in Children

To avoid excess amounts of screen time physical activity and sedentary time must be measured to determine an intervention. The measurement of physical activity and sedentary behavior is an essential part of learning the underlying causes of childhood obesity and to help researchers understand the effectiveness of interventions.[23]

Subjectively Measured: Self reporting, or subjective research, has the ability to capture data from a large population at low cost.[23] Whereas objective measures tend to be more expensive.[23] By using self-reported data from a 2007 National Survey of Children's Health (NSCH), Wethington et al. were able to determine physical activity in youth using a series of questions. For example, "During the past week, on how many days did you exercise, play a sport, or participate in moderate to vigorous activity for at least 20 minutes?" By using a series of survey questions, Wething et al. found that children ages 6-11 were engaging in 20.8% more screen time, far more than 2 hours per day. Self-reported data can add a separate perspective to evaluating physical activity; however, can be unreliable due to failure of participants to reall their physical activity and sedentary behaviors.

Objectively Measured: To measure physical activity in children accurately, direct observation is the best method.[9] Accelerometers are the golden standard used when measuring physical activity and have been a method of direct observation. Accelerometers are able to provide valid results, and objective measures of sedentary time and physical activity.[9,19] Gortmaker et al. study physical activity in children using a curriculum called Food and Fun after School.[20] With the use of accelerometers Gortmaker and colleagues were able to measure approximately 200 children and compared the intervention group to a control group.[20] To show significant differences

between the intervention group and control group baseline data was collected as well and post data. Gortmaker et al. found that the intervention group increased counts per minute by 76 and increased 10.5 minutes per day of physical activity compared to that of the control group.[20] This measurement, using accelerometers, was able to illustrate that children in the intervention group were increasing their physical activity and making improvements towards reaching 60 minutes per day of physical activity compared to the baseline data.[20]

Physical Activity Programs

Compared to other studies the iCook 4-H program was not directed specifically to physical activity nor was as it as intense as other programs. One method of increasing physical activity in children is through intramural sports offered in the school setting. Schools are the ideal spot for children to increase their physical activity and decreasing sedentary behaviors.[24] According to the 2006 Shape of the Nation Report: Status of Physical Education in the USA showed that only 45% of secondary schools offered intramural sports.[24] In a study conducted by Fuller et al., they wanted to examine the relationship between the availability of intramural sports and higher levels of physical activity. By utilizing the Weekly Activity Checklist survey they were able to determine that children increased their moderate-to-vigorous physical activity with availability of intramural sports. Their results show that when you offer extracurricular activities, such as intramural sports, within school may be a method to allow children to live more physically active lifestyles.[24]

In another study called CHANGE!, Children's Health Activity and Nutrition: Get Educated, they offered physical activity and nutritional education to promote a healthy

weight through teacher delivered curriculums within the school. The CHANGE! curriculum consisted for 20 weekly lesson plans, where teachers utilized homework, classroom discussion, and educational videos.[25] Throughout the project Fairclough et al. found that the CHANGE! intervention was able to positively influence body size outcomes as well as increase light physical activity.[25] Similar to the iCook 4-H program, the CHANGE! Curriculum did not offer long periods of one on one guidance of physical activity and weren't able to see significant increases in higher levels of physical activity.

The Dyad Component (Parent & Child)

Parents provide the basic needs of life for their children such as availability of appropriate nutrition and the opportunity to be physically active.[26] Children are dependent on these aspects of life to support optimal health, growth, and development.[5] Parents and caregivers need to realize that they are considered "agents of change". Parents have the power to enhance their children's lifestyle, act as role models, increase physical activity, and develop healthy eating habits.[9] Encouraging interventions to focus on family intervention will promote a healthy eating and physically active environment in the home.[9] Wen Xu et al. examined the behaviors associated with parenting styles and if children replicated their parents habits.[27] Parenting style was defined as parents own behaviors being expressed toward the child.[27] Through survey comparison they found that parent's behaviors, in the area of physical activity and eating habits, directly related to their child's resulting in weight problems and sedentary behaviors.[27]

The Gift of Health Program was a 4-week intervention study designed to help parents and children identify life habits and events that influence the way they eat and are physically active.[26] By using an event history calendar, a self-reported journal of eating

and physical activity patterns, Danford and colleagues were able to link family habits to barriers that they face in order to live a healthier lifestyle.[26] The barriers found by the Gift of Health Program included: constant need for reevaluation of what the family as a whole is eating, the lack to time due to busy schedules, and interruptions of routines.[26] The importance of family intervention to increase nutrient dense foods and physical activity is essential to modify children's behaviors.[28]

Summary

With increasing energy intake and physical inactivity childhood obesity has tripled in the past three decades.[1] The National Center of Health Statistics have found that obese children 6-11 years of age have increased dramatically in obesity by 11% since the 1980s.[1] Although the trend of childhood obesity has plateaued there are still a large amount of children who are overweight and obese.[1] Childhood obesity has been associated with increased risk for chronic diseases such as hypertension, type 2 diabetes, and liver disease.[3] Glickman et al found that at least one third of children will develop type 2 diabetes in their lifetime.[3] Along with negative health consequences effecting children, childhood obesity can affect the physical, emotional, and social well-being of a child.[3] Healthier lifestyle rituals can reduce chronic diseases associated with childhood obesity. Healthy eating and physical activity are crucial to development, growth of a child, and decrease mortality and morbidity.[9] Physical inactivity and increased sedentary behaviors in children have been shown to correlate with the increase of obesity. Sedentary behavior has been defined as low amounts of energy such as sitting or reclining.[11] Guidelines in place for physical activity in children recommend that at least 60 minutes per day is required to maintain a healthy lifestyle.[3,7] Schuna et al. found that

46% of children, between the ages of 6-11, are not meeting the recommendations of 60 minutes per day of physical activity. To account for the amount of time children are sedentary and physically active, motion detectors such as accelerometers and pedometers are used. Through direct observation, accelerometers are used to measure duration, frequency, and intensity of physical activity.[9] The sudden rise in childhood obesity has shown to have a direct effect on the amount of time children spend in sedentary behaviors such as: video games, computers, or television. Programs focusing on reducing sedentary time and healthy nutrition in children are essential to decrease childhood obesity.

Researchers have concluded that with early intervention and family support, children are able to increase physical activity and nutrient dense food intake.[12] By educating children and parents/caregivers about the importance of physical activity and the food environment will assist with behavioral change.[3] Parents are able to provide basic needs of life for their children such as the availability of nutrition and opportunities to be physically active.[26] Children are dependent on their parents to help support these aspects of life to maintain health and support growth and development.[5] Hills et al. have encouraged parents to be "agents of change" for their children.[9] Parents have the power to enhance their children's health and physical activity and act as role models.[9] In order to modify behavior in children, family interventions that prioritize physical activity and nutrient dense foods need to be implemented.[28]

CHAPTER 3-MANUSCRIPT

Introduction

Although the upward trend of childhood obesity has slowed and appears to be on the decline in young children, there are still approximately 33.3% of children who are overweight in the United States[1,2] and childhood obesity in 6-11 year olds increased from 7% in 1980 to 18% in 2010. There is a need for early prevention focused on nutrition and physical activity, as obese children have a greater chance of becoming obese adults, which may lead to a lower quality of life and a multitude of negative health outcomes.[3]

The effects of childhood obesity have long term consequences related to chronic diseases such as: cardiovascular disease, cancer; type 2 diabetes, sleep apnea, and hypertension. NEED REF Glickman et al. predict one third of children will develop type 2 diabetes later during adulthood due to childhood obesity.[3] Increased caloric intake, reduced physical activity, lack of family involvement, genetics, and environment contribute to the development of childhood obesity. NEED REF These negative health consequences can be reduced by increasing the consumption of nutrient dense foods and physical activity.[4]

Schuna et al. recommends that children ages 5-17 get a minimum of 60 minutes of physical activity per day.[5,18] The center for disease control defines physical activity as any bodily movement that produces a contraction of the skeletal muscle which than increases energy expenditure.[2] Physical activity has been associated with increased muscle mass and lower blood pressure levels and can decrease risk factors for obesity, development of type 2 diabetes, and heart disease risk.[29] Physical activity is essential for a healthy lifestyle and prevention of chronic disease. Jerrett et al. found that 42% of

children ages 8-10 are not meeting the guidelines of 60 minutes per day of physical activity[30] and Atkins et al. reported that children are spending a greater amount of their day in sedentary time.[5] Sedentary time is defined as an activity in which a person expends a small amount of energy either lying or sitting down.[6]

In 2012, Guinhouya evaluated physical activity behaviors and reported children are increasing sedentary time in the form of playing video games and watching television, while lacking in moderate to vigorous activity.[7] According to the American Academy of Pediatrics children over the age of two should not spend more than two hours per day in sedentary time.[8] However, in a culture surrounded by social media and television, most children are spending a great deal more than two hours per day in sedentary time.[8] According to Wethington et al. children ages 8-18 are spending approximately 7.5 hours per day in front of a television or media including: video games, internet, and movies.

There is need for programs that reduce sedentary time and reinforce a healthier diet for children. Increasing physical activity behavior and healthy dietary choices of children, may decrease development of chronic diseases associated with obesity.[9] Parental involvement has been found to help children to make a change in their dietary patterns and physical activity.. REF Researchers in the United Kingdom showed that children's lifestyles were greatly improved when parents were involved in a12 week program, focused on nutrition and physical activity.[10]

To improve the health behavior of 9-10 year old children, a randomized control study, iCook 4-H, was developed and conducted by researchers in five states, South Dakota, Nebraska, Maine, Tennessee, and West Virginia. The objective of this study was

to increase moderate-to-vigorous activity and decrease sedentary time in children ages 9-10 through a family-centered intervention cooking curriculum.

Methods

Study Design

iCook 4-H was a randomized control-treatment study for children 9-10 years of age and their adult main food preparer recruited from each state and assessments at 0 (baseline), 4 (post), and 12 months (follow-up)A community-based participatory approach was used across the participating states to include researchers, Cooperative Extension faculty and community members..

Participants and Recruitment

Family dyads composed of 9-10 year old youth and their primary food preparer (parent/caregiver) participated in the study. The adults provided consents in accordance with the policy statements of Institutional Review Boards for the Protection of Human Subjects at each participating university. The youth participated in the review of the consent form with the adult and provided verbal assent.

