THE RELATIONSHIPS AMONG WEIGHT STATUS, PHYSICAL ACTIVITY, AND BODY-ESTEEM IN 3RD GRADE CHILDREN FROM RURAL OKLAHOMA

By

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CHAPTER I

INTRODUCTION

The prevalence of childhood obesity has been increasing in the U.S. over the past 30 years (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010). Current statistics indicate that 37% of children ages 6 to 11 years are either overweight or obese in the U.S. (Janicke et al., 2008). Overweight children have been shown to have an increased risk for a variety of chronic conditions such as type II diabetes and high blood pressure, are more likely to be teased, and are more likely to have lower self-esteem than children of normal weight (Greenleaf, Martin, & Rhea, 2008).

Obesity results from a positive energy balance in which energy intake exceeds energy output on a consistent basis (Center for Disease Control (CDC), 2009). While a variety of dietary recommendations exist to reduce and/or prevent obesity, regular physical activity is always recommended to prevent obesity, and improve overall health of children, as well as positively influence children's self-esteem (Paxton, 2005). Research indicates that decreased levels of physical activity are seen in children as young as first to third grade (Vincent, 2003). Along with decreased physical activity, in the past decade, children are also spending more time in sedentary activities compared to the past.

According to Andersen and colleagues, 67% of American children age 8 to 16 years spend two hours each day watching television and 26% watch television more than 4 hours a day (1998). More sedentary behaviors indicate less physical activity, which can put children at greater risk for physical and non-physical consequences of obesity (Paxton, 2005).

The increasing prevalence of obesity and decreasing levels of physical activity levels may be particularly threatening to children residing in rural areas in the U.S. While there is limited research related to individual lifestyle behaviors in rural areas, some studies indicate that rural residents are more likely to be obese than their urban counterparts (Jackson, Doescher, Jerant, & Hart, 2005). The increased obesity rates do not affect just rural adults, but also children who are at a higher risk for excess adiposity compared to children living in urban areas (Moore et al., 2010). With the prevalence of obesity being higher in rural areas, this suggests important interventions in rural public health planning (Jackson et al., 2005).

While some studies have examined child obesity rates in rural areas in recent years, a critical gap still exists in our understanding of the relationship between body weight, physical activity, and body-esteem. Prior studies have investigated the topics of childhood obesity and general self-esteem; however, to date only a few studies focused on examining the links between body weight, physical activity and body-esteem which is the physical counterpart of self-esteem. Given that the influence of physical activity and weight status on body-esteem among rural children is not well understood, the proposed study will examine the nature of the relationship among body weight, physical activity, body-esteem in a sample of 3rd grade children living in rural Oklahoma.

CHAPTER II

REVIEW OF THE LITERATURE

CHILDHOOD OBESITY

The prevalence of childhood obesity has been a growing concern in the United States. Childhood obesity has tripled in the past 30 years (CDC, 2010). Obesity prevalence has increased from 6.5% in 1980 to 19.6% in 2008 among 6 to 11 year old children (CDC, 2010). Although obesity is an outcome of an imbalance in caloric intake verses caloric expenditure, genetic, environmental, and behavioral factors also play a role in obesity development (Dhir & Ryan, 2010). Excessive weight may negatively influence children not only in terms of their physical health, but also in terms of their emotional health (Cornette, 2008). Thus, in 2001, the Surgeon General stated that the main concern of individuals should be health, and he requested efforts to be made in the way overweight and obese individuals are perceived in all age groups (U.S. Department of Health and Human Services (USDHHS), 2001).

Definition of Childhood Obesity

The Body Mass Index (BMI) is an internationally accepted measure of adiposity in adults (CDC, 2009). Because this measure cannot be accurately used for children, the Body

Mass Index for age (BMI-for-age) was developed in order to address the growth and development that takes place during childhood and adolescence (CDC, 2009). Therefore, the BMI (kg/m²) adjusted for age and gender (BMI-for-age) developed by the CDC in 2000 has been consistently utilized in the U.S. to assess weight status of American children and monitor the prevalence of underweight, normal weight, overweight and obese children nationwide (CDC, 2009; Dhir & Ryan, 2010).

