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# The Relationship among Fifth Grade Physical Education Students' Body Size Perception, FITNESSGRAM Scores, and Physical Activity Level

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The Relationship among Fifth Grade Physical Education Students' Body Size Perception,  
FITNESSGRAM Scores, and Physical Activity Level

By

Ashley Cleveland

A THESIS

Presented to the Faculty of

The Graduate College at the University of Nebraska

In Partial Fulfillment of Requirements

For the Degree of Master of Science

Major: Nutrition and Health Sciences

Under the Supervision of Professor Linda Boeckner

Lincoln, NE

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The Relationship among Fifth Grade Physical Education Students' Body Size Perception,  
FITNESSGRAM Scores, and Physical Activity Level

Ashley Cleveland, M.S.

University of Nebraska, 2016

**Advisor: Linda Boeckner**

*Purpose:* This study aims to explore the correlation between students' self-perception of body image and FITNESSGRAM scores, the relationship between children's body perceptions and their actual body mass index (BMI), and to see if body image in children affects their physical activity level.

*Methods:* FITNESSGRAM fitness testing protocol and a survey developed for the KidQuest nutrition intervention program by South Dakota State University (SDSU) was used to assess the correlation between students' (n= 319) self-perception of body image and FITNESSGRAM scores. In addition accelerometers were used to assess the physical activity level of a subsample (n=57) of the students during an in-class physical education period.

*Results:* On average, students perceived themselves as smaller than their BMI suggested. Those who had a self-perception of a larger body weight, scored lower on their curl-up, 90-degree push up, and PACER fitness tests. There was a significant negative correlation between self-perceived body weight and curl-up, 90-degree push up, and PACER fitness tests ( $p < 0.05$ ). There was no correlation, however, between body weight perception and sit-and-reach. No correlations were found with perceived BMI and physical activity level assessed by the accelerometers.

*Conclusions:* Results of this research can inform future work in the area of youth body

image and fitness interventions, with body image identified as a strong determinant of weight management and nutritional habits among adolescents . Specifically, fitness testing can be influenced by body image. Although there were no correlations with physical activity level in a regular physical education class and body image, it would be interesting to see if this result changed with longer time allotment.

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# **Chapter I: Introduction**

## **Chapter I: Introduction**

Obesity rates have increased drastically within the last decade from 200 million to 300 million individuals that are affected by this disease worldwide. In the last two decades, the children and adolescent obesity percentage has increased by almost fifty percent (Fima, 2008). Obesity has been linked to many health conditions that can cause premature death and decrease quality of life. These conditions include diabetes, cardiovascular diseases, some cancers, musculoskeletal disorders, stroke, osteoarthritis, a number of gastrointestinal diseases, and some mental health conditions (Chittleborough, Montgomerie, Taylor, 2014). There is evidence that an increase in physical activity can decrease the prevalence of obesity (Brown and Summerbell, 2009). Many overweight and obese children, however, feel they are less physically competent and perform poorly on endurance and weight-bearing tasks. Previous studies have shown that actual and perceived physical sport and strength competence are important correlates of fitness in children (Campanozzi et al., 2012). However, little research has been done on the correlation of children's self-perception of body image and fitness scores.

A study published in the Journal of Sport Behavior in 2006 investigated the effect of aerobic and interval circuit training on body image among women. It concluded that an interval program was more beneficial than aerobic exercise alone or no exercise (Anshel, Henry, Michael, 2006). However, it did not study the correlation between body image and fitness test scores. Another study published in the Health Education Research Journal in 2006 by Apitzch and others was

comprised of 206 children aged 8-12 years old and sought to find a correlation between self-reported physical activity and self-perceived physical fitness. Significant associations were found between the children's self-perceived physical fitness and their self-reported physical activity; however, there was no association between their self-perceived competence in physical education and their self-reported physical activity (Apitzsch, Ejlertsson, Rastam, Sollerhed, 2006). Although this study explored the relationship between physical activity and physical competence, the physical activity was self-reported. The present study had trained researchers complete the physical activity scoring.

Although many studies have been done on body image and nutritional habits, to our knowledge no research has been done with FITNESSGRAM® testing scores and body image. A common age that has been studied for body image perception is through the high school years and college females, but pre-adolescence literature is lacking (Anshel, Henry, Michael, 2006). To our knowledge, no research has been done with FITNESSGRAM® testing scores and body image.

The purpose of this study was to explore whether fifth grade students' body perception of themselves affected their fitness performance based on FITNESSGRAM® scores including curl up, 90-degree push up, PACER, and back-saver sit and reach; to compare students' body perception answers to their actual body mass index (BMI); and to view the relationship between physical activity level in physical education class and perception of body size.

## **Chapter II:**

### **Literature Review**

## **Chapter II: Literature Review**

### *Adolescent Health Habits*

Adolescence can be divided into three different stages including early adolescence, middle adolescence, and late adolescence (California Nutrition and Physical Activity Guidelines for Adolescents, 2012). This study will primarily focus on the early adolescence stage (11-14 years of age). Following infancy, this is the only time in a child's life that the rate of physical growth increases. This sudden growth often called a "growth spurt" can be associated with hormonal, cognitive, and emotional changes. With this rapid growth, nutrition can be affected in several ways. First, the increase in physical development requires an increased demand for calories and nutrients. Second, lifestyles are changing during this time and food habits may be affected. Third, pre-adolescent children have a larger drive for individuation which comes with an opportunity to make their own food choices; these food choices could be expanded to healthy options or narrowed to less healthy options (California Nutrition and Physical Activity Guidelines for Adolescents, 2012).

With the ability to start making choices for themselves, pre-adolescents may begin to develop poor eating habits. There are many dietary patterns that could develop including increased serving sizes, eliminating food groups such as fruits and vegetables, skipping breakfast, and increased consumption of added sugars and fast foods. (Edelstein and Sharlin, 2009). Foods that are easily available, low-cost, and high in fat such as chips, candy, or soda can be appealing to this age group. There could be a lack of knowledge regarding nutrition and the health benefits to a well-balanced diet. Fear of weight gain, weight loss, media and advertising messages,

and a desire to change ones' body can lead to disordered eating and poor body image at this age (Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity, 2012).

Specific nutrient-related concerns for adolescents include inadequate calcium, folate, and iron intakes. The intake of sports and energy drinks among adolescents has risen and continues to replace milk and water (Centers for Disease Control and Prevention, 2010). These sugary drinks provide added calories from sugar contributing to overweight, obesity, and dental caries. Since sugar-sweetened beverages are often replacing milk, calcium intake is decreased. Adequate calcium intake is essential during this stage of life for peak bone mass (Greer and Krebs, 2006). While the consumption of sugar-sweetened beverages may increase, a shift away from fruits and vegetables is common among adolescents.

Not only do the poor eating habits described lead to vitamin and mineral deficiencies, but they can lead to overweight and obesity in combination with physical inactivity (California Nutrition and Physical Activity Guidelines for Adolescents, 2012). The recommendation for pre-adolescents is to receive 60 minutes per day of physical activity. Among children 12-19 years, only 50% report regular vigorous physical activity and 25% do not get any vigorous exercise at all (Holick, Moore, Murphy, 2005).

Pre-adolescence is typically the time between grade school and high school for students. During this time, students' are learning to be more responsible, autonomous, and learning about their bodies. It is important during this time to develop a positive self-esteem and self-body image. Nearly 30% of high school

students believe they are overweight and girls are more likely to believe this is true (35%) than boys (23%) (Grunbaum, Kann, Kinchen, Lowry, Ross, Williams, 2002). Eating disorders affect about 5 million Americans, primarily adolescent girls and young women. An excessive focus and importance is placed on body weight and shape, which decreases self-concept and self-esteem contributing to poor body image (American Psychiatric Association, 2000).

### *Body Image*

Body image is defined as an individual's subjective evaluation of his or her own appearance (Harriger & Thompson, 2012). Concern for body image differs according to gender. Boys are more interested in having a muscular body image and girls are more concerned with thinness. Specifically, males assess their bodies in terms of strength and females take interest in weight and the shape of particular body parts such as hips and thighs (Golan, Hagay, Tamir, 2014). Research has found that adolescents, both male and female, with higher body image satisfaction have had higher perceived athletic competence (Gill & Lyu, 2012). An article from the Asian Journal of Social Psychology's findings displayed that male students were more satisfied with their appearance than females and females were more concerned about their appearance than the male students (Gill & Lyu, 2012). This study supported positive relationships between peer acceptance and the perception of physical competence as well as positive body image. This article was mainly focused on the aspect of peer acceptance and physical competence rather than the correlation between body image and fitness scores.



Body image perception can also affect the quality of life in children. Another study by Cavrini and Petracci (2013) sought to evaluate the effect of excess weight and body image on health-related quality of life in a sample of school aged children. A nutritional surveillance study was utilized with a two-stage sampling design. This study concluded that quality of life was reduced when participants had excess weight, sedentary behavior, and an unsatisfactory self-perception (Cavrini & Petracci, 2013). Body image dissatisfaction may begin in school-aged children, but it may increase substantially in adolescence and pre-adolescence. During adolescence there are many unique biological and psychosocial challenges including puberty and school transitions that may contribute to a heightened dissatisfaction with appearance (Canavarro, Frontini, Gouvei, Moreira, 2014).