Children were eligible if they were nine years old before classes started in September 2013, and did not turn 11 years old before December 31, 2013. They were to be free from life threatening illness or conditions, food allergies and/or activity-related medical restrictions that would prevent participation in a face-to-face nutrition and fitness program, willing to eat meat and dairy, and have regular access to a computer with Internet.

A variety of methods were used to recruit youth and their primary meal preparer. Potential participants were recruited through flyers distributed throughout communities at youth-oriented organizations and clubs, schools, town halls, churches, pediatrician offices and groceries, home school, 4-H and other Extension e-mail listservs, demonstrations at fairs and day camps, and news releases and other media outlets. Recruiting was targeted for ethnic diversity among rural, low-income communities to meet the need for obesity prevention in those populations. Recruited adults received phone calls from researchers to confirm study eligibility, review the consent form, and set appointment time for assessments. Dyads were randomized to two treatment and one control stratified by state.

Educational Intervention

The iCook 4-H program was a 12-week family-centered intervention focusing on obesity prevention through improving culinary skills, reinforcing family meal time, and increasing physical activity. The iCook 4-H curriculum was developed from two 4-H programs, Fast Foods[31] and Youth in Motion[32]. The curriculum focused on the importance of family meal time, communication, cooking skills, goal setting and a physical activity portion following the 4-H motto "Learn by Doing." Classes were divided into six sessions each 2 hours in length, from September 2013 through December 2013. Goal setting was included at the end of each session and dyads were encouraged to set goals for cooking, family meal time, and physical activity. Leaders encouraged youth to set goals to meet the physical activity guidelines of 60 minutes of moderate-to-vigorous physical activity each day. Physical activity lessons focused on the benefits and basic knowledge to enhance movement through family interactions of daily living. Topics for each lesson are listed in Table 1. 15-20 minutes of each session was devoted to the PA

components. Leaders were provided with short videos on the physical activity topic and led each physical activity component.

At baseline youth were provided a video camera to document culinary skill and physical activity development to share videos and pictures they created at home on the iCook 4-H website. All youth were encouraged to upload one video per week emphasizing skills learned in the earlier session. Children were instructed to record demonstrations of activities learned in class and practiced and demonstrated at home. The iCook 4-H website allowed children to interact with other participants within the five states creating an online blogging community.

Assessments

Anthropometric: Height and weight were assessed at 0, 4, and 12 months by trained researchers per standard protocols. Each measurement was taken twice with the average recorded for each. Weight was determined to the nearest 0.1kg using a SECA digital scale. A SECA 213 Portable Stadiometer was used to assess height to the nearest 0.1cm. All instruments were calibrated prior to each assessment.

Physical Activity: Block Physical Activity Screener tool (BKPAS) was administered to all children to assess self-reported physical activity over the previous seven days. BKPAS is a validated survey tool for children 8-17 years of age.[33] The BKPAS provides mean daily minutes of moderate, vigorous, and recreational physical activity.

The first 124 participants (Treatment= 93, Control= 31) also wore accelerometers for 7 days at each assessment. Accelerometers (ActiGraph GT3X+), an objective tool, were used to determine the physical activity levels collecting data over a seven day

period. Accelerometers were initialized using the ActiLife 5 Data Analysis Software to accumulate raw acceleration data at a sample rate of 30 hertz. Participants were fitted with the devices on an elastic belt above the right hip and given instructions for wearing the devices (excluding bathing, swimming, and sleeping). Researchers collected the accelerometers on the 7th day.[34] Compliance criteria required children to wear the accelerometers for at least three valid week days and one valid weekend day. A valid day consisted of 10 hours of wear time during the set waking hours of 7am-9pm. Non-wear time was defined as at least 60 repeated minutes of zero activity counts. Average minutes of sedentary time (ST), light physical activity (LPA), moderate physical activity (MPA), vigorous physical activity (VPA), and moderate-to-vigorous physical activity (MVPA) per day were calculated using age specific cut-off points that were linearly scaled to accommodate 10 second epochs.[34]

Quality of Life: Quality of life was assessed using the Pediatric Quality of Life Survey (PedsQL) survey, which consisted of 23 self-reported questions assessing for Physical (8 questions), Emotional (5 questions), Social (5 questions), and School (5 questions) Functioning Scores.[35] Physical Functioning Score queried for difficulty in walking, running, sports activities, bathing, chores, and if you have low energy or ache. Emotional Functioning Score queried for feelings of afraid, sad, angry, trouble sleeping, and worrying about the future. Social Functioning Score queried for getting along with others, asking about friendships, teasing, can do things other children can do, and keeping up with playing with other children. School Functioning Score queried for paying attention in class, forgetting things, keeping up with schoolwork, and missing school due to doctor visits and not feeling well. Response choices were never=0, almost never=1,

sometimes=2, often=3, and almost always=4.[35] Responses were reversed coded and scaled as follows 0=100; 1=75 2=50, 3=25 and 4= 0. [35] The total quality of life score was created by summing the scores of each questions and dividing by the total number of questions, twenty-three. A psychosocial health summary score was computed using the mean of questions for the emotional, social, and school constructs divided by 15. For the purposes of this paper, quality of life was reported on participants who wore accelerometers.

Data Analysis

Descriptive statistics were calculated for each variable at baseline, post, and follow-up. Data were presented as mean ± SD. Repeated measures of variance, with a post hoc Wilks Lambda, was used to determine significance in BKPAS and accelerometer derived physical activity at three different time points (baseline, post, and follow-up) using IBM SPSS 22. Associations between physical activity variables and Quality of Life variables were assessed using Spearman Correlation Coefficient. Statistical significance was set at $p \leq 0.05$.

Results

For the iCook 4-H intervention 228 parent-child dyads were recruited to participate, 150 treatment and 78 control. Age and anthropometric measurements were analyzed in Table 2. All children were between the ages of 9-10 with 71% being White, 11% African Americans, 6% Asian, and 3% Native American.

Block Physical Activity Screen was measured in 228 children at baseline. Accounting for missing data, 130 participants completed the BKPAS from pre to post, and 102 at follow-up. Three categories of physical activity were measured using the

Block survey tool; moderate, vigorous and recreational physical activity. There was no significant difference between groups at baseline, post, and follow-up at any of the physical intensity categories at any time point (Table 3).

Physical activity was objectively measured in 124 children at baseline, 84 children at post, and 51 children at follow-up using accelerometers at each assessment. Forty children met the accelerometer compliance standards of 3 weekdays and 1 weekend day at all three time points. There was no significant difference between groups at baseline, post, and follow-up neither block and accelerometer measured physical activity levels (Table 3).

Total quality of life was positively correlated with accelerometer derived MPA, VPA, and MVPA. Physical Functioning Score was positively correlated with LPA, MPA, VPA, and MVPA and negatively correlated with ST. Emotional Functioning Score was positively associated with VPA and MVPA. No correlation was found with Social Functioning Score construct. School Functioning Score was positively associated with MPA, VPA, and MVPA. The created construct, Psychosocial Health Sore, was positively correlated with VPA and MVPA (Table 4). Quality of life and physical activity was analyzed at post and follow-up, and no associations were found.

Discussion

The objective of this study was to increase moderate-to-vigorous activity and decrease sedentary time in children ages 9-10 through a family-centered intervention cooking curriculum. There was no effect due to the intervention on physical activity or sedentary time. Although we did not see a change in PA or ST, the iCook 4-H program was not designed to be strictly a physical activity program. iCook 4-H was designed to

increase culinary skills, family meal times, and physical activity through a family-oriented, lifestyles approach . Compared to other studies (ref), the physical activity component of the iCook 4-H program did not include a prescriptive component for physical activity. The focus was on family togetherness and encouraging fun activities during this time.

Interventions that have shown significant increases in physical activity included activities such as intramural sports, after school programs, and structured guidance. Schools are the ideal location for children to increase their physical activity and decrease sedentary time.[24] According to the 2006 Shape of the Nation Report: Status of Physical Education in the USA, only 45% of secondary schools offered intramural sports.[24] In a study conducted by Fuller et al., examining the relationship between the availability of intramural sports and higher levels of physical activity, demonstrated that children increased their moderate-to-vigorous physical activity with availability of intramural sports. Their results support extracurricular activities, such as intramural sports, within school may be a method to allow children to live more physically active lifestyles.[24] Another study conducted by Kriemler at el. utilized structured guidance from a trained leader to increase PA and decrease fat composition. The program included three of the physical education routines already in place for the children, but added an additional two sessions per week, daily short activity breaks, and physical activity homework.[36] The control group only had structured physical activity three times a week, without the extra sessions, daily activity breaks, and homework. Kriemler and colleagues were able to see a decrease in fat composition between both control and intervention groups. There was also an increase in aerobic fitness and moderate-to-vigorous activity with the intervention

group compared to the control group. This multi-component physical activity education program was sufficient to increase physical activity in children and lower body fat composition.[36] Kriemler's study introduced children to a variety of strategies to which children can relate to, which in turn made the program enjoyable.[36] School programs and one-on-one education/guidance have been shown to increase moderate-to-vigorous physical activity in children to reach the recommendations of 60 minutes per day. These methods are time intensive and often require trained personnel to deliver physical activity programming.

Others have explored methods to increase physical activity and decrease sedentary time through activities of daily living. The CHANGE!, Children's Health Activity and Nutrition: Get Educated,. offered physical activity and nutritional education to promote a healthy weight through teacher delivered curriculums within the school.[25] The CHANGE! curriculum consisted for 20 weekly lesson plans, where teachers utilized homework, classroom discussion, and educational videos.[25] Throughout the project they found that the CHANGE! intervention was able to positively influence body size outcomes as well as increase light physical activity.[25] Similar to the iCook 4-H program, the CHANGE! curriculum did not offer long periods of one on one guidance of physical activity and were not able to see significant increases in higher levels of physical activity.

Although we did not see a significant change in MVPA and ST in iCook 4-H, there was a correlation between physical activity and quality of life measures at baseline of the iCook 4-H program. It is well established that increasing ones physical activity has positive health benefits such as decreasing risk of cardiovascular disease, stroke, cancer, and risk for diabetes.[37] It has been reported in previous studies that increasing physical

activity results in a decrease in stigmatization of children from discrimination, stress, and bullying, which leads to a higher quality of life.[37]As shown in other studies that have utilized quality of life surveys, physical activity was shown to correlate with higher levels of quality of life. Gopinath et al. utilized a health related quality of life survey to measure how physical activity impacted their quality of life, similar to iCook 4-H. They found that frequent physical activity was associated with better health-related quality of life in adolescents.[38] In contrast, they found that children who spent more time in sedentary time, such as screen time, had lower health-related quality of life scores.[38] In a study called LOGIC, Long-Term Effects of a Lifestyle Intervention in Obesity and Genetic Influence in Children, Rank and colleagues measured the effects of physical activity on quality of life and body composition over a 4-6 week weight-loss program.[39] Similar to iCook 4-H, the LOGIC program was able to see a correlation between physical activity and higher levels of quality of life. Since physical activity and quality of life are correlated there is a need to incorporate physical activity in a child's daily life.