The most commonly used method for defining childhood obesity is calculating BMI (kg/m²) that is adjusted for age and gender. The BMI-for-age is used to categorize children as underweight, normal weight, overweight or obese (CDC, 2009). The issues that can cause an individual child to gain weight are complex, as many factors are involved (Vos & Welsh, 2010). Recent research suggests that the BMI of the mother and father is a predictor of the BMI of the child, and contribute to the development of obesity during childhood (Dhir & Ryan, 2010; Vos & Welsh, 2010). About 5% of the childhood obesity cases are caused by impaired gene function, and several of the behavioral traits that children develop seem to be inherited rather than taught (Dhir & Ryan, 2010; Vos & Welsh, 2010).

Factors Influencing the Development of Childhood Obesity

The universal cause of obesity is an imbalance between energy intake and expenditure that can lead to the buildup of excess fat and consequently obesity (Dhir & Ryan, 2010). Caloric balance is key for maintaining a healthy weight, and if too many calories are consumed as compared to the amount of calories being burned off during

physical activity, these extra calories will be stored as fat in the body, causing weight gain (CDC, 2009).

Weight issues, and thus energy imbalance, in children and adolescents are complex and are directly influenced by genetics, behavioral factors (physical activity and dietary intakes), and various environmental factors (Vos & Welsh, 2010; USDHHS, 2007). The family environment is consistently identified in literature as a significant influence on dietary preferences as well as physical activity (Smith et al., 2010). Parents are typically the most influential people in children's lives, and parents who are obese are more likely to have overweight children (Stenhammer et al., 2010). One study found that the risk of obesity at 8 years old in boys and girls 6 to 10-fold was increased if the same-sex parent was obese (Dhir & Ryan, 2010). Psychosocial stress could be a component of childhood overweight, and as parents have a vital role in the child's life, parental stress may be linked to the child's risk for being overweight (Stenhammer et al., 2010). Parental self-efficacy and activity levels have an effect on the amount of activity a child performs, as parents with a higher self-efficacy report that their children spend a significantly higher amount in physical activity than other children (Smith et al., 2010).

As more parents are working, families are beginning to rely on pre-packaged foods, which are processed and high in fat and calories and low in other nutrients (Dhir & Ryan, 2010). Modern diets have increased in caloric value through saturated fats, trans fats, sugars, and calories, and a predominantly sedentary lifestyle in children is also accountable for this increase in weight (Brown et al., 2009). These factors are influenced by advertising, marketing, food prices, and increased reliance on eating food away from home (St. Onge, Keller, & Heymsfield, 2003). In 1995, 40% of food money in families

was being spent in restaurants, which is associated with greater intake of soda and lower intakes of grains, fruits, vegetables, and milk (French, Story, Neumark-Sztainer, Fulkerson, & Hannan, 2001). In a longitudinal study of young adult women conducted by French, Harnack, and Jeffrey (2000), they found that one additional fast food meal each week resulted in a 56 kcal/d increase and a weight gain of 0.72 kg (1.6 pounds) above the average weight gain that naturally occurs in a 3 year time period. These rising trends in the fast food restaurant industry suggest that the quality of diet in children and adolescents has worsened over the past several years (St. Onge et al., 2003).

Gender and Regional Differences in the Prevalence of Childhood Obesity

Although adiposity among children has increased across the entire U.S, differences in the prevalence of childhood obesity have been identified by gender, age, as well as geographical location (Smith, Vendela, Bartee, & Carr, 2008). Research indicates that between the years of 1995 and 2008 (Ogden et al., 2010), obesity among boys aged 2 to 19 years increased from 11% to 31.9%, and obesity among girls aged 2 to 19 years increased from 12% to 34.6% on average (American Heart Association (AHA), 2011). The etiology of overweight and obesity among boys and girls may be different, not only because of social and cultural influences, but also biological differences between males and females, as findings indicate that boys engage in more physical activity, and social pressures are different for each sex (Simen-Kapeu &Veugelers, 2010).