In addition to body image acting as a barrier to a positive quality of life, it can be a barrier to exercise participation. Research has shown that an individual's decision to exercise is affected by location. For example, individuals felt more likely to work out if they were in a private area versus a public location where others could see them. Studies have also concluded that negative body image can be a reason for individuals to exercise to improve that self-esteem; however, these studies were not focused on children but rather university students (Brudzynski & Ebben, 2010).

### *Self- Perceived Weight*

In addition to the understanding of body image, it is important to recognize the significance of individuals' self- perceived weight and its accuracy. For example, a child who thinks they have a larger body mass index than what is actually measured or vice

versa. A study on the accuracy of weight perception in children found that girls were more likely than boys to overestimate their weight status and boys more likely to underestimate (Abbott, Davies, Lee, Stubbs, 2010). Some see the overestimation as an area of concern by too much media attention to fatness; however, the ten-year-old girls were more accurate on their assessment of weight status than boys. It was proposed that as the rates of overweight and obesity continue to increase, the public image of healthy weight would change. For example, what is classified as being overweight might be defined by the public eye as “normal” (Abbott et al., 2010).

The image of a healthy weight can affect whether or not an individual's weight is underestimated or overestimated. Self-perception of weight can also lead to different lifestyle habits. A recent study found that preadolescent middle school students and adolescent high school students (aged  $16.43 \pm 0.01$ ) who underestimated their weight did nothing to control it such as diet or exercise; whereas those in the overestimation group partook in diet and exercise to lose weight. This same study showed that participants in the underestimation group had a higher frequency of eating breakfast and consuming milk daily than did the overestimation group. (Lee and Lee, 2016).

Media, parental comments, and opinions from peers and friends may influence how children and adolescents perceive weight (Ho, Lai, Lam, Lo, Mak, 2009). Weight misperception were influenced by weight comments from family and/or peers; however, an important finding of the study was that less than one-fifth of the comments received by adolescent boys and girls were accurate. Researchers concluded family members, professionals, and peers of adolescents should acknowledge the possible effects of incorrect weight comments on adolescents and adolescents should be taught how to

properly assess their weight status in order to establish more accurate perceptions of themselves (Ho et al., 2009).

### *FITNESSGRAM®*

Nationwide, 76.5% of schools administer physical fitness tests and many schools use fitness testing even if they are not required to do so (Brener, Eaton, Lowry, McManus, 2008). Due to increased concern for obesity, statewide mandates are being developed that require physical education teachers to complete physical fitness testing (Brener et al., 2008). Fitness testing has been a part of most schools' physical education program for over fifty years and FITNESSGRAM® is now one of the most frequently used testing programs (Downing and Hill, 2015). With the use of FITNESSGRAM®, students' fitness testing in school can be accomplished. In order to know if the use of FITNESSGRAM® is beneficial, confirmation of its validity is needed. A study done in Texas assessed schools from the Dallas-Fort Worth area and fitness testing occurred over a two-week period at each school during physical education classes. This study concluded that teacher administered, health-related physical fitness tests, like FITNESSGRAM®, were reliable and valid. It is important to consider training for those administering the testing (Jackson, Martin, Morrow, 2013).

Although FITNESSGRAM® is a reliable and valid form of testing, there are many conflicting studies about the value of fitness testing with regards to self-efficacy, confidence, and overall interest in physical activity. Harris and Cale (2009) found that fitness testing might contribute to a decreased interest in physical education because the results undermine the confidence and self-esteem for those who see no improvement in their scores or have low scores (Harris and Cale, 2009). Conversely, Wiersma and

Sherman stated that physical fitness testing can be done in a motivating manner and this could increase self-efficacy, enjoyment, and internal validity (Wiersma and Sherman, 2008).

### *Physical Activity, Intensity, and Accelerometry*

Global physical activity guidelines recommend that children ages 5-17 years should receive at least 60 minutes of moderate to vigorous physical activity daily to improve overall health and fitness and reduce risk for chronic diseases (Muthuri, Onywera, Tremblay, Wachira, 2014). Incorporating daily physical activity can help reduce the risk and prevalence of overweight and obesity in children and adolescents. Although this is the recommendation, few children are receiving this amount of activity due to several factors including parental BMI, socioeconomic status, and transportation method to school (Muthuri et al., 2014). Muthuri found that students who received motorized transport to school had a higher BMI than those who participated in active transport. This study also found that students in private schools were 96.4% less likely to meet the daily physical activity recommendations than are students in public schools.

There are several opportunities throughout the day for children to be active in school including physical education classes and recess; however, research has shown that some students are not actually being physically active during this time. A study examined the relationship between socioeconomic status and physical activity during recess by the use of accelerometry. Accelerometers are an instrument used for measuring acceleration; their sensors measure frequency, duration, intensity, and patterns of one's movement. They provide dimensionless physical activity scores in 'counts', which are

summarized over a user specified time period, or epoch (Cortina-Borja, Dezateux, Griffiths, Kinnafick, 2011). The use of accelerometers has proved to be effective with research as one of the best ways to produce objective information on children's physical activity by looking at frequency, duration, and intensity (Eston, Rowlands, & Stone, 2009). As a cost effective, unit-free producing method of objective data, accelerometers have become increasingly popular in physical activity research. This study utilized the cut off points from Freedson, Pober, and Janz in 2005 which include a wide range of activities including common lifestyle and play, similar to what would be conducted in a physical education setting for students. This study sought to review and critique the literature on accelerometer calibration in children to aid in cut off points assessing physical activity levels in children. Freedson, along with Sirard and Debold developed a regression equation to estimate METs from counts (Freedson, Sirard, Debold, 1997). Using the average body weight of 29.8 kg for children aged 6 to 18, the boundaries for 3, 6, and 9 METs correspond to approximately 0-149 counts per minute (CPM) for sedentary activity, 150-499 CPM for light, 500-3999 CPM for moderate, 4000-7599 CPM for vigorous, and  $\geq 7600$  CPM for very vigorous (Freedson et al., 1997).

A study conducted in 2013 sought to develop and validate the ActiGraph GT3X cut-off points in 5 to 9 year old children since no other found studies had compared cut off points based on vector magnitude compared to vertical counts. The GT3X model was released to reflect a tri-axial measurement rather than uniaxial measurement of accelerometry. The study provides count cut-off points corresponding to energy expenditure Metabolic Equivalents (METs) of 3 METs and 6 METs for moderate and vigorous intensity, respectively (Jimmy, Mader, Seiler, 2013).

Using accelerometers, Aucuturier and others (2014) investigated students at recess rather than in physical education class. The results showed that students with lower social economic status had lower physical activity levels than those with a higher social economic status (Aucuturier, Baquet, Berthion, Blaes, Van Praagh, Ridgers, 2014); however, the relationship between the children's self-perceived body image and physical activity levels was not demonstrated. The present study will aim to distinguish the significance of this relationship.

## **Chapter III: Methodology**

### **Chapter III: Methodology**

Specific research questions guiding this research were: 1) What is the correlation between students' self-perception and FITNESSGRAM® scores? 2) How do children's body perceptions relate to their actual BMI? 3) Does body image in children influence their physical activity level (low, moderate, high)?

The hypotheses for this study are:

1. Fifth grade students' body perception will influence their FITNESSGRAM® scores. Those who perceive themselves as larger than they actually are will score lower on their fitness testing.
2. Fifth grade children will perceive themselves as larger than they actually are.
3. Fifth grade children's body images (based on self-rated scale) will influence their physical activity levels based on the accelerometer. Those who perceive themselves as overweight or obese will not be as active in regular PE class compared to those who do not perceive themselves as overweight or obese.

#### *Participants and Setting*

The proposed study is a sub-study of a larger study with approximately 350 fifth grade students at Johnson Crossing Academic Center (JCAC) in Fremont, Nebraska, United States. Participating students agreed by signing a youth assent and their parents signed an informed consent (Appendix F and Appendix G). No data were used from those who did not consent/assent. Participants were asked to take part in FITNESSGRAM® physical fitness testing in their physical education class. The tests



utilized included the following physical fitness measures: height, weight, curl up, 90-degree push up, Back-Saver Sit and Reach, and PACER. The schoolteachers, school principal (Appendix A), and Institutional Review Board (IRB) approved all methods (Appendix B). To insure proper administration of the FITNESSGRAM® procedures, each researcher was required to take an online FITNESSGRAM® course and certification.

### *Instrumentation and Definitions*

Survey data were gathered from the larger quantitative study, existing FITNESSGRAM® testing procedures, and additional accelerometer data to determine the significance of the relationship between personal body perception and fitness performance based on testing scores.

### *Survey*

All participants were asked to complete a baseline and follow-up survey regarding their lifestyle habits as well as nutrition-related questions that were used to evaluate a nutrition intervention program (KidQuest) developed by South Dakota State University. In the survey, the participants answered a question that reads “please circle which image best describes you” based on the BMJ Publishing Group Ltd. and Royal College of Pediatrics and Child health perception scale (Appendix C). The choices ranged from A to G, and were matched to numbers 1 to 7, with increasing BMI ranges for each number (Table 1). Each participant was assigned a perceived BMI Image Category number based on their selection on the survey. Their actual BMI was calculated from their height and weight and then also matched to the corresponding BMI Image Category (actual BMI

Image Category number). The difference between perceived BMI Image Category number and actual BMI Image Category number was compared by subtracting the actual BMI Image Category number from the perceived BMI Image Category number. A negative number indicated the participants saw themselves as smaller than they actually were; a positive number indicated the participants saw themselves as larger than actual.