Conclusion

Physical activity, if associated with healthful eating behavior, can positively impact children's health.[40] Increasing physical activity can help prevent chronic diseases such as cancer, stroke, and Type 2 diabetes.[7,40] Children should have several opportunities to be physically active throughout the week and year round.[40] Allowing children to be physically active early in life may be an encouraging factor to becoming active adults.[40] Children are dependent on adult caregivers to provide knowledge and guidance in healthy lifestyles.[9] The iCook 4-H program was a multi-component program

that emphasized the need for parent/caregiver involvement and focused on increasing physical activity through daily living and goal setting.

APPENDICES

Appendix A: Consent & Assent Forms

- *Treatment-Consent Form:*

Consent Form

Thank you for your interest in the iCook Project, which is a 4-H program and a research study. Kendra Kattelmann and her team at South Dakota State University, including Cooperative Extension staff, are studying health and fitness of children between 9-10 years old and the adult in their home who makes most of the food. To participate, you and your child must be free from food allergies and/or activity-related medical restriction that would prevent participation in a face-to-face food, nutrition and fitness program. We want to study you and your child over 2 years to help understand the impact of physical growth, nutrition and physical activity on health and fitness.

The purpose is to study how to help children make choices about what they eat and how physically active they are so that they will grow strong and have healthy lives.

You will be part of a 5-state study about children's nutrition and physical health. The four other researchers are at the University of Maine, the University of Nebraska, University of Tennessee, and West Virginia University.

There will be 6 cooking classes every other week from August through November. Each cooking session will take about 2 hours and will take place at the Sioux Falls Extension office. In addition to the cooking sessions, you will be asked to participate in other activities that will be primarily online thorough an educational community for parents and children. The project will last for 2 years so that eating habits and physical activity can be assessed long term to see their impact on health and fitness.

What Will You Be Asked to Do?

You will be asked to have your blood pressure measured and complete a 30-minute online survey at the start of the program, and then at 4 months, 12 months and 24 months.

Sample questions for the online survey are:

- How often do you compare prices before you buy food?
- How concerned are you about your child eating too much when you are not around him or her?
- During the past 30 days, for how many days have you felt very healthy and full of energy?
- I worry about what will happen to me.

You will be asked to visit the program website regularly, at least once per week during the fall sessions, and help upload videos your child has made about cooking, being physically active and eating as a family. You will be given a login and password for security.

You will be asked to be assessed in August and November of this year and then in August of 2014 and August of 2015 to complete the 2 year study. At each assessment period we will ask you to take the 30 minute survey and have your blood pressure measured.

What will your child be asked to do?

Your child will be asked to complete a 50 minute assessment that includes 30 minutes for an online survey and 20 minutes for physical assessments (e.g. height, weight, waist circumference; blood pressure). Your child will be asked to pick the outline of a girl's/boy's body that looks most like she/he does. The reason for this assessment is because children often grow and mature very quickly between 9-10 years old and we want to measure that growth. The body outline question will be asked by an older female researcher or a male researcher for boys and a female researcher for girls. Assessments will be at the start of the program, and then at 4 months, 12 months, and 24 months.

Sample questions for the online survey your child will be asked are:

- During the past week, how many days did you eat breakfast?
- I can follow a recipe by myself (answer from agree to disagree)
- I worry about what will happen to me (answer from never to almost always)

In addition your child will be asked to make and share video clips with camera equipment provided by the program staff about themselves and your family cooking, eating, and being active together. These videos will be hosted on a private YouTube channel and will only be accessible to other people participating in the project.

During the 2-year period, your child may be asked to wear a waistband that contains an activity monitor for a week each time physical assessments are taken. This device records your child's activity (e.g., step and movement during day and night).

What will both of us be asked to do?

For the first twelve weeks you and your child will be asked to participate in 2-hour cooking sessions every other week with your child. Between sessions you and your child will be asked to cook together, participate in family meals, and be physically active.

Following the first twelve weeks, you and your child will be asked to participate for 22 months in an online community website that is developed just for this study. The website will have educational sections designed for both the adult and the child. You will be able to interact with your peer group in forums moderated by program staff. Your child will also be able to continue creating and sharing videos. Online activities can be done from home or anywhere you have an Internet connection. The site is mobile friendly.

Benefits to Participation

You will gain knowledge and experience to improve culinary skills, child feeding practices, family meal times, and physical activity. Your family's participation in this study may lead to better understanding of the role of nutrition and fitness in childhood obesity.

Risks to Participation

There is minimal risk to participating in the study, primarily due to time and inconvenience. Normal kitchen risk is possible.

Compensation

You and your child will receive $10.00 each time you complete the assessments for a total of $80.

Program Resources

You will receive $10 each time you come to one of the six cooking sessions for a total of $60. Your child will receive a video camera to shoot the requested videos on family activities around cooking, mealtime and recreation. This camera will be the child's to keep.

Confidentiality

All information that is provided is confidential and protected. All data collected will be kept on the researcher's password protected computer and in South Dakota State

University, Nutrition Assessment Lab, for up to four years and then destroyed. Paper copies will be filed in locked cabinets. Not identifiable information will be stored indefinitely in an electronic version accessible to the researchers who are part of the 5-state study.

Website data collection and educational intervention will be password protected. Your contact information will be requested for payment purposes and for contacting you for follow up assessments. This information will be destroyed once you are paid at the end of the study. All data will be reported in summary format and no names will be used.

Voluntary

Participation in this study is voluntary. If you choose to take part in this study, you may stop at any time. If you choose to stop you will only receive incentives for the assessments and program activities that you have completed.

Contact Information

Contact Kendra Kattelmann and Celine Kabala for questions about the research project at 605-688-4045, at South Dakota State University. For questions about your rights as a study participant, contact the SDSU Research Compliance Coordinator at 605-688-6975, SDSU.IRB@sdstate.edu

Your signature below indicates that you have read, understand the above information, and that you agree that you and your child will participate in the iCook-4H Research Program. You will receive a copy of this form for your records.

_____

_____

Printed Name Signature

_____

Date

_____

Your child's first and last name

- *Treatment-Assent Form*

Subject ID #: _____

iCook 4-H Assent Form

My name is Chase Merfeld. I am trying to learn about cooking, family meals and being physically active. If you would like, you can be in my study which is called iCook-4-H.

If you want to be in my project, your parent or guardian will have to say it is okay and that they agree to be in the project, too. iCook starts with you and your parent cooking together. There are 6 classes this fall. There is a survey on the Internet that will take about 20 minutes. We will ask questions like "How many fruits do you eat each day?" You will be measured 4 times over the next 2 years. We will measure your height, weight, waist and blood pressure which will take about 10 minutes. We will also ask you to look at an outline of a girl's/boy's body showing how bodies change as we grow and have you pick the one that looks most like you.

You will get a video camera to keep and make videos of you and your family cooking, eating and playing together. We will ask you to go to a safe website to share the videos with other children and parents in iCook. We will ask you to go to the website at least once a week to see the fun activities that will be there.

I will keep information you give me private. I will put it together with things I learn about other children, so no one can tell what things came from you. When I tell other people about my study, no one can tell who I am talking about because I will not use your name.

Your parents or guardian have to say it's OK for you to be in the project. After they decide, you get to choose if you want to do it too. If you don't want to be in the project, no one will be mad at you. If you want to be in the study now and change your mind later, that's OK. You can stop at any time. If you are part of this project we will give you $10 each time we measure you. Your parents will also get $10 each time you do because they will be doing the same kinds of activities as you for this project.

My telephone number is 605-688-6199. You can call me if you have questions about the study or if you decide you don't want to be in the study any more. You can also email me at celine.kabala2@sdstate.edu
I will give you a copy of this form in case you want to ask questions later.

- *Control-Consent Form*

Consent Form

Thank you for your interest in the iCook Project, which is a 4-H program and a research study. Kendra Kattelmann and her research team at South Dakota State University, including Cooperative Extension staff, are studying health and fitness of children between 9-10 years old and the adult in their home who makes most of the food. To participate, you and your child must be free from food allergies and/or activity-related medical restriction that would prevent participation in a face-to-face food, nutrition and fitness program. We want to study you and your child over 2 years to help understand the impact of nutrition and physical activity on health and fitness.

The purpose is to study how to help children make choices about what they eat and how physically active they are so that they will grow strong and have healthy lives.

You will be part of a 5-state study about children's nutrition and physical health. The four other researchers are at the University of Maine, the University of Nebraska, University of Tennessee, and West Virginia University. We want to study you and your child over 2 years to help understand the impact of physical growth, nutrition and physical activity on health and fitness.

What Will You Be Asked to Do?

You will be asked to have your blood pressure measured and complete a 30-minute online survey at the start of the program, and then at 4 months, 12 months and 24 months.

Sample questions for the online survey are:

- How often do you compare prices before you buy food?
- How concerned are you about your child eating too much when you are not around him or her?
- During the past 30 days, for how many days have you felt very healthy and full of energy?
- I worry about what will happen to me

What will your child be asked to do?

Your child will be asked to complete a 50 minute assessment that includes 30 minutes for an online survey and 20 minutes for physical assessments (e.g. height, weight, waist circumference; blood pressure). Your child will be asked to pick the outline of a girl's/boy's body that looks most like she/he does. The reason for this assessment is because children often grow and mature very quickly between 9-10 years old and we want to measure that growth. The body outline question will be asked by an older female researcher or a male researcher for boys and a female researcher for girls. Assessments will be at the start of the program, and then at 4 months, 12 months, and 24 months.

Sample questions for the online survey your child will be asked are:

- During the past week, how many days did you eat breakfast?
- I can follow a recipe by myself (answer from agree to disagree)
- I worry about what will happen to me (answer from never to almost always)

During the 2-year period, your child may be asked to wear a waistband that contains an activity monitor for a week each time physical assessments are taken. This device records your child's activity (e.g., step and movement during day and night).