Since 1980, reports indicate rural residents are at a higher risk of becoming obese compared to urban residents (Jackson et al., 2005). Childhood overweight has been reported to vary by geographical region as well, as higher prevalence of obesity has been

seen in rural areas compared to urban areas in developed countries, suggesting that effective interventions for rural children and youth areas are needed (Simen-Kapeu & Veugelers, 2010). For children living in rural areas, Tambalis, Panagiotakos, and Sidossis (2010), found that from 1997 to 2008, the prevalence of obesity in boys (8.1% to 12.4%) and girls (7.2% to 11.3%) increased more in rural areas compared to urban areas. Research also suggests contributing factors that may be responsible for these trends, including the smaller population size of rural communities and the distance to a metropolitan area (Jackson et al., 2005). The risk of overweight is highly present in rural schools (Simen-Kapeu & Veugelers, 2010), and could be contributed to difficulties in accessing healthy foods or lack of availability of healthy foods in rural areas (Tambalis, Panagiotakos, & Sidossis, 2010). The higher prevalence of obesity in rural Oklahoma has also been observed. One study indicates the prevalence of rural Oklahoma obesity among adults is increasing annually 5.6-7.6% from an already moderate prevalence of 20.2% to 22.7% (Jackson et al., 2005).

Consequences of Childhood Obesity

There are both physical and non-physical consequences of childhood overweight (Cornette, 2008). Physical consequences of obesity include hypertension, dyslipidemia, insulin resistance, and fatty liver disease to name a few (Han, Lawlor, & Kimm, 2010). Non-physical complications of obesity may include depression, social isolation, poor self-esteem, discrimination, poor self-image, and low academic performance (Cornette, 2008). Both physical and emotional consequences of obesity may significantly diminish children's wellbeing and should be treated (Cornette, 2008).

Physical health consequences of childhood obesity are often the main focus of concern for many people, including health care professionals and researchers (Cornette, 2008). Overweight youth are at an increased risk for developing several health problems in their adulthood. There has been a strong association found between childhood obesity and early-onset comorbidities like insulin resistance, type 2 diabetes, hypertension, dyslipidemia, nutritional deficiencies, and lifestyle factors (Raghuveer, 2010). When excess weight develops during childhood, it can track into the adult life (Dhir & Ryan, 2010) and continue to worsen, thus causing children to experience weight problems their entire lives (Raghuveer, 2010).

In terms of cardiovascular risk, a population-based study of 5 to 17 year old obese children indicated that 70% of the children presented at least one risk factor for cardiovascular disease (CDC, 2010). Childhood obesity is also associated with insulin resistance and glucose intolerance, which leads to the development of type 2 diabetes (Lee, 2009). The American Diabetes Association now recommends that obese children after age 10, or when puberty onset occurs, should be screened for type 2 diabetes, because an intervention could prevent the glucose intolerance at such a young age from turning into diabetes (Lee, 2009). Hypertension is also a main concern for overweight children, as they are at a 3-fold higher risk for developing hypertension than non-obese children (Lee, 2009). According to research, 20% to 30% of obese children 5 to 11 years of age have elevated diastolic or systolic blood pressure, which can lead to an 8-fold increase of developing hypertension as adults (Lee, 2009). Dyslipidemia is another comorbidity of childhood obesity, and is also related to diabetes and hypertension (Raghuveer, 2010). Dyslipidemia is defined as high triglycerides, and usually a

combination of high LDL (low density lipoprotein) cholesterol, low HDL (high density lipoprotein) cholesterol, and high VLDL (very low density lipoprotein) cholesterol (Raghuveer, 2010). Obesity increases adiposity, which may result in abnormal lipid levels, causing dyslipidemia (Lee, 2009).