Table 1. Body Image Category Corresponding with BMI Ranges, Boys and Girls

<i><b>BMI Image Category</b></i>	<i><b>BMI Range BOYS</b></i>	<i><b>BMI Range GIRLS</b></i>
1	14-14.6	13-13.5
2	14.7-15.5	13.6-14.9
3	15.6-16.5	15-16.6
4	16.6-18.5	16.7-17.7
5	18.6-24.9	17.8-19.4
6	25.0-28.4	19.5-24.6
7	28.5-29	24.7-28.5

#### ***FITNESSGRAM®***

The researchers recorded both pre and post FITNESSGRAM® test scores for future use in this study as follows.

**PACER:** The PACER is a multistage fitness test adapted from the 20-meter shuttle run test. The test is progressive in intensity and provides a built-in warm-up, which helps children to pace themselves effectively. Data were collected by use of a

PACER-recording sheet (Appendix D). For the PACER running test, students were cued with the use of a CD that played on a stereo. This CD told them when each numbered lap was complete and maintained appropriate timing and cadence. Students were allotted two incomplete laps in which they did not complete the lap before the time was up. On the student's first incomplete lap a check was marked in the circle associated with the lap they hadn't completed. On the student's second incomplete lap, a star was marked. If the student had two incomplete laps, their number on the first miss was recorded; if the student stopped after one incomplete lap, then that number was recorded. Each student had his or her own recording sheet coded with his or her ID number. Once data collection was completed, the scores were compiled into one spreadsheet. From the PACER score, VO<sub>2</sub> max can be calculated by a validated equating method (Boiarskaia, Boscolo, Mahar, Zhu, 2011). Measuring VO<sub>2</sub> max itself requires expensive equipment and is thus not feasible for administration in a school setting. Thus, several field tests are commonly used such as 1-mile run, or the Aerobic Capacity Endurance Run (PACER).

**Curl Up:** The student being tested lies in a supine position on the mat, knees bent at an angle of approximately 140 degrees, feet flat on the floor, legs slightly apart, and arms straight and parallel to the trunk with palms resting on the mat. The students start with their back flat on the floor. A testing strip is present at the bottom of the mat closest to the students' feet. When the students are curling up, students move the fingertips from the side of the testing strip closest to their head to the other side closest to their feet by moving the arms and shoulders up and down. Movements should be slow and gauged to the specified cadence of about 20 curl-ups per minute (1 curl every 3 seconds). For the curl up test, students were cued with the use of a CD that played on a stereo. The CD

kept the cadence for the students to know when to lift their shoulders off the mat and when to lie back down. Students are stopped after completing 75 curl-ups or when the second form correction is made. A form correction is when the researcher tells the student how to fix their current procedure in order to properly do the curl up. For example, a student might raise their feet off the floor and the researcher would ask them not to. Researchers recorded the final number on a spreadsheet upon completion.

**90 Degree-Push-Up:** From a prone position, the student pushes up off the mat with the arms until arms are straight. Thus, the student begins the fitness test with their arms extended off the ground and the students are cued by the researchers for this position. The back should be in a straight line and then the student lowers the body using the arms by bending the elbows to 90 degrees so the upper arm is parallel to the floor. This movement is repeated as many times as possible. During the test, a CD plays on a stereo to keep the cadence for the participants. Students are stopped when the second form of correction is made. A form correction is when a student does not bend their elbows fully to 90 degrees, or if they put a knee down during the test. Researchers recorded the final number on a spreadsheet upon completion.

**Back-Saver Sit and Reach:** The student being tested removes his or her shoes and sits down at a test apparatus. The test apparatus is a sturdy box that measures approximately 12 inches high. A measuring scale is placed on top of the box with a 9-inch mark parallel to the face of the box. One leg is fully extended with the foot flat against the face of the box. The other knee is bent with the sole of the foot flat on the floor. The arms are extended forward over the measuring scale with the hands placed one on top of the other, palms facing down, and the student reaches directly forward. The

student reaches their hands progressively forward four times and holds the position on the fourth reach for at least one second. After one side has been measured, the student switches the position of the legs and reaches again. The number of inches on each side is recorded to the nearest  $\frac{1}{2}$  inch reached, to a maximum score of 12 inches. Researchers recorded the final number on a spreadsheet upon completion.

### *Accelerometers*

Accelerometers were used to measure the physical activity level of the students who received and gave consent to participate. ActiGraph GT9X Link is scientifically validated and measures physical activity and sleep. Acceleration is defined as the change in velocity over time and thus it quantifies the volume and intensity of movement. The accelerometers measure proper acceleration (Freedson et al., 2005).

For the study, 320 consent forms were sent home to the parents. Of the 320, 73 completed both youth assent and parental consent forms. Of the 73, 57 were present for the data collection. Classes have approximately 50 students and there were less than 25 in each class that consented to participation; therefore, measurements were recorded from all 57 students who provided youth assent and parental consent. Researchers were present during all PE classes to set up and administer the accelerometers. Before each class began participating in physical activity, the same teachers explained to the students the itinerary and lesson plan for the class. Activity happened for approximately 36 minutes in each class; this time does not include explanation time or the time it took to turn in the accelerometers. The accelerometers were used in a typical physical education setting that was separate from the physical activity class in which fitness testing was

conducted in order to gauge common practice. During these classes, the students were learning about football. Initially they partook in several exercises including running and passing. Then they performed a scrimmage game of flag football.

On the first day of accelerometry measurement, researchers provided initialized accelerometers for three of the six classes. The other three classes did not have physical education that day as the students went to a different class. Thus, three classes participated the first day and three classes participated the second day. All classes from both data collection days had the same football lesson as depicted above. The accelerometers were placed around the participant's left side of the waist. Accelerometers were placed on a band with a buckle prior to data collection. Students buckled them around their waists themselves unless they needed a researcher's assistance. Times were logged for each class and for each participant; these times were the start and end time. Data were downloaded following the first day of data collection. Accelerometers were re-initialized for the second day's data collection and the process was repeated. The accelerometers measured the intensity of physical activity. The physical activity intensity categories were labeled as: sedentary (S), light (L), moderate (M), vigorous (V), and very vigorous (VV). Threshold values for accelerometer counts (counts/minute) were 0-149 for sedentary, 150-499 for light, 500-3999 for moderate, 4000-7599 for vigorous, and >7600 for very vigorous. (Freedson, Pober, Jans, 2005)

The participants used an online Qualtrics portal to complete the survey tool, which was developed by South Dakota State University (SDSU) for the larger study. Researchers assisted the participants with entering their identification numbers for the

study before they began filling out the survey. Only survey data for the body perception question were used in this study.

The researchers collected the participants' height, weight, curl up, 90-degree push up, PACER, Back-Saver Sit and Reach, and trunk lift scores, using FITNESSGRAM® testing protocol. Data were recorded for both the pre and post fitness testing sessions; however, the data utilized in this study were the post data. Post data were used because it was closest to the time of the data gathered from the accelerometer.

### *Statistical Methods*

All statistical analyses were performed using SPSS (version 23, 2015, IBM Corporation). Pearson correlation coefficients were used to test the association between FITNESSGRAM® scores and actual BMI as well as perceived BMI on the Body Size Visual Rating tool. Significance was analyzed at the  $p \leq 0.05$  level. An average difference was used to see the difference between actual BMI and perceived BMI. ActiLife software (version 6.11.7, 2012, ActiGraph Corporation) was used for the accelerometer data analysis. Three axes were enabled for physical activity level analysis. Physical activity counts or scores were converted into time (in minutes) of moderate-to-vigorous physical activity (MVPA) using Freedson Combination (1998) energy expenditure, Freedson Children (2005) METs and Cut Points. Data were collected in 10-second epochs then integrated into 60-second epochs. Pearson correlation coefficients were used to test the association between time in MVPA and perceived BMI on the Body Size Visual Rating Tool.





## **Chapter IV: Results**

## Chapter IV: Results

### *Descriptive Statistics*

Three hundred and 20 children consented to participate in the overall study but due to incomplete data only 319 (160 males; 159 females) were included in the analysis. No significant differences in height, weight, and body mass index were detected by gender. Overall mean values were:  $57.1 \pm 3.5$  inches for height;  $99.1 \pm 29.7$  lbs for weight; and  $21.3 \text{ kg/m}^2 \pm 6.4 \text{ kg/m}^2$  for body mass index. Mean age for 286 children who entered their birthday into the survey instrument was  $10.4 \pm 1.2$  years. Table 2 shows the descriptive statistics of the child participants including age, BMI, and BMI-for-age percentile. On average, all males and females were in a healthy range according to the Centers for Disease Control and Prevention growth chart (Centers for Disease Control and Prevention, 2015).

### *Actual vs. Perceived BMI*

The mean actual BMI Image Category number for all student participants was  $4.9 \pm 1.4$  ( $n=314$ ), and mean perceived BMI Image Category number was  $3.5 \pm 1.4$  ( $n=282$ ). For the students who completed the accelerometry tests ( $n=57$ ), the mean actual BMI Image Category number was  $4.9 \pm 1.5$  and mean perceived BMI Image Category number was  $3.3 \pm 1.3$ . This did not support the hypothesis in that the student participants perceived their body size was smaller than it actually was.