Benefits to Participation

We will provide you and your child with your blood pressure assessment in writing within a month of each assessment period. Your family's participation in this study may lead to better understanding of the role of nutrition and fitness in childhood obesity.

Risks to Participation

There is minimal risk to participating in the study, primarily due to time and inconvenience.

Compensation

You and your child will receive $10.00 each time you complete the assessments for a total of $80.

Confidentiality

All information that is provided is confidential and protected. All data collected will be kept on the researcher's password protected computer and in South Dakota State University, Nutrition Education and Behavior Laboratory, for up to four years and then destroyed. Not identifiable information will be stored indefinitely in an electronic version accessible to the researchers who are part of the 5-state study.

Your contact information will be requested for payment purposes and for contacting you for follow up assessments. This information will be destroyed once you are paid

at the end of the study. All data will be reported in summary format and no names will be used.

Voluntary

Participation in this study is voluntary. If you choose to take part in this study, you may stop at any time. If you choose to stop you will only receive incentives for the assessments that you have completed.

Contact Information

Contact Kendra Kattelmann and Celine Kabala for questions about the research project at 605-688-4045, at South Dakota State University. For questions about your rights as a study participant, contact the SDSU Research Compliance Coordinator at 605-688-6975, SDSU.IRB@sdstate.edu

Your signature below indicates that you have read, understand the above information, and that you agree that you and your child will participate in the iCook-4H Research Program. You will receive a copy of this form for your records.

_____

_____

Printed Name Signature

_____

Date

_____

Your child's first and last name

- *Control-Assent Form*

Subject ID #: _____

iCook 4-H

Assent Form

My name is Celine Kabala. I am trying to learn about cooking, family meals and being physically active. If you would like, you can be in my study which is called iCook-4-H.

If you want to be in my project, your parent or guardian will have to say it is okay and that they agree to be in the project, too. You will be measured 4 times over the next 2 years. We will measure your height, weight, waist and blood pressure which will take about 10 minutes. We will also ask you to look at an outline of a girl's/boy's body showing how bodies change as we grow and have you pick the one that looks most like you. There is a survey on the Internet that will take about 20 minutes. We will ask questions like "How many fruits do you eat each day?"

I will keep information you give me private. I will put it together with things I learn about other children, so no one can tell what things came from you. When I tell other people about my study, no one can tell who I am talking about because I will not use your name.

Your parents or guardian have to say it's OK for you to be in the project. After they decide, you get to choose if you want to do it too. If you don't want to be in the project, no one will be mad at you. If you want to be in the study now and change your mind later, that's OK. You can stop at any time. If you are part of this project we will give you $10 each time we measure you. Your parents will also get $10 each time you do because they will be doing the same kinds of activities as you for this project.

My telephone number is 605-688-6199. You can call me if you have questions about the study or if you decide you don't want to be in the study any more. You can also email me at celine.kabala2@sdstate.edu

I will give you a copy of this form in case you want to ask questions later.

Appendix B: Recruitment Protocols & Flyer

- *Recruitment Protocols*

Protocols for Campus Coordinators (CC)

* The term CC has been used through this section, however any trained researcher can use these protocols.

Randomization

Dyads (n=200; double recruitment to ensure a sample size of 100 dyads) will be recruited in each state with recruitment numbers based on location of program delivery (See Table 1 for example). After each state has completely finished recruitment of 200 dyads, the campus coordinator will randomize participants into treatment and control groups using geographical cluster randomization. Using geographical cluster randomization will ensure that each cluster has an equal number of treatment and control participants.

Table 1: Randomization Template for Maine

Geographic Location Clusters	Number of Programs and Participants		Random Number Lists Generated
	Treatment	Control	
Orono – Umaine Campus	4 X 6= 24 dyads	24 dyads	2 lists of 48[a]
Hampden	2 X 7 = 14 dyads	14 dyads	2 lists of 28[b]
Ellsworth	2 X 6 = 12 dyads	12 dyads	2 lists of 24[c]
Total	50 dyads	50 dyads	

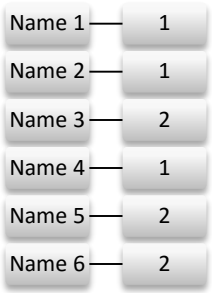
[a ,b, c]: label the first random number list you print as A. You will use this list to start your randomization. The second printed list will be labeled as B and will be used only if you don't fill your treatment and control quota using the first list.

Using a random number generator (http://www.random.org/integers/) create and label the number lists. On the generation site enter the number of participants by cluster (integers to be created); each integer value will be between 1 and 2 (1=treatment, 2=control). Campus coordinators will list all dyads by cluster and using the random numbers list, assign a name to each number in the order the numbers are listed. Figure 1 provides an example of this process.

As participants are called for prescreening (Script and Form found in Study Manual Page) they will be informed if they are in treatment or control. If a participant is screened ineligible, or does not want to participate, the campus coordinator will document the reason (Form in Study Manual: Page) will continue down the list as set forth until 50 treatment dyads and 50 control dyads have been prescreened with appointments for assessment.

Recruited dyads that were not used to complete the study quota should be called and informed that the study is full. This action should not be completed until every effort has been made to fulfill the 50 treatment and 50 control dyads. The study will be considered closed regardless of quota after August 23, 2013.

Figure 1: Sample Names Matched to Random Number List



Registration Phone Call

Once the 4H staff provide names and contact information for recruits, the CC will call them and review the informed consent, confirm interest, and make an appointment for the parent and child to be (physical and online). (Refer to following Scripts)

Script for Campus Coordinator. Use when calling the name of a potential participant, given to the campus coordinator by the Extension Recruiter. (Participant Contact and Appointment Sheet Appendix R)

**NOTE: Before starting this call all participants should already be randomly assigned using the randomization protocols.

Name of recruit_____

Hello, _____. My name is name from the University name and I am working with Extension partner and she/he told me that you are interested in the iCook-4H project. Is this a good time to talk to you about the project. If not, when would be a good time to call again.

_____enter time for another call.

If yes, continue.

Would you prefer to participate in the Orono or Ellsworth area?

_____ (put on google drive randomization list as appropriate before going further)

Just confirming, our requirements for the project. (must check yes for each item)

YES

_____ you are at least 18

_____your child is between 9-10

_____you prepare most of the family meals

_____you have a computer at home with Internet

_____eat meat and dairy

_____you can participate in iCook activities between Late August and Thanksgiving

If no to any of the above, say, I am sorry but you are not eligible for our study. Thank you for your interest in our work. Good-bye

Continue if meet eligibility.

iCook is a 4-H program and also a research project to study how to help kids make better choices about what they eat and how physically active they are to strengthen their growth and development so they will have healthful lifestyles now and in the future.

For Treatment Participants

You have been randomly chosen to participate in iCook Classes. The unique aspect is that it is designed for both the child and the parent to participate together. You will be able to cook and take some food home. The focus is on being active together through cooking and eating as a family and having fun together. Your child will be given a video camera during the project to make cooking show videos of their home activities to upload on our study website. The program will start in September and last until Thanksgiving. The classes will be 2 hours long, every other week.

Because it is a study, we are asking you and your child to complete some questionnaires, about health habits and cooking skills and your child to have physical measurements taken at the beginning and end of the project. We will have you come back in August of 2014 and 2015 to complete the same surveys. We may also ask your child to wear a monitor to measure physical activity for 1 week during the study. You and your child will each get $10. In addition, you will get $10 at each session you attend. The total amount is $140.

iCook is not only about cooking and having fun with your child, you will also be helping us because there are 4H groups in 5 states all working together to learn more about helping our children be smart in the kitchen, physically strong and have healthy, active lifestyles.

Would you like to sign up for iCook and make an appointment for the assessments and schedule your class days?

_____ yes _____no

Use schedule on google drive to schedule appointment day/time.

Month	**Ali**		**Felicia**		**Deb**		**Kendra**	
	Tuesday	*Thursday*	*Tuesday*	*Thursday*	*Wednesday*	*Tuesday*	*Saturday*	*Saturday*
	Class 5:00-7:00 UMaine	Class 5:00-7:00 UMaine	Class 4:00-6:00 UMaine	Class 4:00-6:00 UMaine	Class 4:00-6:00 Hancock office	Class 3:30-5:30 Eastbrooke	Class 9:30-11:30 UMaine	Class 9:30-11:30 UMaine
	Date of the Month							
Aug	20	22	27	29	21	27	24	31
Sept	3,17	5,19	10,24	12,26	4,18	10,24	7,21	14,28
Oct	1,15,29	3,17,7	8,22	10,24	2,16,30	8,22	5,19	12,26
Nov			5	7		5	2	9

Here is your scheduled time _____

Would you rather be called or emailed the day before as a reminder?

Enter contact_____

For Control Participants

You have been randomly chosen to participate in the survey and anthropometric measures. We are asking you and your child to complete some questionnaires, about health habits and cooking skills and your child to have physical measurements taken at the beginning and end of the project. We will have you come back in August of 2014 and 2015 to complete the same surveys. We may also ask your child to wear a monitor to measure physical activity for 1 week during the study. You and your child will each get $10 every time you take an assessment. For the total project you will each get $40.

Would you like to sign up for iCook and make an appointment for the assessments?

_____ yes _____no

Here is your scheduled time _____.

Would you rather be called or emailed the day before as a reminder?

Enter contact_____

After the registration phone call, the campus coordinator will create an account on the website for the participants. In this set up a username will be assigned. Please use the following style for creating usernames: First Initial Last Name State Number if needed (i.e. dmathewsme or dmathewsme1). More details will be explained.

Script for Campus Coordinator Program has met Participant Quota: 2013 Study

My name is name and I am calling because of your interest in the iCook-4H program. I would like to thank you for your interest, but at this time the program is full. I would be glad to give your contact information to our Extension staff for other 4H programming if you would like.

- *Flyer*

Are you 9 or 10 years old?

You are invited to be in the iCook 4-H Food & Fitness Study

It's about eating well and being physically active so you grow strong and healthy

Still Recruiting!

Starting in September
Do not have to be a current 4-H member
9 & 10 year old youth and meal preparing adult
Receive $80 over a 2 year period

Some families will have the opportunity to attend cooking classes this fall. All families will have blood pressure taken and complete surveys and youth will have physical measurements taken 4 times over the next 2 years.