Obstructive sleep apnea is a pulmonary disorder than can occur in overweight children, caused from a large amount of abdominal fat that leads to rapid, shallow breathing with carbon dioxide accumulation and several moments when no breath is taken at all (Han et al., 2010; Lee, 2009). Obese children have been reported more frequently to have sleep apnea and other reactive airway diseases than their normal weight peers, in fact, an estimated 33% to 94% of children with severe obesity suffer from sleep apnea (Han et al., 2010; Lee, 2009). Obstructive sleep apnea is a major concern because it is thought to impair cardiovascular, metabolic, and cognitive functions, and is related to social and behavioral problems (Kohler et al., 2009). It may also cause an increased appetite, when compared with non-obese children (Spruyt, Sands Capdevila, Serpero, Kheirandi, 2010). Sleep apnea may also impact academic or work performance because it is associated with daytime drowsiness and poor concentration, as well as memory lapses (Lee, 2009). In general, overweight and obesity can be seen as a chronic medical condition with several physical consequences, which not only impacts their lives as children, but also as adults (Lee, 2009).

In terms of non-physical consequences, the most immediate impact of obesity that children experience themselves is social discrimination and low self-esteem (USDHHS, 2007; Paxton, 2005). Literature reports predominant negative attitudes toward obese children, being rated by peers as less intelligent and attractive, less friendly, and less

popular, and more mean and lazy than non-obese children (Griffiths & Page, 2008). As children develop, they construct an identity and concept of themselves (Paxton, 2005) and if this concept is negative, it may result in a decreased life expectancy and quality of life (Wang & Veugelers, 2008). Self-esteem affects several aspects of health and behavior, including social adjustment, activity, self-confidence, goal direction, and anxiety (Cameron, 1999). Self-esteem has been defined as a construct that is comprised of believing in oneself, feeling good about oneself, and valuing oneself (DeBate, Gabriel, Zwald, Huberty, & Zhang, 2009). Obese children are often ranked by other children as least desired friends and are more prone to getting bullied (Lee, 2009). Individuals who are obese in childhood tend to have low self-esteem as well as poor body image and self-confidence (Vander Wal & Thelen, 2000). Similarly, overweight adolescents, especially girls, tend to develop a negative body-image, which can carry on into adulthood (Lee, 2009; Stunkard & Burt, 1967). Gender differences in self-esteem have been identified in previous research (Paxton, 2005). Females are judged on their appearance and the standards of beauty for females are much higher than those of males, thus a female being overweight can become a burden because it is associated with being unattractive (Paxton, 2005). Several studies on self-esteem in relation to weight have been conducted with children (Table 1.1).

BODY-ESTEEM, BODY IMAGE & OBESITY

Definition of Body-Esteem & Body Image

One component of self-esteem is body-esteem, which can be defined as the physical counterpart to self-esteem: constructed of how an individual's attitude,

evaluations, and feelings measure up with their body (Mendelson & White, 1985). Body-esteem has been measured in research using a variety of instruments (Franzoi & Shields, 1984; Mendelson & White, 1985), and is a variable that has been linked to several different negative health outcomes, such as depression, obesity, and development of eating disorders in a sample of 7, 8, and 9 year old children (Duncan, Al-Nakeeb, & Nevill, 2004) (Table 1.1). Flannery-Schroeder and Chrisler conducted a study on 1st, 3rd, and 5th graders and found that body-esteem scores were decreased as the children aged as can be seen by the following scores: 18.06, 16.79, and 12.09, out of 24 items (1996). High percentages of children have been found to have a decreased body-esteem during pre-pubertal stages (Flannery-Schroeder & Chrisler, 1996). When asked the question "Kids my age like my looks," 24.2% of children answered no, and 42.2% of 3rd grade children wished they looked better and often feel ashamed about how they look (Flannery-Schroeder & Chrisler, 1996).