### *Descriptive Statistics for FITNESSGRAM® tests*

Table 3 provides the results of the FITNESSGRAM® tests. With the exception of the PACER test, all tests indicated the children were, on average, in the

FITNESSGRAM® Healthy Fitness Zone (HFZ) (Appendix E) To be in the Healthy Fitness Zone for the PACER tests, 10 to 11 year-old children should have a

$VO_{2\max}$  (ml/kg/min) of  $\geq 40.2$ . The mean score for these children of  $38.6 \pm 7.8$

$VO_{2\max}$  (ml/kg/min) placed them in the needs improvement (NI) category of the

FITNESSGRAM® standards. The  $VO_2$  max score was calculated from

$VO_{2\max} = 41.77 + (PACER \text{ laps} * 0.49) - 0.0029 * (PACER \text{ laps}^2) -$

$(0.62 * bmi) + 0.35 * (age * gender)$  (Boiarskaia, Boscolo, Mahar, Zhu, 2011).

#### *Correlation between actual BMI Image Category Scores and FITNESSGRAM® Scores*

Correlations between the actual BMI Image Category Score and the FITNESSGRAM® curl up, 90-degree push up, and PACER tests were significant and supported the research hypothesis that those with lower BMI would score higher on those fitness test categories (See Table 4). The exceptions were the lack of significant correlations between actual BMI Image Category Score and FITNESSGRAM sit-and-reach tests on both the left and right sides which were not significant ( $p=0.965$  and  $p=0.723$  for left and right, respectively).

Table 2. Descriptive Statistics of the Child

	<b>Overall (mean ± SD) (n=286)</b>	<b>Boys (mean ± SD) (n=140)</b>	<b>Girls (mean ± SD) (n=146)</b>
<b>Age (years)</b>	10.4 ± 1.2	10.6 ± 0.59	10.5 ± 0.53
<b>BMI (kg/m<sup>2</sup>)</b>	21.3 ± 6.4	20.7 ± 5.47	21.7 ± 5.61
<b>BMI-for-age percentile</b>	71.4 ± 26.1	71.0 ± 25.2	71.7 ± 26.9

Table 3. FITNESSGRAM® Test Score Descriptive Statistics

<b>FITNESSGRAM® Test</b>	<b>Mean ± SD</b>	<b>N</b>
<b>Curl Up*</b>	34.61±26.56	314
<b>90-Degree Push Up*</b>	13.37±11.96	310
<b>Back-Saver Sit and Reach-Left (in.)</b>	8.97±2.88	313
<b>Back-Saver Sit and Reach-Right (in.)</b>	8.97±2.77	314
<b>PACER**</b>	38.64±7.79	312

\*Curl up and 90-degree push up were recorded as a maximum number of completed repetitions

\*\*PACER score was converted to estimated VO<sub>2</sub> max (ml/kg/min)<sup>2</sup>

*Table 4. Correlation Between Actual BMI Category Score and FITNESSGRAM® Scores*

<b>FITNESSGRAM® Test</b>	<b>Pearson Correlation (R)</b>	<b>R<sup>2</sup></b>	<b>Sig. (2- tailed)</b>	<b>N</b>
<b>Curl Up</b>	-0.113	0.013	0.047*	310
<b>90-Degree Push Up</b>	-0.308	0.095	0.000*	306
<b>Back-Saver Sit and Reach-Left</b>	0.002	0.000	0.965	310
<b>Back-Saver Sit and Reach-Right</b>	0.020	0.0004	0.723	311
<b>PACER</b>	-0.372	0.138	0.000*	308

\* $p \leq 0.05$

*Correlation between Perceived BMI Category Score and FITNESSGRAM® Scores*

Similar to the correlation results of actual BMI Image Category Scores with FITNESSGRAM® test measures, significant correlations were found between perceived BMI Image Category scores and the FITNESSGRAM® curl up, push up and PACER tests (Table 5) which supported the research hypothesis that lower perceived BMI would be associated with higher FITNESSGRAM® test scores. No significant correlations were found between perceived BMI and sit-and-reach tests on either left or right side ( $p=0.199$  and  $p=0.187$  for left and right, respectively).

*Table 5. Correlation Between Perceived BMI Category Score and FITNESSGRAM® Scores*

<b>FITNESSGRAM® Test</b>	<b>Pearson Correlation</b>	<b>R<sup>2</sup></b>	<b>Sig. (2- tailed)</b>	<b>N</b>
<b>Curl Up</b>	-0.187	0.035	0.002*	278
<b>90-Degree Push Up</b>	-0.307	0.094	0.000*	274
<b>Back-Saver Sit and Reach-Left</b>	-0.077	0.006	0.199	279
<b>Back-Saver Sit and Reach-Right</b>	-0.079	0.006	0.187	280
<b>PACER</b>	-0.414	0.171	0.000*	276

\* $p \leq 0.05$

*Correlation between Perceived BMI Category Score and Time Spent in Sedentary, Light, Moderate, Vigorous, Very Vigorous Activity*

Threshold values for accelerometer counts (counts/minute) were 0-149 for sedentary, 150-499 for light, 500-3999 for moderate, 4000-7599 for vigorous, and >7600 for very vigorous. Of the 69 children who consented to take part in the addition to the original study, 57 were included in the analysis using the accelerometer to examine perceived BMI which they identified using the Body Size Perception Visual Rating tool compared to the percentage of time spent in the different categories of physical activity: sedentary, light, moderate, vigorous, and very vigorous. Pearson's correlation was used for the correlation between student's perceived BMI and time in the different categories of physical activity. For all five categories of physical activity levels, no significant correlations were found with the perceived BMI Image Category Score (Table 6). In addition to analyzing the accelerometer count categories separately, they were also combined into sedentary-light and moderate-vigorous-very vigorous. Pearson's correlation was then used again for the correlation between student's perceived BMI and these two separate groups of intensity. For both combined groups of physical activity levels, no significant correlations were found with the perceived BMI Image Category Score (Table 7). This result shows no relationship between perceived BMI and activity level in this physical education class setting, and did not support the research hypothesis.



*Table 6. Correlation Between Perceived BMI Image Category Score and Percentage of Time Spent in S, L, M, V, VV activity*

<b>Activity Intensity Level</b>	<b>Pearson Correlation (R)</b>	<b>R<sup>2</sup></b>	<b>Sig. (2-tailed)</b>	<b>N</b>
<b>Sedentary (S)</b>	-0.008	0.000	0.955	57
<b>Light (L)</b>	-0.054	0.003	0.692	57
<b>Moderate (M)</b>	0.110	0.012	0.416	57
<b>Vigorous (V)</b>	-0.048	0.002	0.725	57
<b>Very Vigorous (VV)</b>	0.062	0.004	0.645	57

*\*p* ≤ 0.05

*Table 7. Correlation Between Perceived BMI Image Category Score and Percentage of Time Spent in S and L combined, M, V, and VV combined activity*

<b>Activity Intensity Level</b>	<b>Pearson Correlation (R)</b>	<b>R<sup>2</sup></b>	<b>Sig. (2-tailed)</b>	<b>N</b>
<b>Sedentary (S) and Light (L)</b>	-0.039	0.002	0.774	57
<b>Moderate (M), Vigorous (V), And Very Vigorous (VV)</b>	0.040	0.002	0.768	57

*\*p* ≤ 0.05

## **Chapter V:**

### **Discussion and Conclusion**

## **Chapter V: Discussion and Conclusion**

The purpose of this study was to explore whether fifth grade students' body perception affected their fitness performance in a physical education setting; to compare their self-body perception score to their actual BMI; and to see if there was a correlation between physical activity level and body perception. Body weight perception can be a strong determinant of weight management and nutritional habits among adolescents (Brener, 2004). Adolescents who are underweight or normal weight that perceive themselves as overweight are at an increased risk of eating disorders such as bulimia or anorexia nervosa (Brener, 2004). In addition, adolescents who view themselves' as normal or underweight but are actually overweight are less likely to diet or exercise (Brener, 2004). With preadolescents and adolescents viewing themselves as both overweight and underweight when they are actually the opposite of their view, it is clear that either image could cause nutrition-related issues. One of these issues that we chose to look at included exercise. Thus, it was important to view the body perceptions of students and the effects it had on fitness scores and physical activity levels.

With use of the KidQuest survey developed by South Dakota State University, we were able to obtain answers from fifth grade students about their body perception. The question developed from the BMJ Publishing Group Ltd. And Royal College of Pediatrics and Child health perception scale allowed us to understand the students' self-body perception. With the responses from the self- body perception question and Body Image Category scale, it is possible to better understand whether or not the students' perceived BMI is comparable to their actual BMI. From here, it is important to see if

students view themselves as smaller or larger than they actually are. Previous research showed that a negative response for body acceptance associated with a self-image heavier than the ideal one was associated with lower quality of life levels (Cavrini, 2013); however, to our knowledge no studies have been done on the association of body perception and FITNESSGRAM® scores. By analyzing and correlating the FITNESSGRAM® scores and body perceptions, our data showed that body perceptions were related to FITNESSGRAM® scores. Just as the researchers hypothesized, as body mass index perception scores increased, FITNESSGRAM® scores decreased. This was true for all tests (PACER, curl-up, and 90-degree push up) except for the right and left Back-Saver Sit and Reach tests, which measured flexibility. One study published in 2010 found that flexibility is lower at higher and lower BMIs in both boys and girls aged 13-18 years (Huang & Malina, 2010). Another study illustrated that the relationship between BMI and flexibility increase as age increases. This same study found a non-significant relationship between BMI and flexibility in girls aged 8-12 years. The best Back-Saver Sit and Reach scores were noted with a BMI in the 40<sup>th</sup> to 80<sup>th</sup> percentile, which is a normal weight. Whereas the poorest scores were shown with high and low extremes of BMI (Al-Asiri & Shaheen, 2015).