To participate, youth and adults will need to:

- Be free from food allergies and/or activity-related medical restrictions that would prevent you being in a face-to-face food and fitness program
- Eat meat and dairy, as vegetarian options may not be available in the food and fitness program.
- Have access to computer at home or library with Internet

Space is limited! Call (605) 367-7877 or (605) 688-6199 if interested!

Appendix C: Data Form & Protocols for Assessments

- *Data Form*

Adult Name: **Website username:** **Subject ID:** **Child Name:** **Website username:** **Subject ID:**		**Gender: (circle) Male Female** **Gender: (circle) Male Female**
Adult Birthdate (mo/day/year) **Child Birthdate (mo/day/year)**	**Home Address:**	**Child Year in School: (circle)** **First Second Third Fourth Fifth**
Daytime Phone:	**Cell Phone:**	**Email Address:**
Best Way to Contact: ☐ Email ☐ Day Phone ☐ Cell Phone ☐ Other, Please Specify		

	Baseline (Fall 2013)	**Post Test (Winter 2013)**	**12-M (August 2014)**	**24-M (August 2015)**
Compensation Given	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Researcher Initials				
Did the Participant Complete				
Consent	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Survey	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Photo Release	☐ Yes ☐ No			
Liability Form	☐ Yes ☐ No			

Child **Child ID:**	**Baseline (Fall 2013)** **#1**	**#2**	**AVG**	**Post Test (Winter 2013)** **#1**	**#2**	**AVG**
Height (cm)						
Weight (kg)						
Waist Circumference (cm)						
Blood Pressure (mm/Hg)						
Blood Pressure Arm (left or right)						
Blood Pressure Staging (use chart)						
Tanner Staging	**Upper:** **Lower:**			**Upper:** **Lower:**		
Comments						

*Enter these data on www.icook4h.com website
**Round off the average of the two official measurements to two decimal places

	Baseline (Fall 2013)	**Follow-Up (Winter 2013)**
Did the Participant Complete		
Survey	☐ Yes ☐ No	☐ Yes ☐ No
Anthropometrics	☐ Yes ☐ No	☐ Yes ☐ No
Tanner	☐ Yes ☐ No	☐ Yes ☐ No
Accelerometer Accelerometer ID Accelerometer Returned	☐ Yes ☐ No ☐ Yes ☐ No	☐ Yes ☐ No ☐ Yes ☐ No

Child **Child ID:**	**12-Month (August 2014)** **#1**	**#2**	**AVG**	**24-Month (August 2015)** **#1**	**#2**	**AVG**
Height (cm)						
Weight (kg)						
Waist Circumference (cm)						
Blood Pressure (mm/Hg)						
Blood Pressure Arm (left or right)						
Blood Pressure Staging (use chart)						
Tanner Staging	**Upper:** **Lower:**			**Upper:** **Lower:**		
Comments						

*Enter these data on www.icook4h.com website
**Round off the average of the two official measurements to two decimal places

	12-M (August 2014)	**24-M (August 2015)**
Did the Participant Complete		
Survey	☐ Yes ☐ No	☐ Yes ☐ No
Anthropometrics	☐ Yes ☐ No	☐ Yes ☐ No
Tanner	☐ Yes ☐ No	☐ Yes ☐ No
Accelerometer Accelerometer ID Accelerometer Returned	☐ Yes ☐ No ☐ Yes ☐ No	☐ Yes ☐ No ☐ Yes ☐ No

Adult **Adult ID:**	**Baseline (Fall 2013)** **#1**	**#2**	**AVG**	**Follow-Up (Winter 2013)** **#1**	**#2**	**AVG**
Blood Pressure (mm/Hg)						
Blood Pressure Arm (left or right)						
Blood Pressure Staging (use chart)						
Concerns for Error						

*Enter these data on www.icook4h.com website
**Round off the average of the two official measurements to two decimal places

	Baseline (Fall 2013)	**Follow-Up (Winter 2013)**
Did the Participant Complete		
Survey	☐ Yes ☐ No	☐ Yes ☐ No
Blood Pressure	☐ Yes ☐ No	☐ Yes ☐ No

Adult **Adult ID:**	**12-Month (August 2014)** **#1**	**#2**	**AVG**	**24-Month (August 2015)** **#1**	**#2**	**AVG**
Blood Pressure (mm/Hg)						
Blood Pressure Arm (left or right)						
Blood Pressure Staging (use chart)						
Concerns for Error						

*Enter these data on www.icook4h.com website
**Round off the average of the two official measurements to two decimal places

	12-M (August 2014)	**24-M (August 2015)**
Did the Participant Complete		
Survey	☐ Yes ☐ No	☐ Yes ☐ No
Blood Pressure	☐ Yes ☐ No	☐ Yes ☐ No

- *Anthropometric Measurement Protocols*

Responsibility of Site Primary Investigators

- Site PIs are ultimately responsible for ensuring that assessment protocols described in this manual are followed precisely.
- Proper training of all those who will conduct the assessments is required.
- The site PI is responsible for calculating the inter-rater reliability for all assessors at the site after training and before measurements start.

General Study Procedures

- All scales must be calibrated prior to use and calibrated periodically during measurement.
- Each anthropometric measurement must be taken at least twice and recorded immediately (consider having a recorder available to facilitate this process and reduce errors).
- Each measurement must be entered into the online database. It is recommended that this be done either during or at the end of each day of measurement.
- An independent observer must verify that the data recorded on the NRI data recording sheet (Appendix) and the data recorded in the Excel database are the same. This observer should initial both copies, verifying that the data are correct. Corrections need to be noted under comments.
- Be mindful of the units of measurement used. For example, if the balance beam scale has both metric and English measures, assessors must be clear about which notch on the beam goes with which type of measure—metric should be used.
- All height and weight data must be reported in metric units: centimeters and kilograms, respectively. Waist circumference will be recorded in centimeters.

Weight Assessment

Body weight is the most common anthropometric measurement used, and has the advantages that it is safe, non-invasive, and inexpensive. Weight measurement is easy to train to unskilled people, and weight reflects past changes and assesses growth and can be used to identify malnutrition. Weight should be the 1st assessment conducted during the assessment appointment.

Required Item(s) for Weight Assessment

- Digital scale
- Standardized weights for calibration
- Stool or chair to allow participant to remove shoes and socks
- Extra t-shirts and shorts available, if needed
- Nearby restroom facilities

Figure 1. Digital Scale

Important Notes

- Due to natural weight fluctuations that occur during the day, it is desirable to weigh the participant at the same time of day (within 2 hours) for each assessment.
- To measure weight accurately, scales should be recalibrated on a regular basis and each time a scale is moved to a different location. Please review your scale manual for proper calibration techniques or contact an appropriate representative.
- The current recommendations for taking weight are to have the participant facing away from the balance beam or digital readout to reduce panicking and moving their hands and body.
- Educate your staff about the importance of not commenting on the participant's weight and not responding if the participant does comment. Staff can say, for example, "thank you for helping us with this measurement."
- **Please ensure the same scale is used for all weight measurements.**

Weight Assessment Protocol

1. Zero the scale. Balance beam scales must be level prior to weighing the participant. The scale must be on a hard, flat surface, not on carpet.
2. Ask participants to empty their bladder prior to being weighed. This is required of all participants.
3. Ask participants to remove excess clothing, shoes, and socks prior to being weighed.
4. Ask the participant step up onto scale fully. Staff must make sure that both feet are completely on the scale (See Figure 3).

Figure 2. Feet placement on scale.

5. Ask the participant stand completely still with arms at sides and eyes looking straight ahead.
6. Record weight to the nearest 0.1 kg on the data collection sheet.
7. Repeat measurement. If there is > 0.2 kg difference between measurements, repeat until two measurements are within 0.2 kg. These two agreeing measurements will be the official measurements.
8. Record all measurements on NRI data collection sheet. Be sure to cross out any unofficial measurements (i.e. those discarded due to excess disagreement).
9. Record the average of the two official measurements to two decimal places (e.g., 0.2 + 0.3 = 0.5/2=0.25).

Height Assessment

The measurement of height is also one of the most fundamental and easily obtained measurements. It is measured using a wall-mounted stadiometer, assuming the person is able to stand unassisted. Height should be the 2nd assessment conducted during the assessment appointment.

Required Item(s) for Height Assessment

- SECA 213 Portable Stadiometer
- Step stool or chair

Important Notes

- Be sure that the stadiometer is located in a non-carpeted area.
- For obese participants, it can sometimes be difficult to have four points of contact with the vertical backboard or wall (see Step 4 below). In this case, it is important to have as many contact points as possible (at least two), making sure the subject is looking straight ahead.

Height Assessment Protocol

1. Ask the participant to remove shoes.
2. Ask the participant to remove hair ornaments, buns, or barrettes that prevent the participant from placing his/her head against the back of the stadiometer.
3. Ask the participant to step completely under the slide of the stadiometer, making sure that the subject is centered with the stadiometer.

4. Ask the participant to stand as straight as possible with feet together and heels, buttock, shoulder blades, and back of head completely touching the wall (or as much as possible). This four-point contact will ensure that body weight is evenly distributed.
5. Be sure that the subject is looking straight ahead and that there is a horizontal plane from the bony socket of the eye to the notch above the projection of the ear (Frankfurt Plane; see Figure 3).
6. Make sure the black stopper at the top of the stadiometer is pressed against the wall. (Figure 4: Stadiometer setup)

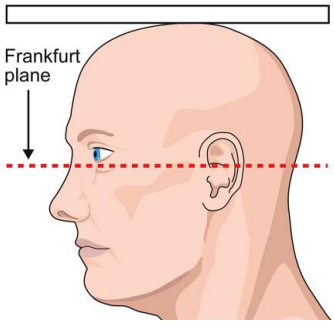


Figure 3: Frankfurt Plane

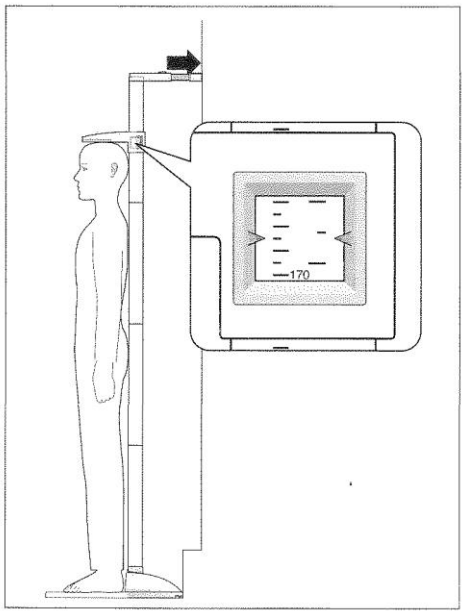


Figure 4: Stadiometer setup

7. Ask the participant to take a deep breath in and hold it to straighten the spine and standardize measurement.
8. Fix the height slide in place and ask the participant to resume normal breathing.
9. Record height to the nearest 0.1 centimeter on the data collection sheet. Be sure to avoid parallax (angular distortion) by bending down, kneeling, or standing on a stool and reading the height value at eye level.
10. Repeat measurement. If there is > 0.2 centimeter difference between measurements, repeat until two measurements are within 0.2 centimeter. These two agreeing measurements will be the official measurements.