Gender roles also come into play when discussing body-esteem, with girls showing a greater decline in body-esteem over time than boys (Mendelson, Mendelson, & White, 2001). For both males and females, research indicates that BE-Appearance at every age (8-19 years) is correlated with global self-esteem (Mendelson et al., 2001). Starting in early stages of life, girls in the U.S. begin to set an ideal appearance and weight standard, and may then develop a dislike for their bodies (Mendelson et al., 2001). Literature suggests that between 8-13 years in females, a significant decline in self-evaluations occur, but this is not common for boys (Mendelson et al., 2001). Research has addressed domain-specific measures of body-esteem, and indicates that overweight children are at the highest risk of having low body-esteem (Allen, Byrne, Blair, & Davis,

2006). Furthermore, overweight children are more dissatisfied with their bodies compared to normal weight children (Mendelson & White, 1985), and the body-esteem of obese children is typically lower than the normal population's self-esteem (Mendelson & White, 1982).

Another term commonly used for body-esteem is body image, which can be defined as the reflections and feelings a person may have about their body (Cecil & Stanley, 1997). Since physical appearance is one concrete way to describe oneself, body image may be among the first characteristics that children recognize as a part of self-concept (Wood, Becker, & Thompson, 1996). Dissatisfaction with appearance is a more serious issue for girls than it is for boys (Heinberg et al., 1995), but researchers indicate boys will have ideal figures unlike their actual figure (Cohn et al., 1987). As young as age 7 or 8, children can identify their own body type and begin defining themselves by physical appearance. Starting at the age of 5, children are in tune with the negative social effects of obesity (Wood et al., 1996). Wood et al. (1996) found that 55% of girls were dissatisfied with their size compared to only 35% of boys in a sample of 8-10 year old children. In addition, girls had a greater desire to be thin than boys (Wood et al., 1996). Overall, by 8 to 10 years of age, children are displaying body dissatisfaction and in turn, having lower self-esteem, with girls displaying lower self-esteem than boys (Wood et al., 1996).

Assessment of Body-Esteem in Children

In contrast to self-esteem, body-esteem has not been studied extensively in previous research in relation to body weight and physical activity (Table 1.1).

Table 1.1. Summary of literature measuring body esteem, self esteem, and relationships to body weight and physical activity

Reference	Self-esteem or Body-esteem	Type of Study	Main Variables	Age Group	Gender	Weight Status(normal vs. overweight vs. obese, or all)	Findings
Allen et al., 2006	Body esteem & Self esteem; Children's body image scale (2002).	Correlational	Weight & Shape concern, Global self-esteem	7-13 years	38 ovwt boys 51 ovwt girls Normal weight: 54 boys 64 girls	118 normal 61 overweight 28 obese (ovwt/obese combined to form 1 group)	Overweight children more concerned with wt/shape than healthy weight children. Controlled for BMI z-score, children with high wt/shape concern reported lower self-esteem, higher body-dissatisfaction, and higher depression than normal wt. Implications for prevention and treatment of psychological prob in overwt children.
Mendelson & White, 1996	Body esteem & Self esteem; 20 item BES scale (Mendelson & White, 1993)	Correlational	Body esteem & self esteem related to gender, age, weight	8.5-12.5 years	220 girls 159 boys	Underweight, overweight	Gender accounted for sig amount variance: SE-Athletic boys higher; SE-conduct, girls higher (ie, do the right thing). Self eval of behavioral conduct neg associated with weight for girls; No sig effect on social (girls) or athletic (boys) domains BE – BE-Appearance: boys higher than girls; BE-weight: boys higher than girls. Increasing wt = lower BE-appearance & Wt.
Mendelson & White, 1985	Body Esteem (self-body esteem); 24 item BES scale (Mendelson & White, 1982)	Correlational	Body esteem and Self-esteem as function of age	8.5-11.4 yrs 11.5-14.4 yrs 14.5-17.4 yrs	47 girls 50 boys	Normal weight(less than 107% BW) Overweight children (112% of BW)	Overweight related to feelings about one's body. Independent of relative weight, feelings about self related to feelings about one's body. Age 10, relative wt accounted for sig contribution to BE; heavier children tended to have lower BE.
Franzoi, 1984	Body esteem; Franzoi & Shields Body Cathexis Scale (1984)	Correlational	Body esteem and self esteem correlates	Undergrad psych students in California	366 girls 257 males	N/A	Tested for gender differences. Physical attractiveness, appearance, and agility all depend on other people's opinions for females. Physical attractiveness, exercise ability, and strength all important for males. Women judge bodies more on part-by-part basis.