These findings could imply that preadolescents with higher body satisfaction engage in more physical activity such as exercise, team sport participation, and less sedentary activity such as television viewing than those with lower body satisfaction. Increased physical activity and decreased sedentary activity are believed to play a key role in obesity prevention. These findings show the importance of body satisfaction for the prevention of unhealthy weight control practices and a need to work toward

integrated prevention approaches with youth, specifically preadolescents (Goeden et al., 2004).

In addition to looking at the relationship between FITNESSGRAM® scores and body perception, the researchers were interested in the correlation between actual BMI and perceived BMI. Research has been done on high school students, but to our knowledge, little information is available on fifth grade students. For this research question, participants' actual BMI was translated into a BMI Image Category Score that matched the body images and corresponding BMI ranges from the BMI Publishing Group Ltd. And Royal College of Pediatrics and Child health perception scale. It was hypothesized that fifth grade children would perceive themselves as larger than they actually are; however, the data from this study showed that fifth grade students selected a lower perceived score than what their actual score translated to so they saw themselves as smaller than their actual BMI. The present findings on underestimating size are similar to those of Barrett's study on Jamaican adolescent children (Barrett et al, 2011). One can only speculate as to what might account for this unexpected finding. In the United States, body image satisfaction was inversely associated with body weight for female adults and adolescents (Barrett et al, 2011). Thus, underestimating weight may serve as a protective factor for self esteem. Another reason for this finding could involve the students' family members. For example, the family members could have large BMI's in comparison to the students; therefore, the student feels underweight compared to their parents or other family members (Brener, 2004). This inappropriate weight perception may increase the risk of obesity and obesity-related chronic diseases in adolescents and pre-adolescents (Barrett et al, 2011). Recognizing actual body weight is important for

these pre-adolescent students so they can choose to implement lifestyle changes to reduce the onset of chronic diseases associated with obesity. Although pre-adolescents may not have the ability to make changes at home as their parents are the primary decision-makers, it is important they know the consequences associated with obesity so they are aware for the future. If the pre-adolescents are unable to see themselves as overweight or obese, the task is getting them to view that. If they cannot, it may be a major obstacle promoting lifestyle changes.

While body perception did affect FITNESSGRAM® scores, no correlation was found between the self-body perception and physical activity level in PE class. This is most likely due to the short length of the class period. With classes ranging only 30-38 minutes long, it was difficult to gauge the actual physical activity of the student. To give a better assessment in the future, researchers could have the students wear accelerometers for a longer period of time, such as an entire school day, and then include multiple daily repetitions. Doing this could capture the physical activity available in a school environment as well as the time spent after school (i.e. sports, extracurricular activities, etc.). In addition to looking at the intensity of physical activity throughout an entire day and not just in PE class, it would be worthwhile to see if perceived BMI is affected at different times throughout the day. For example, participants may view themselves differently at the time when they are home around their family versus when they are around their peers.

## **Limitations & Recommendations**

Although significance was not shown with body image perception and physical activity level, there was significance shown with a correlation between body image perception and FITNESSGRAM® scores. In addition, the study helped show that students perceive themselves as smaller than they actually are, based on BMI.

Limitations and recommendations to overcome those limitations for future research fall into three categories: 1) Sample size for accelerometry; 2) Time for accelerometry; and 3) Setting for accelerometry.

### *Sample Size for Accelerometry*

The larger study's data was used for research questions one and two; therefore, this sample size was much larger and a parent notification form was utilized. However, a parental informed consent was required for the smaller study that looked at research question three regarding physical activity level and body image. It can be assumed that since the parental informed consent was required to be sent back, unlike the parent notification form, there were fewer participants in this portion of the study. In the future, researchers should utilize the parent notification for all parts, if possible.

*Time for Accelerometry*

The students who had consent for the study wore accelerometers during their physical activity class. The class only lasted for 30-38 minutes and this is a limitation because there was not enough time to understand their actual physical activity level. For future studies, it would be beneficial to look at a longer physical education class or even have the participants wear accelerometers for an entire 24-hour period and repeated 24-hour periods over more than one week to get more repetitions for comparison.

*Setting for Accelerometry*

As stated before, the students were in a physical education class when they wore the accelerometers. All classes had the same lesson about football. It would be interesting to look at how different lessons affect different students (possibly by age, gender, etc.) in the future. Looking at just one lesson was a limitation of this study because we were not able to see the progress over time as the students learned more. Perhaps their activity levels would have increased once they became more comfortable with the subject.



## Conclusion

In conclusion, this study shows that body image does have an effect on fitness scores in fifth graders when using FITNESSGRAM® testing methods. In addition, the study shows that with this group of students, actual BMI is larger than what the participants perceive their BMI as. In this study, there was no correlation between body image perception and physical activity level in a normal physical education class. This could be due to our small sample size for this additional portion of the study. The present study utilized data from the accelerometers that was condensed into 60 second time intervals. In the future, researchers could perform a similar study but with shorter time increments (i.e. 10 second epochs), to have more quick bouts of activity recorded for participants.

Results from this study have implications with regards to self-esteem and body image in adolescents and their physical fitness abilities. The higher ones' perceived BMI score and actual BMI is, the more likely they are to do more poorly on their fitness testing, specifically with FITNESSGRAM®. Using this knowledge helps others realize that body image does play a role in physical fitness. To address this issue, it is most important for physical education teachers to be aware of their students' body image perception and their self-efficacy. It would be possible, with a survey similar to this one, for the physical education teachers to evaluate their students' body image perception related to their actual BMI. They should know whether or not their students' believe they are capable to execute physical activities in an everyday setting or a fitness testing setting. From here, the teachers know if they need to increase their motivational skills with the students.

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## Appendices

## **Appendix A**

### **Letter of Permission from Johnson Crossing**



## JOHNSON CROSSING ACADEMIC CENTER

*Principal*  
Brent Cudly

**200 Johnson Rd.  
Fremont, Nebraska 68025  
(402)721-2003**

*Guidance Counselor*  
Dave Sutton

*Assistant Principal*  
Jason Chicoine

*Guidance Counselor*  
Kim Bottorff

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Research Compliance Services  
2200 Vine Street  
275 Whittier Research Center  
Lincoln, NE 68583-0863

Dear Institutional Review Board at the University of Nebraska-Lincoln,

I have spoken with Ashley Cleveland about her thesis project, which entails assessing the physical activity level of 150 randomly selected fifth grade students using accelerometers. Her plan is to do this sometime late April or early May 2015, which works best for the school due to summer break quickly approaching. I support the methods and procedures described in Project #15197 and understand that the data will be used to explore the relationship between self-body perception and physical activity level in a physical education class setting.

Sincerely,



Mr. Brent Cudly

Johnson Crossing Academic Center Principal

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**Appendix B**

University of Nebraska-Lincoln

Institutional Review Board Approval – [Study Name]



## Official Approval Letter for IRB project # 15197

April 15, 2015

Ashley Cleveland  
Department of Nutrition and Health Sciences

Linda Boeckner  
Department of Nutrition and Health Sciences  
LEV 119B, UNL, 68583-0806

IRB Number: 20150415197 EP  
Project ID: 15197  
Project Title: Fifth Grade Students Self Body Image Perception, FITNESSGRAM Scores, and Physical Activity Level in Physical Education

Dear Ashley:

This letter is to officially notify you of the approval of your project by the Institutional Review Board (IRB) for the Protection of Human Subjects. It is the Board's opinion that you have provided adequate safeguards for the rights and welfare of the participants in this study based on the information provided. Your proposal is in compliance with this institution's Federal Wide Assurance 00002258 and the DHHS Regulations for the Protection of Human Subjects (45 CFR 46). Your project has been approved under Expedited Category 4.

Date of EP Review: 4/5/15

You are authorized to implement this study as of the Date of Final Approval: 04/15/2015, this approval is Valid Until: 04/14/2016.

1. Your stamped and approved informed consent document has been uploaded to NUgrant (file with Approved, pdf in the file name). Please use this document to distribute to participants. If you need to make changes to the informed consent document, please submit the revised document to the IRB for review and approval prior to using it.

We wish to remind you that the principal investigator is responsible for reporting to this Board any of the following events within 48 hours of the event:

- \* Any serious event (including on-site and off-site adverse events, injuries, side effects, deaths, or other problems) which in the opinion of the local investigator was unanticipated, involved risk to subjects or others, and was possibly related to the research procedures;
- \* Any serious accidental or unintentional change to the IRB-approved protocol that involves risk or has the potential to recur;
- \* Any publication in the literature, safety monitoring report, interim result or other finding that indicates an unexpected change to the risk/benefit ratio of the research;
- \* Any breach in confidentiality or compromise in data privacy related to the subject or others;
- \* Any complaint of a subject that indicates an unanticipated risk or that cannot be resolved by the research staff.

For projects which continue beyond one year from the starting date, the IRB will request continuing review and update of the research project. Your study will be due for continuing review as indicated above. The investigator must also advise the Board when this study is finished or discontinued by completing the enclosed Protocol Final Report form and returning it to the Institutional Review Board.

If you have any questions, please contact the IRB office at 472-0865.