Figure 3. Frankfurt Plane.

11. Record all measurements on the data collection sheet. Be sure to cross out any unofficial measurements (i.e. those discarded due to excess disagreement).
12. Record the average of the two official measurements to two decimal places (e.g., 0.2 + 0.3 = 0.5/2=0.25).

Waist Circumference Assessment

A person's waist circumference is the most practical indicator of fat distribution and abdominal fat. It is often used in combination with BMI in the assessment of obesity. Waist Circumference should be the 3rd assessment to be conducted during the assessment appointment.

Required Item(s) for Waist Circumference Assessment

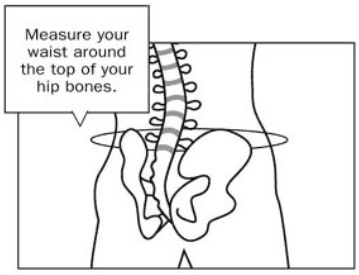
- Gulick tape measure
- Washable marker

Important Notes

- Measurement of waist circumference may be uncomfortable to some individuals because they are exposing their bellies. Be sure measurements are conducted in a relatively private or screened-off area.
- Two people should work together to take this measurement, if possible, to ensure the tape is in a level horizontal plane and not twisted. A mirror or two corner mirrors are useful in making sure the tape is level.
- If an individual has a large abdominal fat mass, this measurement can be difficult. You must palpate the hip area until you feel the iliac crest.

Waist Circumference Assessment Protocol

1. Ask the participant to adjust his/her shorts or pants to a level just below the top of the hip bones and to raise his/her shirt to just above the umbilicus (belly button).
2. Locate and mark *both* iliac crests with a non-permanent marker. The iliac crests are the tops of the hip bones (see Figure 6).



mference at the iliac
st.

3. Place the tape measure around the waist of the participant at the level of the marked iliac crests making sure that the tape is in a horizontal plane and not twisted.
4. Ask the participant to exhale to ensure that they are not holding in their belly.
5. Upon the exhale, gently tighten the tape without compressing the skin.
6. Record the measurement to the nearest 0.1 cm on the data collection sheet.
7. Repeat measurement. If there is > 0.5 cm difference between measurements, repeat until two measurements are within 0.5 cm. These two agreeing measurements will be the official measurements.
8. Record all measurements on the data collection sheet. Be sure to cross out any unofficial measurements (i.e. those discarded due to excess disagreement).

9. Record the average of the two official measurements to one decimal place (e.g., 2 + 3 = 5/2=2.5).

Tanner Staging Assessment

Tanner staging maturation level will be completed in a private setting. A line drawing of male anatomy is shown to males and a line drawing of female anatomy will be shown to females. The child points at the appropriate stage of maturation and the iCook-4H study team will document the response on a data collection form. This survey is required to appropriately classify the child when reporting maturation level and for determining correlations with the child's physical measurement and blood pressure.

Tanner Staging Assessment

Tanner staging maturation level will be completed in a private setting. A line drawing of male anatomy is shown to males and a line drawing of female anatomy will be shown to females. The child points at the appropriate stage of maturation and the iCook-4H study team will document the response on a data collection form. Male researchers will ask male children and female researchers will ask female children. If this is not possible, an older female researcher will ask the question. This survey is required to appropriately classify the child when reporting maturation level and for determining correlations with the child's physical measurement and blood pressure.

Blood Pressure Assessment

Blood pressure should be the 4rd assessment to be conducted during the assessment appointment.

Important Information

This procedure needs to take place in a relatively quiet location. The participant should be as still as possible during the readings.

Required Item(s) for Blood Pressure Assessment

1. 2 Omron HEM 907 XL Intellisense Prof. Digital BP monitor

Blood Pressure Assessment Protocol

1. Child should be sitting with arm resting on the table at heart level.
2. Avoid placing the cuff over clothing or a rolled up sleeve that might constrict the arm.
3. Make sure the cuff is the appropriated size
    a. Cuff width should be ½ to 2/3 the upper arm length.
4. Palpate for the brachial artery pulse point
    a. Found in the antecubital space on the little finger side of the palme-up extended arm.
    b. Gently hyperextending the arm might make this easier to find.
5. Center the bladder over the brachial artery with the lowest egdge 2.5 cm above the antecubital space.
6. Obtain palpated systolic pressure and at 30 mmHg

7. Deflate rapidly and wait 30 seconds before reinflating
8. Apply bell head making a light but airtight seal over the palpable artery. The diaphragm end may be adequate, but the bell is preferable and may help block ambient noise.
9. Inflate rapidly to level determined in step 6.
10. Release pressure 2-3 mmHg/sec. (slowly).
11. Listen for onset of 2 consecutive beats, Korotkoff Phase 1, = systolic pressure.
12. Listen for the absence of sound, Korotkoff Phase 5, = diastolic pressure.
13. Deflate cuff and remove. Record reading.

References:
Lohman TG, Roche AF, Martorell R. Anthropometric Standardization Reference Manual. Champaign, IL: Human Kinetics Books, 1988.

Body Mass Index (BMI)

BMI is an index used as a screening tool to help determine an individual's risk for health problems related to too little or too much body fat. It is a mathematical calculation of the ratio between height and weight and is not a direct measure of body fat. The index is the same for men and women. Note that baseline BMI < 18.5 is an exclusionary criterion for this study.

Table

BMI	Risk for Health Problems
< 18.5	Increased risk
18.5 - 24.9	Lowest risk
25.0 - 29.9	Low risk unless waist circumference is high which slightly elevates risk
30 - 39.9	Increased risk
> 40.0	Higher risk

If BMI is below 18.5 or above 30, one may be at increased risk for health related problems. BMI below 18.5 can be indicative of malnutrition due to low calorie and protein intake, which results in low body muscle and fat (please note that persons with BMI < 18.5 are not eligible to participate in the study). BMI above 30 may increase risk for developing conditions such as diabetes and high cholesterol. A high BMI is not necessarily indicative of risk for individuals with a lot of muscle mass, such as athletes because BMI will reflect muscularity rather than fatness for these individuals.

Waist Circumference

BMI is just one indicator of potential health risks associated with being overweight or obese. The National Heart, Lung, and Blood Institute guidelines also recommend measuring waist circumference because abdominal fat is an independent predictor of risk for obesity-related diseases.

Waist circumference is a common measure used to assess fat around one's waist (abdomen). The presence of excess body fat within the abdomen is considered a risk factor for health problems like diabetes. There are different waist circumference risk cut-points for men and women (see

table below). Dietary patterns including whole grains, fruits, and vegetables and physically activity are recommended to minimize health risk.

Sex	Waist Circumference
Male	>102 cm (40 meteres)
Female	>88 cm (35 meteres)

Interobserver Error Procedure

Purpose

To assess the degree of variation due to measurement error

Requirements

- At least 5 subjects to be measured
- One expert
- One or more observers
- Data record sheets (example in Appendix)
- Excel file "Height", "Weight", and "Waist"

Procedure

1. The expert and all the observers measure height, weight, and waist circumference of all the subjects twice.
2. Record the data immediately on data collection sheet
3. Enter the data into the Excel worksheet "Measurement" (it will automatically calculate the Pearson's correlations between expert and observers, and the error in the worksheet "Evaluation" in the same Excel file).

Statistical note (Lohman, 1981):

xi = measures by expert (average of three measurements)
yi = measures by observer 1 (average of three measurements)
X = mean of xi
Y = mean of yi
Sx = Standard deviation of expert
Sy = Standard deviation of observer 1

$$\text{Peason's } r = \frac{\Sigma(xi - x)(yi - y)}{(n-1)(Sx)(Sy)}$$

$$\text{Spooled} = \frac{\sqrt{[(Sx)^2 + (Sy)^2]}}{\sqrt{2}}$$

$$\text{Inter observer error} = \frac{S_{pooled}\sqrt{(1 - r^2)}}{\sqrt{2}}$$

Evaluation

Pearson's r ranges from –1 to +1. The closer the Pearson's r to 1, the higher the correlation of the observer's measurement with the expert's.

Inter-observer error tells how an observer's measurements differ from an expert's. The unit of inter-observer error is the same as the measurement (inch for height, pound for weight, and centimeter for waist circumference).

- *Physical Activity Protocols*
  - *Block Survey Example*

- *Accelerometer Protocols*

Preparation

1. Labeling your accelerometers
    a. Each research site location: please use the following numbers for labeling your accelerometers and identifying your subjects.
        i. Maine: 11001-11125
        ii. Nebraska: 21001-21125
        iii. Tennessee: 41001-41125
        iv. West Virginia: 51001-51125
        v. South Dakota: 31001-31125
        Subject's ID number should be the same as their blocks ID number
            1. Create an Excel spreadsheet to keep track of all this information (Subject's name, accelerometer number/subject ID number, accelerometer serial number)
    b. Arrow indicating correct positioning of accelerometer
    c. Contact Information
2. Schedule drop off of accelerometers
    a. Educate subjects
3. Strategies to Optimize Compliance
    a. Informational Handout
    b. Activity log
    c. Reminder flyers
    d. Reminder phone calls and/or texts
    e. Communication with parents
4. Schedule pick up of accelerometers
    a. Good communication with site coordinator

Initializing & Downloading Instructions for GT3X+ (ME, NE, TN, SD)
Initialization Instructions