Reference	Self-esteem or Body-esteem	Type of Study	Main Variables	Age Group	Gender	Weight Status(normal vs. overweight vs. obese, or all)	Findings
Harter, 1982	Physical competence& self worth; Perceived Competence Scale for Children	Correlational	Competence in physical self, social self, and school	300 3rd-6th graders; 9-12 yrs	Boys and girls	Overweight children from 2 different weight loss intervention programs	Scale related to physical, cognitive, and peer social relationships in school. Largest correlation is between social and physical subscales; Popularity in Jr. high and High School depends significantly on athletics; Scale measures competence in school, physical competence, and social relationships with adults.
Mendelson & White, 1982	Body esteem; Mendelson and White BE Scale 24 item scale, 1982	Correlational	Body esteem and weight	7.5-12 years	21 girls 15 boys	20 normal 16 obese	BE found to be related to wt (% overwei.) and sex. BE correlated with relative weight and self-esteem. Children dissatisfied with body appearance dissatisfied with things in life like intellectual and behavioral issues. BE decr as wt incr.
Allon, 1979	Body esteem; no scale indicated – simply chatted with participants about weight and diet	Correlational	Weight and Shape concern; Body esteem related to weight	7-17 years	Boys and girls	All overweight; needing to lose anywhere from 7-150 lbs	Female adolescents have difficult time dealing with being overweight. Males age 7-12 had trouble losing weight; Adolescent females had trouble losing weight, but child females lost 5 pounds at least. Females 7-17 who had trouble losing experienced higher social stigmatization; all females had strong negative body image. Intensive focusing on one's overweight and negative body image seemed to inhibit weight losing for some youth.
Secord & Jourard, 1953	Body esteem; Body cathexis scale (Secord & Jourard, 1953	Correlational	Body cathexis related to personality theory	College age	45 males 43 girls	N/A	Low body cathexis associated with insecurity. Self-cathexis and Body-cathexis interrelated, tend to be cathected to the same degree. Women are more likely to develop anxiety concerning their bodies, because of social importance of the female body most likely.

Table 1.1 Continued

Reference	Self-esteem or Body-esteem	Type of Study	Main Variables	Age Group	Gender	Weight Status(normal vs. overweight vs. obese, or all)	Findings
DeBate et al., 2009	Self esteem; Rosenburg Self Esteem Scale & Schematic Figural Scale	Intervention	Global Self-Esteem related to intervention PA program	85.6% participants: 3rd-5th grade. 60%: 6th-8th grade	1,034 girls from Girls on the Run program	Unknown	Intervention – 12 wk program – running primary activity. Beneficial changes in self-esteem, body size satisfaction, and PA commitment/freq. Sig gains in global self-worth and esteem after intervention. Weight loss was not indicated in the study – body size dissatisfaction decreased post-intervention
Lee, 2009	Self esteem & Social stigmas;	Review	Self esteem & social stigmas -	Review	Review	Review	Social/psychological consequences more prevalent than medical complications; obese children more likely to have poor body image, low self-esteem and confidence b/c mid childhood is critical for development. Overweight young children more likely to maintain positive self image and self-esteem; adolescents particularly girls, get negative self image.
Griffiths & Page, 2008	Self esteem & peer ratings; Interpretive phenomenological analysis (IPA): verbal, written, & reading themes.	Correlational/ Qualitative data/ Case Study	Weight related victimizations influence on self-esteem	12-18 years	5 Girls – only 5 out of 12 people gave written consent and only females needed	Obese: >95th %ile (British age-gender growth charts)	Social impact of victimization – more prevalent in children with higher levels of obesity. Physical, verbal and relational forms of bullying all reported. Stigmatization negative influence on emotional well-being, low self-confidence, body dissatisfaction.