Sincerely,

Julia Torquati, Ph.D.  
Chair for the IRB

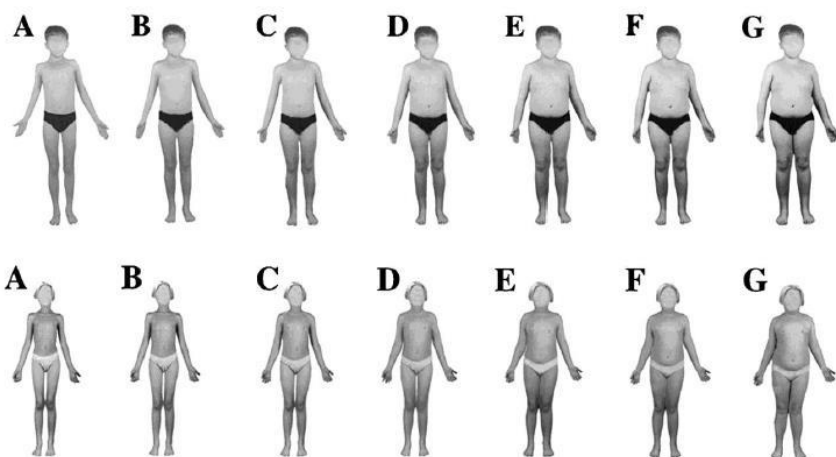


## **Appendix C**

### **Body Image Perception Instrument**

## Body Size Perception Visual Rating

Please circle the picture that you think represents how you see your body size.



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**Appendix D**  
**PACER Laps Recording Sheet**

A-CR-CCP-803/PF-001  
Chapter 4, Annex C

**FITNESSGRAM PACER Test Individual Score Sheet B**

Student Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27
28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54

*The Cooper Institute, Fitnessgram/Activitygram: Test Administration Manual (3<sup>rd</sup> ed.), Human Kinetics (p. 92)*

Figure 4C-2 Fitnessgram PACER Test Individual Scoresheet B

## **Appendix E**

### **FITNESSGRAM Performance Standards**





### FITNESSGRAM Performance Standards<sup>1</sup>

For each test area, the *FITNESSGRAM* uses the Healthy Fitness Zone (HFZ) to evaluate fitness performance. The performance goal for all test areas is the HFZ which represents a level of fitness that offers protection against the diseases that result from sedentary living. If the performance goal is not met, the results are classified as Needs Improvement (NI) or, for Aerobic Capacity and Body Composition, Very Lean (Body Composition only) or Needs Improvement-Health Risk (NI-HR). **Note: There are no changes to the performance standards for the 2015–16 school year.**

#### Females

Age	Aerobic Capacity			Body Composition <sup>1</sup>							
	One-Mile Run/20m PACER/Walk Test VO <sub>2</sub> max (ml/kg/min) <sup>2</sup>			Skinfold Measurements/ Bioelectric Impedance Analyzer Percent Body Fat				Body Mass Index			
	NI – Health Risk	NI	HFZ	NI – Health Risk	NI	HFZ	Very Lean	NI – Health Risk	NI	HFZ	Very Lean
5	VO <sub>2</sub> max standards not available for students ages 5 through 9 <sup>3</sup> . <b>For Walk Test only, standards also not available for students ages 10, 11, and 12.</b>			≥ 28.4	≥ 20.9	20.8 – 9.8	≤ 9.7	≥ 18.5	≥ 16.9	16.8 – 13.6	≤ 13.5
6				≥ 28.4	≥ 20.9	20.8 – 9.9	≤ 9.8	≥ 19.2	≥ 17.3	17.2 – 13.5	≤ 13.4
7				≥ 28.4	≥ 20.9	20.8 – 10.1	≤ 10.0	≥ 20.2	≥ 18.0	17.9 – 13.6	≤ 13.5
8				≥ 28.4	≥ 20.9	20.8 – 10.5	≤ 10.4	≥ 21.2	≥ 18.7	18.6 – 13.7	≤ 13.6
9				≥ 30.8	≥ 22.7	22.6 – 11.0	≤ 10.9	≥ 22.4	≥ 19.5	19.4 – 14.0	≤ 13.9
10	≤ 37.3	37.4 – 40.1	≥ 40.2	≥ 33.0	≥ 24.4	24.3 – 11.6	≤ 11.5	≥ 23.6	≥ 20.4	20.3 – 14.3	≤ 14.2
11	≤ 37.3	37.4 – 40.1	≥ 40.2	≥ 34.5	≥ 25.8	25.7 – 12.2	≤ 12.1	≥ 24.7	≥ 21.3	21.2 – 14.7	≤ 14.6
12	≤ 37.0	37.1 – 40.0	≥ 40.1	≥ 35.5	≥ 26.8	26.7 – 12.7	≤ 12.6	≥ 25.8	≥ 22.2	22.1 – 15.2	≤ 15.1
13	≤ 36.6	36.7 – 39.6	≥ 39.7	≥ 36.3	≥ 27.8	27.7 – 13.4	≤ 13.3	≥ 26.8	≥ 23.0	22.9 – 15.7	≤ 15.6
14	≤ 36.3	36.4 – 39.3	≥ 39.4	≥ 36.8	≥ 28.6	28.5 – 14.0	≤ 13.9	≥ 27.7	≥ 23.7	23.6 – 16.2	≤ 16.1
15	≤ 36.0	36.1 – 39.0	≥ 39.1	≥ 37.1	≥ 29.2	29.1 – 14.6	≤ 14.5	≥ 28.5	≥ 24.4	24.3 – 16.7	≤ 16.6
16	≤ 35.8	35.9 – 38.8	≥ 38.9	≥ 37.4	≥ 29.8	29.7 – 15.3	≤ 15.2	≥ 29.3	≥ 24.9	24.8 – 17.1	≤ 17.0
17	≤ 35.7	35.8 – 38.7	≥ 38.8	≥ 37.9	≥ 30.5	30.4 – 15.9	≤ 15.8	≥ 30.0	≥ 25.0	24.9 – 17.5	≤ 17.4
17+	≤ 35.3	35.4 – 38.5	≥ 38.6	≥ 38.6	≥ 31.4	31.3 – 16.5	≤ 16.4	≥ 30.0	≥ 25.0	24.9 – 17.8	≤ 17.7

≥ The score is greater than or equal to the indicated value.

≤ The score is less than or equal to the indicated value.

<sup>1</sup> The *FITNESSGRAM* and Healthy Fitness Zones (HFZ) are registered trademarks of The Cooper Institute.

<sup>2</sup> VO<sub>2</sub>max reflects the maximum rate that oxygen can be taken up and utilized by the body during exercise. It is estimated by utilizing the student's height, weight, and other specific information, which is based on the test option (i.e., One-Mile Run, 20m PACER, or Walk Test) administered. The calculation procedures are found in the Reference Guide on the California Physical Fitness Test (PFT) Resources Web page at <http://www.cpfdata.org/resources.aspx>.

<sup>3</sup> For Body Composition, the California Department of Education (CDE) considers a student who exceeds the HFZ as meeting the HFZ. Exceeding the HFZ means obtaining a score less than a number on the lower end or right side of the HFZ.

<sup>4</sup> Grade five students age 9 with time or laps reported have a VO<sub>2</sub>max calculated and are compared to the HFZ for students age 10. If a One-Mile Run time or PACER laps are reported for grade five students less than age 9, a VO<sub>2</sub>max will not be calculated, but the student will be reported in the HFZ.



#### Females

Age	Abdominal Strength and Endurance	Trunk Extensor Strength and Flexibility	Upper Body Strength and Endurance			Flexibility	
	Curl-Up # of completed up to max of 75	Trunk Lift # of inches up to max of 12	90° Push-Up # of completed up to max of 75	Modified Pull-Up # of completed up to max of 75	Flexed-Arm Hang # of seconds up to max of 90	Back-Saver Sit & Reach <sup>1</sup> # of inches up to max of 12	Shoulder Stretch
5	≥ 2	6 – 12	≥ 3	≥ 2	≥ 2	9	Touching fingertips together behind the back on <b>both</b> the right and left sides.
6	≥ 2	6 – 12	≥ 3	≥ 2	≥ 2	9	
7	≥ 4	6 – 12	≥ 4	≥ 3	≥ 3	9	
8	≥ 6	6 – 12	≥ 5	≥ 4	≥ 3	9	
9	≥ 9	6 – 12	≥ 6	≥ 4	≥ 4	9	
10	≥ 12	9 – 12	≥ 7	≥ 4	≥ 4	9	
11	≥ 15	9 – 12	≥ 7	≥ 4	≥ 6	10	
12	≥ 18	9 – 12	≥ 7	≥ 4	≥ 7	10	
13	≥ 18	9 – 12	≥ 7	≥ 4	≥ 8	10	
14	≥ 18	9 – 12	≥ 7	≥ 4	≥ 8	10	
15	≥ 18	9 – 12	≥ 7	≥ 4	≥ 8	12	
16	≥ 18	9 – 12	≥ 7	≥ 4	≥ 8	12	
17	≥ 18	9 – 12	≥ 7	≥ 4	≥ 8	12	
17+	≥ 18	9 – 12	≥ 7	≥ 4	≥ 8	12	

≥ The score is greater than or equal to the indicated value.

≤ The score is less than or equal to the indicated value.

<sup>1</sup> Student must reach the distance on both the right and left sides to achieve the HFZ.