1. Plug in the accelerometers you want to initialize into the USB ports on the hub.
2. Open ActiLife software
    a. Select the devices you want to initialize
        i. To initialize all the devices plugged in, click the top box in the heading row
            1. **Tip: I would do 1 at a time to eliminate error**
        ii. To only initialize specific devices from those plugged in, click the boxes corresponding with those specific device's rows
    b. Click "Initialize"
3. In "Initialize Devices" pop up window:
    a. Set Sample Rate at 30 Hz.
    b. Do not click the boxes to activate the Flash LED during delay mode or Flash LED during data collection
        i. If these boxes already have checks in them, uncheck to deactivate them
    c. Set your Start Date and Start Time
        i. **Tip: Having a calendar handy makes this process much easier when setting start/stop date/times.**
            1. Start Date and Start Time should be set to begin at 12:00am midnight on the day AFTER you fit your subject with the belt.
                a. **Tip: If you hand out and fit subjects on Wednesday, July 17th, Start Date and Start Time would be Thursday, July 18th at 12:00am midnight.**
    d. Check the box to use a Stop Time.
    e. Set the Stop Date and Stop Time
            1. Stop Date and Stop Time should be set so that you're recording 7 FULL days of data.
                a. **Tip: If you set your Start Date and Start Time for Thursday, July 18th at 12:00am midnight, your Stop Date and Stop Time would be Thursday, July 25th at 12:00am midnight.**
    f. Click "Enter Subject Info"
        i. **Maine: 11001-11125**
        ii. **Nebraska: 21001-21125**
        iii. **Tennessee: 41001-41125**

   iv. **West Virginia: 51001-51125**
   v. **South Dakota: 31001-31125**

4. In the "Enter Subject Information" pop up window:
   a. Enter the numbers you have assigned each accelerometer or subject into the Subject Name column to correspond with the device's serial number.
      i. **Tip: this should be the same ID number as their blocks ID number**
   b. All other columns can be left blank.
   c. Click "Initialize All"
5. In the main ActiLife screen, check the progress of initialization
   a. In the status column, the devices will progress from "Initializing…" and "Refreshing…" to "Finished Initializing"
   b. When the status of each device says "Finished Initializing", you may unplug the devices from the computer.

Downloading Instructions

1. Plug in the accelerometers you want to download into the USB ports on the hub.
2. Open ActiLife software
   a. Select the devices you want to download
      i. To download all the devices plugged in, click the top box in the heading row
      ii. To only download specific devices from those plugged in, click the boxes corresponding with those specific device's rows
   b. Click "Download"
3. In Download Options pop up window:
   a. Select the Download Location
      i. Create a new folder for your pre and post assessments
      ii. Follow this template in naming your folder:
         1. icook_preassessments_SD
         2. icook_postassessments_SD
         3. **icook_followupassessments_SD**
   b. Select <Subject Name><Start Date> as the Download Naming Convention
   c. Do not check the boxes for Add biometric and user information OR Create clinical report on download for ActiSleep Monitors
   d. Check the box to activate Create AGD File
   e. Select the 10 seconds EPOCH option
   f. Select the 3 number of Axis
   g. Check the boxes to activate the Steps, Lux, and Inclinometer options

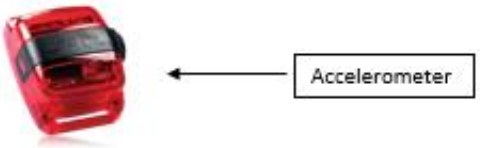
        i. Do not check the box for Low Frequency Extension
            1. If this box is already checked, uncheck it to deactivate it
    h. Click “Download All Devices”
4. In the main screen of ActiLife, check the progress of downloading
    a. In the status column, the devices will progress from “Downloading” and “creating AGD” to “finished downloading” OR “finished downloading AGD file”
    b. When the status of each device says “finished downloading” OR “finished downloading AGD file”, the download has been successful
5. At the end of downloading all your devices, open the folder you created for everything to save in
    a. Double check that you have an ActiGraph file AND an AGD file for each of the accelerometers you downloaded
    b. Rename both the ActiGraph file AND the AGD file for each subject following this template:
        i. Subject ID-Accelerometer serial number-start date

- *Accelerometer Participant Instructions*

Dear Participants of the iCook 4-H program,

Thank you for agreeing to participate in the iCook 4-H program. An important part of the iCook 4-H program is to promote physical activity and help you and your children lead a more active lifestyle. This week we will be assessing physical activity in your child. Your child will wear a small red device that measures physical activity for the next several days. The device needs to be worn on a belt around the waist 24 hours a day except during bathing. The device is called an accelerometer. In order to make our data collection process go smoothly, here are a few tips and pointers that will help us to assess your child's physical activity.

- All child participants will be wearing the device shown below:



- The accelerometer should be worn at the waist on the belt provided. The accelerometer should be placed over one hip. As shown in the picture below:

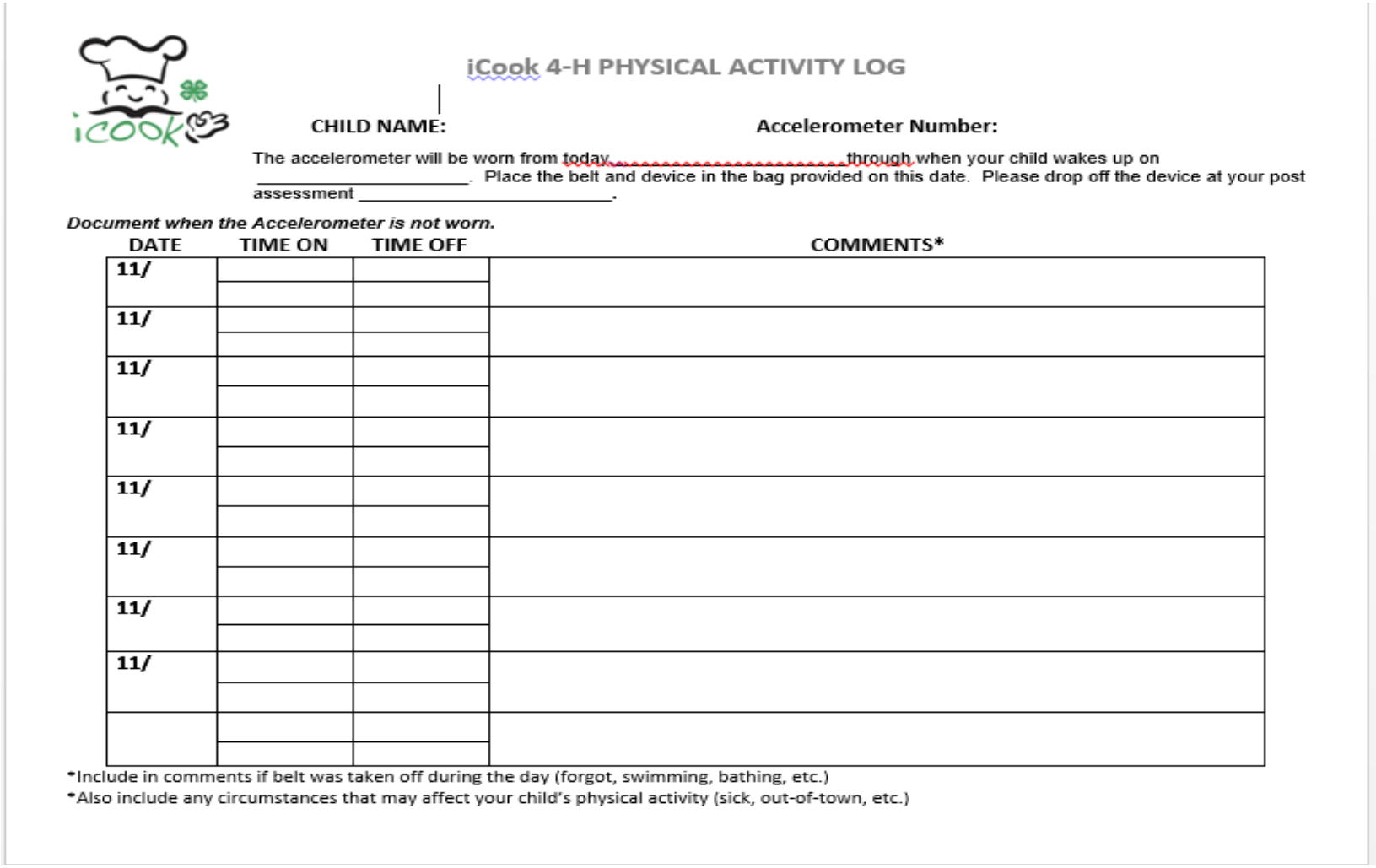
- The accelerometer has an arrow on it, please make sure this is pointing upwards (towards the sky).
- The belt can be worn above or beneath your clothing.
- The accelerometer can NOT get wet. Therefore, it needs to be removed in all instances where it would get wet, such as: bathing, swimming, heavy rain.
- The accelerometer should be worn 24 hours a day. Please help your child remember to take the accelerometer off before swimming or bathing and put on after swimming or bathing.
- Attached is a physical activity log to help track and monitor activity throughout the week. We ask for your assistance to help your child fill out the log each day. Please record what time the accelerometer is put on and taken off.
- If you forget to wear your accelerometer at any point throughout the week make sure you put it back on as soon as you remember.

The accelerometer will be worn from today _____through _____.
A research assistant from the iCook program will be picking up the device and the iCook 4-H Physical Activity Log from your child at _____on _____.

Thank you very much for your participation. If you have any questions or concerns, please feel free to contact the iCook program faculty below:

Celine Kabala
Phone: 605-688-6199
E-mail: Celine.Kabala2@sdstate.edu

- *Physical Activity Log*



iCook 4-H PHYSICAL ACTIVITY LOG

CHILD NAME: **Accelerometer Number:**

The accelerometer will be worn from today through when your child wakes up on _____. Place the belt and device in the bag provided on this date. Please drop off the device at your post assessment _____.

Document when the Accelerometer is not worn.

DATE	TIME ON	TIME OFF	COMMENTS*
11/			
11/			
11/			
11/			
11/			
11/			
11/			
11/			

*Include in comments if belt was taken off during the day (forgot, swimming, bathing, etc.)
*Also include any circumstances that may affect your child's physical activity (sick, out-of-town, etc.)