Reference	Self-esteem or Body-esteem	Type of Study	Main Variables	Age Group	Gender	Weight Status(normal vs. overweight vs. obese, or all)	Findings
Wang & Veugelers, 2008	Self esteem & QOL (Quality of life); 11 items from various self-esteem assessment instruments	Correlational	Body weight affects on self-esteem, school performance	5th grade (10-11 yrs)	4,945 5th grade Girls and boys	Normal: 66.6% Ovrwt: 23.5% Obese: 9.9% of the population	Excess body weight has negative influence on self-esteem & school performance, positive effect of PA on self-esteem reported. PA effects self-esteem in a positive manner, sedentary activities effect self esteem and school performance in a negative manner. 1 unit BMI increase = decrease in self-esteem score. Rural area: 34.5% of population are rural dwellers (nothing stated in particular on rural vs. urban); Less PA, more sedentary lifestyle, poor diets, and excess body weight all risk factors for low self-esteem
USDHHS, 2007	Self esteem			6-19 years	Girls/boys in general pop.	N/A	Social discrimination is most immediate consequence of overweight in children; associated with low self-esteem
Paxton, 2005	Self esteem; Piers-Harris Children's Self-Concept Scale, 2nd edition	Correlational/ descriptive	Effects of obesity on self-esteem	6th-8th grade (11-14 years)	332 girls 378 boys	14 obese 70 normal	Obese children have sig lower self-esteem than those of normal wt. Females have tendency to endure greater pressure to maintain physical appearance acceptable to society. Obese kids feel inadequate, can impact whole lives.
Cameron, 1999	Self esteem; Piers Harris Children's Self-concept scale (Piers, 1984).	Intervention	Self-esteem related to weight loss and PA	10-15 years	29 girls/ 20 boys 36 girls/24 boys	49 obese 60 normal	Sig difference on global self-esteem at end of 12 wk weight loss intervention in obese children, with scores on self-esteem being lower at end of 12 wks. At beginning of intervention, no sig diff in self-esteem between normal vs. overweight; End of intervention, Physical attributes and appearance subscales: weight loss group sig lower scores. Control group no change. Being singled out for treatment may lower self esteem – indicates that children DID decrease self-esteem by end of intervention due to being singled out as overweight – scores were lower as compared to normal weight children.

Table 1.1 continued.

Reference	Self-esteem or Body-esteem	Type of Study	Main Variables	Age Group	Gender	Weight Status(normal vs. overweight vs. obese, or all)	Findings
Raustrop et al., 2005	Self esteem & PA; Children and Youth Physical Self-Perception Profile (CY-PSPP) (Whitehead, 1995); Pedometers	3 year follow-up study	PA relationship to self-esteem overtime	7-14 years Follow up: 10-15 years	47 boys 46 girls	Normal weight	Significant increase in BMI over time, stabilized self-esteem. Indicates that the main predictors for increasing PA for girls is promoting physical self-esteem, and for boys is to have a decreased BMI. The results from this study are reverse of our hypothesis (the higher the PA level, the better the body-esteem score).
Strauss et al., 2001	Self esteem & PA relationship; Children's PA questionnaire (Saunders et al) & Piers-Harris Children's Self-Concept scale	Intervention	PA relationship to children's self-esteem and self-efficacy	10-16 years	44 boys 48 girls	N/A	Overall, children spent 75.5% of the day inactive, watching television, sitting at the computer, and doing homework. 1.4% of the day was spent in vigorous activity. Time spent in sedentary behaviors was inversely correlated with the amount of moderate-level activity only; time spent in high level activity correlated with self-efficacy scores and social influence scores. High-level PA associated with improved self esteem
Tremblay et al., 2001	Self esteem & PA relationship; questionnaires developed on PA and self-esteem (Self Description Questionnaire, 16 items)	Correlational	PA relationship to children's self-esteem	12 years old	5,146 students male and female	Normal weight (defined as $<95^{th}$ percentile)and obese ($>95^{th}$ percentile)	Increased PA levels associated with increased self-esteem; Both males and females: increased self-esteem with increased level of vigorous activity- only gender comparisons – females and males who are more active show improvements in self-esteem; increased levels of PA associated with lower BMI; females 2 times as likely to have lower BMI than males. *no comparisons by weight class indicated
Izzo, 2000	PA and Self-Esteem	Review of literature	PA relationship to self esteem	All age groups	Boys and girls	Obese	Correlation of obesity and self esteem: as weight increased, self esteem decreased; low self-esteem could be an important factor in obesity; obese children with lower self-esteem have elevated loneliness, sadness, and nervousness.