## FITNESSGRAM Performance Standards<sup>1</sup>

For each test area, the FITNESSGRAM uses the Healthy Fitness Zone (HFZ) to evaluate fitness performance. The performance goal for all test areas is the HFZ which represents a level of fitness that offers protection against the diseases that result from sedentary living. If the performance goal is not met, the results are classified as Needs Improvement (NI) or, for Aerobic Capacity and Body Composition, Very Lean (Body Composition only) or Needs Improvement-Health Risk (NI-HR). **Note: There are no changes to the performance standards for the 2015–16 school year.**

### Males

Age	Aerobic Capacity			Body Composition <sup>1</sup>							
	One-Mile Run/20m PACER/Walk Test VO <sub>2</sub> max (mL/kg/min)			Skinfold Measurements/ Bioelectric Impedance Analyzer Percent Body Fat				Body Mass Index			
	NI – Health Risk	NI	HFZ	NI – Health Risk	NI	HFZ	Very Lean	NI – Health Risk	NI	HFZ	Very Lean
5	VO <sub>2</sub> max standards not available for students ages 5 through 9 <sup>2</sup> . For Walk Test only, standards also not available for students ages 10, 11, and 12.			≥ 27.0	≥ 18.9	18.8 – 8.9	≤ 8.8	≥ 18.1	≥ 16.9	16.8 – 13.9	≤ 13.8
6				≥ 27.0	≥ 18.9	18.8 – 8.5	≤ 8.4	≥ 18.8	≥ 17.2	17.1 – 13.8	≤ 13.7
7				≥ 27.0	≥ 18.9	18.8 – 8.3	≤ 8.2	≥ 19.6	≥ 17.7	17.6 – 13.8	≤ 13.7
8				≥ 27.0	≥ 18.9	18.8 – 8.4	≤ 8.3	≥ 20.6	≥ 18.3	18.2 – 14.0	≤ 13.9
9				≥ 30.1	≥ 20.7	20.6 – 8.7	≤ 8.6	≥ 21.6	≥ 19.0	18.9 – 14.2	≤ 14.1
10	≤ 37.3	37.4 – 40.1	≥ 40.2	≥ 33.2	≥ 22.5	22.4 – 8.9	≤ 8.8	≥ 22.7	≥ 19.8	19.7 – 14.5	≤ 14.4
11	≤ 37.3	37.4 – 40.1	≥ 40.2	≥ 35.4	≥ 23.7	23.6 – 8.8	≤ 8.7	≥ 23.7	≥ 20.6	20.5 – 14.9	≤ 14.8
12	≤ 37.6	37.7 – 40.2	≥ 40.3	≥ 35.9	≥ 23.7	23.6 – 8.4	≤ 8.3	≥ 24.7	≥ 21.4	21.3 – 15.3	≤ 15.2
13	≤ 38.6	38.7 – 41.0	≥ 41.1	≥ 35.0	≥ 22.9	22.8 – 7.8	≤ 7.7	≥ 25.6	≥ 22.3	22.2 – 15.8	≤ 15.7
14	≤ 39.6	39.7 – 42.4	≥ 42.5	≥ 33.2	≥ 21.4	21.3 – 7.1	≤ 7.0	≥ 26.5	≥ 23.1	23.0 – 16.4	≤ 16.3
15	≤ 40.6	40.7 – 43.5	≥ 43.6	≥ 31.5	≥ 20.2	20.1 – 6.6	≤ 6.5	≥ 27.2	≥ 23.8	23.7 – 16.9	≤ 16.8
16	≤ 41.0	41.1 – 44.0	≥ 44.1	≥ 31.6	≥ 20.2	20.1 – 6.5	≤ 6.4	≥ 27.9	≥ 24.6	24.5 – 17.5	≤ 17.4
17	≤ 41.2	41.3 – 44.1	≥ 44.2	≥ 33.0	≥ 21.0	20.9 – 6.7	≤ 6.6	≥ 28.6	≥ 25.0	24.9 – 18.1	≤ 18.0
17+	≤ 41.2	41.3 – 44.2	≥ 44.3	≥ 35.1	≥ 22.3	22.2 – 7.0	≤ 6.9	≥ 29.3	≥ 25.0	24.9 – 18.6	≤ 18.5

≥ The score is greater than or equal to the indicated value.  
 ≤ The score is less than or equal to the indicated value.

<sup>1</sup> The FITNESSGRAM and Healthy Fitness Zones (HFZ) are registered trademarks of The Cooper Institute.

<sup>2</sup> VO<sub>2</sub>max reflects the maximum rate that oxygen can be taken up and utilized by the body during exercise. It is estimated by utilizing the student's height, weight, and other specific information, which is based on the test option (i.e., One-Mile Run, 20m PACER, or Walk Test) administered. The calculation procedures are found in the Reference Guide on the California Physical Fitness Test (PFT) Resources Web page at <http://www.pftdata.org/resources.aspx>.

<sup>3</sup> For Body Composition, the California Department of Education (CDE) considers a student who exceeds the HFZ as meeting the HFZ. Exceeding the HFZ means obtaining a score less than a number on the lower end or right side of the HFZ.

<sup>4</sup> Grade five students age 9 with time or laps reported have a VO<sub>2</sub>max calculated and are compared to the HFZ for students age 10. If a One-Mile Run time or PACER laps are reported for grade five students less than age 9, a VO<sub>2</sub>max will not be calculated, but the student will be reported in the HFZ.



### Males

Age	Abdominal Strength and Endurance	Trunk Extensor Strength and Flexibility	Upper Body Strength and Endurance			Flexibility	
	Curly-Up # completed up to max of 75	Trunk Lift # of inches up to max of 12	90° Push-Up # completed up to max of 75	Modified Pull-Up # completed up to max of 75	Flexed-Arm Hang # of seconds up to max of 90	Back-Saver Sit & Reach <sup>1</sup> # of inches up to max of 12	Shoulder Stretch
5	≥ 2	6 – 12	≥ 3	≥ 2	≥ 2	8	Touching fingertips together behind the back on both the right and left sides.
6	≥ 2	6 – 12	≥ 3	≥ 2	≥ 2	8	
7	≥ 4	6 – 12	≥ 4	≥ 3	≥ 3	8	
8	≥ 6	6 – 12	≥ 5	≥ 4	≥ 3	8	
9	≥ 9	6 – 12	≥ 6	≥ 5	≥ 4	8	
10	≥ 12	9 – 12	≥ 7	≥ 5	≥ 4	8	
11	≥ 15	9 – 12	≥ 8	≥ 6	≥ 6	8	
12	≥ 18	9 – 12	≥ 10	≥ 7	≥ 10	8	
13	≥ 21	9 – 12	≥ 12	≥ 8	≥ 12	8	
14	≥ 24	9 – 12	≥ 14	≥ 9	≥ 15	8	
15	≥ 24	9 – 12	≥ 16	≥ 10	≥ 15	8	
16	≥ 24	9 – 12	≥ 18	≥ 12	≥ 15	8	
17	≥ 24	9 – 12	≥ 18	≥ 14	≥ 15	8	
17+	≥ 24	9 – 12	≥ 18	≥ 14	≥ 15	8	

≥ The score is greater than or equal to the indicated value.  
 ≤ The score is less than or equal to the indicated value.

<sup>1</sup> Student must reach the distance on both the right and left sides to achieve the HFZ.

**Appendix F**  
**Youth Assent Form**  
**(English and Spanish)**



IRB# 20150415197 EX  
Date Approved: 04/15/2015  
Valid Until: 04/14/2016

COLLEGE OF EDUCATION AND HUMAN SCIENCES  
Department of Nutrition and Health Sciences

#### **YOUTH ASSENT FORM**

Physical Activity Level in a Physical Education Class

We would like for you to help us with a study. The project is an addition to the KidQuest nutrition lessons you have been doing on Friday's in your P.E. class. We want to see if the way you think you look affects your physical activity level in a normal P.E. class. We will use the pictures you think look like you from the previous study in addition to the new part. If you want to help, you will wear a gadget called an Accelerometer for one whole class. Only 25 students will wear one of these, so you might not be randomly selected. The researchers will help you put the accelerometer around your waist (it clips right above your belly button) and it will record your activity level throughout the whole class.

We want to do this study so that we can see how you see yourself affects the way you move in P.E. Your individual results from the accelerometer will be private. We will not be sharing your individual information with anyone and none of your information will be connected to your name.

Your parents will also be asked to give their permission for you to take part in this study. Please talk this through with your parents before you decide that you want to do this. If you decide you do not want to wear an accelerometer, you can stop at any time by just telling one of us.

If you have any questions at any time, please ask one of the researchers.

Signature of Subject

Date

Signature of Investigator

Date

#### **PRIMARY INVESTIGATOR**

Ashley Cleveland  
Phone: 618-979-7860

#### **ADVISOR and CO-INVESTIGATOR**

Dr. Linda Boeckner  
Phone: 402-472-7634



IRB# 20150415197 EX  
Date Approved: 04/15/2015  
Valid Until: 04/14/2016

FACULTAD DE EDUCACIÓN Y CIENCIAS HUMANAS  
Departamento de Nutrición y Ciencias De La Salud

### FORMULARIO DE CONSENTIMIENTO PARA JÓVENES

Nivel De Actividad Física En Una Clase De Educación Física

Nos gustaría que nos ayude con un estudio. El proyecto es una adición a las lecciones de nutrición de KidQuest que usted ha estado haciendo los viernes en la clase de educación física. Queremos ver si la manera de pensar sobre su apariencia física tiene algún efecto en la actividad física durante una clase de educación física. Vamos a utilizar las imágenes que usted piensa que se parecen a usted del estudio previo además de una parte nueva. Si quiere ayudar, usted usará un dispositivo llamado un acelerómetro durante una clase entera. Sólo 25 estudiantes usarán uno de estos, por lo que podrían no escogerlo al azar. Los investigadores le ayudarán a ponerse el acelerómetro alrededor de su cintura (lo usará justo encima de su ombligo) y registrarán su nivel de actividad a lo largo de toda la clase.