- *Quality of Life*
  - *Survey Example Questions*

	Never (1)	Almost Never (2)	Sometimes (3)	Often (4)	Almost Always (5)	Choose Not To Answer (6)
It is hard for me to walk more than one block (1)	•	•	•	•	•	•
It is hard for me to run (2)	•	•	•	•	•	•
It is hard for me to do sports activity or exercise (3)	•	•	•	•	•	•
It is hard for me to take a bath or shower by myself (4)	•	•	•	•	•	•
It is hard for me to do chores around the house (5)	•	•	•	•	•	•
I hurt or ache (6)	•	•	•	•	•	•
I have low energy (7)	•	•	•	•	•	•

	Never (1)	Almost Never (2)	Sometimes (3)	Often (4)	Almost Always (5)	Choose Not To Answer (6)
I feel afraid or scared (1)	•	•	•	•	•	•
I feel sad or blue (2)	•	•	•	•	•	•
I feel angry (3)	•	•	•	•	•	•
I have trouble sleeping (4)	•	•	•	•	•	•
I worry about what will happen to me (5)	•	•	•	•	•	•

	Never (1)	Almost Never (2)	Sometimes (3)	Often (4)	Almost Always (5)	Choose Not To Answer (6)
I have trouble getting along with other kids (1)	•	•	•	•	•	•
Other kids do not want to be my friend (2)	•	•	•	•	•	•
Other kids tease me (3)	•	•	•	•	•	•
I cannot do things that other kids my age can do (4)	•	•	•	•	•	•
It is hard to keep up when I play with other kids (5)	•	•	•	•	•	•

	Never (1)	Almost Never (2)	Sometimes (3)	Often (4)	Almost Always (5)	Choose Not To Answer (6)
It is hard to pay attention in class (1)	•	•	•	•	•	•
I forget things (2)	•	•	•	•	•	•
I have trouble keeping up with my schoolwork (3)	•	•	•	•	•	•
I miss school because of not feeling well (4)	•	•	•	•	•	•
I miss school to go to the doctor or hospital (5)	•	•	•	•	•	•

- *Quality of Life Protocols*

The PedsQL™ Scoring Algorithm

Scoring the Pediatric Quality of Life Inventory™

Scoring Instructions

The PedsQL™ **Generic Core Scales** are easy to score. The items of the four Scales (Physical Functioning, Emotional Functioning, Social Functioning, and School Functioning) are grouped together on the actual questionnaire, so it is easy to create Scale Scores.

1. On the PedsQL™ **Generic Core Scales**, for ease of interpretability, items are reversed scored and linearly transformed to a 0-100 scale, so that higher scores indicate better HRQOL (Health-Related Quality of Life).

2. To reverse score, transform the 0-4 scale items to 0-100 as follows: 0=100, 1=75, 2=50, 3=25, 4=0.

3. To create **Scale Scores**, the mean is computed as the sum of the items over the number of items answered (this accounts for missing data). If more than 50% of the items in the scale are missing, the Scale Score should not be computed. Imputing the mean of the completed items in a scale when 50% or more are completed is generally the most unbiased and precise method. To do this, count the number of missing values in the scale (call it nmiss). Next, sum the item scores and divide by the number of items in the scale minus nmiss. Alternatively, use the Compute command in SPSS to compute the MEAN.

4. To create the **Psychosocial Health Summary Score**, the mean is computed as the sum of the items over the number of items answered in the Emotional, Social, and School Functioning Scales. The **Physical Health Summary Score** is the same as the Physical Functioning Scale Score.

5. To create the **Total Scale Score**, the mean is computed as the sum of all the items over the number of items answered on all the Scales.

PedsQL™ QuickView℠ Scoring

Response Choices	Never	Almost Never	Some-times	Often	Almost Always
Raw Scores	0	1	2	3	4
0-100 Scale Scores	100	75	50	25	0

THESIS TABLES

Table 1: Physical Activity Components of iCook 4-H

Table 1: Physical Activity Components of iCook 4-H			
Session	**Objective (Time)**	**Objective**	**Examples of Activities**
1	Introduction to the importance of goal setting and physical activity (15min)	Play getting-to-know-you "Circle Game" with youth and adults to promote physical activity and healthful eating	Adults and children play the "Circle Game", which helps leaders and other participants get to know each other during the first session. Paper plates are taped to the floor with one less plate than participants. Participants run around and across the circle to an open plate.
2	Know Your Heart Rate, Importance of Aerobic Activity (20min)	Participants will assess their heart rate at different levels of physical activity.	Adults and children are taught how to measure heart rate and then measure the effects of different levels of physical activity intensities on their heart rate. For example, walking for 1-2 min., knee raises for 1 min, and sprinting/jumping jacks for 1-2 min.
3	Activity Charades- Building Strong Muscles Every Day (15min)	Participate in game to demonstrate everyday exercises/activities that promote building muscles.	An individual from one team chooses a slip of paper from the bowl/hat and must act out the activity for his or her team to guess without using any sounds or words, only actions. Activities represent physical activity in everyday life.
4	Importance of stretching (15min)	Participants will understand the importance of stretching and practice some stretching exercises.	Adults and children will demonstrate stretching activities from a handout and hold each stretch for 20 seconds. Stretches include hamstring, triceps, lower back, quadriceps, shoulder extension, and inner thigh.
5	Healthy Downtown- iCook Shuffle (15min)	Identify healthy downtime activities and play iCook shuffle game.	Participants must then "shuffle" their feet forward a little at a time to move without letting the bean bag fall off the tops of their feet. Participants buddy up with another person or pair and create their own game using the bean bags that could be a fun downtime activity.
6	Active Play- Cup Stacking Game (15min)	Participate in group active play- cup Stacking Game.	Adults and children participate in the cup stacking game. The participants divide into two teams and stack 10 cups into a pyramid. Once the first players stack and unstack the pyramid they run back to their perspective team and tag the next person to go.

Table 2: iCook 4-H Baseline Demographics

Table 2: iCook 4-H Baseline Demographics	
State	**(Frequency %)**
Maine	48 (30%)
Nebraska	14 (9%)
South Dakota	26 (17%)
Tennessee	25 (16%)
West Virginia	45 (29%)
School Grade	**(Mean±SD)**
Age	10±0.6
Height	140±7.4
Weight	39±11
BMI %	66±29
Race	**(Frequency %)**
White	113 (71%)
Black	17 (11%)
Asian	1 (.6%)
Hispanic	4 (6%)
Native American	5 (3%)
Other	6 (6%)
Demographics (State, School Grade, and Race) of participants who participated in iCook 4-H at baseline. BMI Percentage based on Center for Disease Control Growth Charts	

Table 3: Physical Activity Levels and Quality of Life Score for the iCook 4-H Intervention

Table 3: Physical Activity levels and Quality of Life Scores for the iCook 4-h Intervention														
Outcome PA Measures (Mean±SD)	**Block PA (Minutes/Day)[1]**			**Accelerometer PA (Minutes/Day)[2]**					**Quality of Life[3]**					
	Moderate Physical Activity	**Vigorous Physical Activity**	**Recreational Physical Activity**	**Sedentary (ST)**	**Light Physical Activity (LPA)**	**Moderate Physical Activity (MPA)**	**Vigorous Physical Activity (VPA)**	**Moderate to Vigorous Physical Activity (MVPA)**	**Total QOL**	**Physical Functioning**	**Emotional Functioning**	**Social Functioning**	**School Functioning**	**Psychosocial Health Score**
Baseline														
Treatment	71±58	28±39	74±73	546±57	244±48	33±10	16±9	50±17	78±16	28±6	16±4	17±4	17±4	50±10
Control	97±78	35±36	96±75	547±58	238±49	36±12	18±9	54±19	76±14	28±5	14±5	17±3	16±4	48±10
Post														
Treatment	65±65	29±43	66±68	580±63	218±53	28±9	14±7	42±14	64±12	23±4	13±4	14±3	14±3	41±8
Control	74±56	34±42	80±78	575±64	228±50	33±13	16±8	49±20	59±16	22±6	11±4	14±4	12±4	36±10
Follow-up														
Treatment	76±93	41±55	87±102	607±82	192±67	27±13	13±9	40±18	86±9	31±4	17±3	19±2	18±3	55±6
Control	87±70	38±37	94±70	578±79	215±57	31±16	15±13	46±27	81±14	30±5	17±4	18±3	17±2	52±10
Baseline to Post														
Time Effect	0.019	0.93	0.09	0.004	0.007	0.002	0.055	0.005	0.000	0.000	0.000	0.000	0.000	0.000
Time*Group Effect	0.176	0.887	0.544	0.53	0.614	0.428	0.386	0.37	0.227	0.572	0.232	0.511	0.785	0.267
Baseline, Post, & Follow-up														
Time Effect	0.046	0.378	0.14	0.005	0.004	0.013	0.253	0.045	0.000	0.000	0.001	0.000	0.000	0.000
Time*Group Effect	0.323	0.436	0.329	0.726	0.776	0.384	0.716	0.54	0.273	0.985	0.874	0.418	0.052	0.476

[1]Physical Activity was subjectively measured using the BLOCK survey tool. Kids self-reported over the past seven days of physical activity. [33]
[2]Physical Activity was objectively measured using ActiGraph Accelerometers.[34]
[3]Quality of Life Scores were measured using the Pediatric Quality of Life Survey.[35]
[4]$P < 0.05$, Mean and Standard Deviation (SD) were used to determine the accelerometer derived physical activity for each participant at three different time points (baseline, post, and follow-up).

Table 4: Correlation between quality of life and physical activity levels at baseline

Table 4: Correlation between quality of life and physical activity levels at baseline					
Spearman's Correlation Coefficient Significance (2-tailed)	**Sedentary Time (ST)**	**Light Physical Activity (LPA)**	**Moderate Physical Activity (MPA)**	**Vigorous Physical Activity (VPA)**	**Moderate to Vigorous Physical Activity (MVPA)**
Total QOL	-0.206 0.052	0.144 0.178	**0.233** **0.028**	**0.279** **0.008**	**0.256** **0.015**
Physical Functioning	**-0.256** **0.008**	**0.195** **0.045**	**0.287** **0.003**	**0.339** **0.000**	**0.314** **0.001**
Social Functioning	-0.035 0.713	0.005 0.959	0.096 0.317	0.094 0.331	0.092 0.341
Emotional Functioning	-0.091 0.357	0.040 0.684	0.162 0.100	**0.211** **0.031**	**0.183** **0.062**
School Functioning	-0.104 0.276	0.039 0.684	0.236 0.012	0.263 0.005	0.260 0.006
Psychosocial Health Score (Social+Emotional+School)	-0.141 0.174	0.092 0.374	0.182 0.077	0.231 0.024	0.203 0.048

P-Value (<0.05)
N=106
Spearman Correlation Coefficient was used to examine the relationship between physical activity intensity categories (ST, LPA, MPA, VPA, MVPA) and quality of life. Each participant who completed the Pediatric Quality of Life survey and were compliant with wearing accelerometers were included in this data analysis.

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