Queremos hacer este estudio para poder ver cómo su percepción de apariencia física afecta la manera de moverse en su clase de actividad física. Sus resultados individuales del acelerómetro serán privados. No compartiremos su información personal con nadie y ninguna de su información estará conectada a su nombre.

También se le pedirá a sus padres dar permiso para que usted tome parte en este estudio. Por favor, hable de esto con sus padres antes de decidir si quiere hacer esto. Si usted decide que no quiere usar un acelerómetro, usted puede parar en cualquier momento con sólo decirle a uno de nosotros.

Si tiene alguna pregunta en cualquier momento, por favor preguntele a uno de los investigadores.

Firma del Participante

Fecha

Firma del Investigador

Fecha

### INVESTIGADOR PRIMARIO

Ashley Cleveland  
Teléfono: 618-979-7860

### ASESOR ACADÉMICO y CO-INVESTIGADOR

Dr. Linda Boeckner  
Teléfono: 402-472-7634

**Appendix G**  
**Parental Consent Form**  
**(English and Spanish)**



COLLEGE OF EDUCATION AND HUMAN SCIENCES  
Department of Nutrition and Health Sciences

PARENTAL INFORMED CONSENT FORM  
Physical Activity Level in a Physical Education Class

Dear Parent/ Guardian:

We are excited to announce that your child has the opportunity to participate in an extension of the research project (KidQuest) they have been doing in their P.E. class. The goal of this project is to understand how physically active your child is being in P.E. class (i.e. low, moderate, highly active). We will be looking at their responses from the previous surveys they took in response to how they view their body image. We will then see if there is a relationship between body image and physical activity level. The research project will only take one class period.

This letter is a request for your child to participate in this extension of the KidQuest research project developed by the University of Nebraska- Lincoln Nutrition Education Program.

We are requesting your permission to conduct the following evaluations. Your child will be asked to do the following:

- Wear an accelerometer around the waist (above the belly-button on the outside of their clothing)
- Participate in a regular P.E. class while wearing the accelerometer

The measurements will be free of charge. Confidentiality of individual measurements will be strictly protected. Participation in the components of the project listed above are voluntary and you may withdraw your child at any time without penalty. Youth will be provided with the regular P.E. class regardless of whether or not they participate in the evaluation measures listed above. There are no known risks associated with this research.

The data (without any individual identifiers) may be submitted to professional journals and other publications may be presented in a public setting.

If you have additional questions about the research that will be done, please contact the primary investigator listed below.

Ashley Cleveland  
Masters Candidate  
University of Nebraska- Lincoln  
Telephone: (618) 979-7860  
Email: ashleycleveland12@gmail.com

Dr. Linda Boeckner  
Academic Advisor/ Co-investigator  
University of Nebraska-Lincoln  
Telephone: (402) 472-7634  
Email: lboeckner1@unl.edu

Your child's rights as a research participant have been explained to you. You may ask questions concerning this research and have those questions answered before agreeing to participate in or during the study. Or you may call the investigator at any time at (618) 979-7860. Please contact the investigator:

- If you want to voice concerns or complaints about the research

Please contact the University of Nebraska- Lincoln Institutional Review Board at (402) 472-6965 for the following reasons

- You wish to talk to someone other than the research staff to obtain answers to questions about your rights as a research participant
- To voice concerns or complaints about the research
- To provide input concerning the research process
- In the event the study staff could not be reached

Participation in this study is voluntary. You are free to decide not to enroll your child in this study extension. You can refuse to participate or withdraw your child at any time without harming their or your relationship with the researchers or the University of Nebraska-Lincoln, (or other institutions or organizations), or in any other way receive penalty or loss of benefits to which you are otherwise entitled.



Dr. Linda Boeckner  
Academic Advisor/ Co-investigator  
University of Nebraska-Lincoln  
Telephone: (402) 472-7634  
Email: lboeckner1@unl.edu

Your child's rights as a research participant have been explained to you. You may ask questions concerning this research and have those questions answered before agreeing to participate in or during the study. Or you may call the investigator at any time at (618) 979-7860. Please contact the investigator:

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- To provide input concerning the research process
- In the event the study staff could not be reached

Participation in this study is voluntary. You are free to decide not to enroll your child in this study extension. You can refuse to participate or withdraw your child at any time without harming their or your relationship with the researchers or the University of Nebraska-Lincoln, (or other institutions or organizations), or in any other way receive penalty or loss of benefits to which you are otherwise entitled.



FACULTAD DE EDUCACIÓN Y CIENCIAS HUMANAS  
Departamento de Nutrición y Ciencias De La Salud

FORMULARIO DE CONSENTIMIENTO INFORMADO PARA LOS PADRES  
Nivel De Actividad Física En Una Clase De Educación Física

Estimado Padre / Tutor Legal:

Estamos muy contentos de anunciar que su niño tiene la oportunidad de participar en una extensión del proyecto de investigación (KidQuest) que ha estado haciendo en su clase de educación física. El objetivo de este proyecto es entender que tan activo su niño ha estado en la clase de educación física (es decir, bajamente, moderadamente, altamente activo). Vamos a estar mirando las respuestas a las encuestas previas que ellos tomaron con respecto a como ven su imagen corporal. Después veremos si hay una relación entre la imagen corporal y el nivel de actividad física. El proyecto de investigación sólo tomará un período de clase.

Esta carta es una petición para que su niño participe en esta extensión del proyecto de investigación KidQuest desarrollado por el Programa de Educación Nutricional de la Universidad de Nebraska - Lincoln.

Estamos solicitando su permiso para conducir las siguientes evaluaciones. Le pediremos a su niño que haga lo siguiente:

- Use un acelerómetro alrededor de la cintura (arriba del ombligo en el exterior de su ropa)
- Participe en una clase de educación física habitual mientras usa el acelerómetro

Las medidas serán gratuitas. La confidencialidad de medidas individuales será estrictamente protegida. La participación en los componentes del proyecto mencionados previamente es voluntaria y usted puede retirar a su niño en cualquier momento sin penalización. Los jóvenes recibirán la clase de educación física habitual, independientemente de si participan o no en las medidas de evaluación mencionadas anteriormente. No existen riesgos conocidos asociados con esta investigación.

Los datos (sin ningún tipo de identificadores individuales) pueden ser presentados a revistas académicas y otras publicaciones se pueden presentar en un lugar público.

Si usted tiene preguntas adicionales sobre la investigación que se va a hacer, por favor póngase en contacto con el investigador principal que aparece a continuación.

Ashley Cleveland  
Candidata a Maestría  
Universidad de Nebraska - Lincoln  
Teléfono: (618) 979-7860  
Correo Electrónico: ashleycleveland12@gmail.com

Dr. Linda Boeckner  
Asesor Académico / Co-investigador  
Universidad de Nebraska - Lincoln  
Teléfono: (402) 472-7634  
Correo Electrónico: lboeckner1@unl.edu

Los derechos de su niño como participante de la investigación se le han explicado a usted. Usted puede hacer preguntas con respecto a esta investigación y obtener las respuestas antes de aceptar a participar en o durante el estudio. O puede llamar al investigador en cualquier momento al (618) 979-7860. Por favor, póngase en contacto con el investigador:

- Si desea expresar sus preocupaciones o quejas sobre la investigación

Por favor, póngase en contacto con la Junta de Revisión Institucional de la Universidad de Nebraska-Lincoln al (402) 472-6965 por las siguientes razones

- Usted desea hablar con alguien que no sea el personal de investigación para obtener respuestas a preguntas sobre sus derechos como participante de la investigación
- Para expresar sus preocupaciones o quejas sobre la investigación
- Para dar aportes sobre el proceso de investigación
- En caso de que no pudo contactar al personal del estudio

La participación en este estudio es voluntaria. Usted es libre de decidir no inscribir a su niño en este estudio de extensión. Usted puede negarse a participar o retirar a su niño en cualquier momento sin perjudicar su relación o la de su niño con los investigadores o la Universidad de Nebraska-Lincoln, (u otras instituciones u organizaciones), o de cualquier otra manera recibir una sanción o pérdida de beneficios a los que usted tiene derecho.

**DOCUMENTACIÓN DE CONSENTIMIENTO INFORMADO**

**USTED ESTÁ TOMANDO UNA DECISIÓN VOLUNTARIA DE PERMITIR O NO PERMITIR QUE SU NIÑO PARTICIPE EN EL ESTUDIO DE INVESTIGACIÓN. SU FIRMA CERTIFICA QUE USTED CONFIRMA QUE HA LEÍDO Y ENTENDIDO ESTE DOCUMENTO Y ESTÁ DANDO SU PERMISO PARA QUE SU NIÑO PARTICIPE EN ESTE ESTUDIO DE INVESTIGACIÓN DE EXTENSIÓN. AL CONTACTAR AL INVESTIGADOR PRINCIPAL YA ENUMERADO USTED PUEDE SOLICITAR UNA COPIA DE ESTE FORMULARIO DE CONSENTIMIENTO. DEVUELVA ESTA PÁGINA, FIRMADA, USANDO EL SOBRE ADJUNTO, CON SU NIÑO A SU PROFESOR O A LA SIGUIENTE DIRECCIÓN:**

Dr. Linda Boeckner  
119B Leverton Hall  
Lincoln, NE 68583-0806

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Nombre del Niño

Fecha

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Firma del Padre/Tutor Legal

Fecha