Reference	Self-esteem or Body-esteem	Type of Study	Main Variables	Age Group	Gender	Weight Status(normal vs. overweight vs. obese, or all)	Findings
Fox et al., 1999	Self esteem & PA	Review	PA influence on self-esteem	Review	Review	Review	Sufficient evidence on effectiveness of exercise as treatment for clinical depression; Moderate exercise can reduce state and trait anxiety and improve global self-esteem
Caruso & Gill, 1992	Self esteem, Body esteem & PA relationship; Body Cathexis Scale (Secord & Jourard, 1953), Rosenburg Self-Perception scale & BES scale (Franzoi & Shields)	10 week Interventions (2 studies compared)	PA relationship to self esteem and body esteem	18 and up	38 females 27 male 38 female	N/A	Study 1: Physical activity does enhance physical self perceptions and body esteem. Weight training and control groups differed, as weight training group more active; training group saw activity as important, and had a higher physical competence and body esteem, therefore perceived importance of fitness may influence outcomes.Study 2: No significant results found in BE or self perceptions due to activity program; However, competence in PA levels did increase.

Among the few studies on body-esteem (Table 1.1), Mendelson and White indicate that overweight individuals experience lower body-esteem (1996). Research also indicates that body-esteem may be multidimensional and can be measured by self-report questionnaires (Mendelson & White, 1985), open-ended interviews (Allon, 1979), or even reaction to body-related words (Secord & Jourard, 1953; Mendelson & White, 1996) (Table 1.1). Feelings about weight may be different than feelings about ones general appearance; the embarrassment that is caused by social stigmas attached to being a heavier weight may be fully independent of the other aspects of body-esteem (Mendelson & White, 1996). Obesity may cause young children to feel bad about their own weight, which causes low body-esteem; low body-esteem may then contribute to lower self-esteem globally and in several different domains, including social and athletic domains (Mendelson and White, 1996).

Development of body-esteem has been hypothesized to begin in children at 8 years of age and older. At this age they not only make judgments about their competence in different domains, they begin to construct their own view of self-worth as a person (Harter, 1982). For children 7.5 to 11 years old, body-esteem has been related to being overweight (Mendelson & White, 1985). The body-esteem scale is used to measure global body-esteem in children and consists of three subscales: BE-Weight (self-evaluation of body weight), BE-Appearance (self-evaluation of general appearance and body-esteem), and BE-Attribution (attribution of positive evaluations to others) (Mendelson & White, 1993). Mendelson and White found that relative weight affected body-esteem but that the relations between body-esteem and self-esteem were not affected by weight (1982), but mainly by BE-appearance subscale of the Mendelson and

White Body-esteem Scale (1996). Overall, boys seem to have a higher athletic competence than girls in self-esteem measures in childhood and adolescence, and it has been indicated in literature that boys receive more praise for being athletic than girls (Mendelson & White, 1996). Girls exhibit a lower behavioral conduct due to being heavier than boys, and girls also tend to have more negative opinions of their appearance and weight on the body-esteem scale compared to boys (Mendelson & White, 1996).

These results are consistent with ideas that children are very sensitive to societal norms for weight and appearance, and at a young age overweight children learn to dislike their weight, causing body-esteem to decrease beginning at a young age (Mendelson & White, 1996). Multiple strategies to improve global-self-worth in overweight children have been suggested, including changing personal grooming and becoming more assertive when faced with stereotyping about body image (Mendelson & White, 1996). However, maintenance of a healthy weight through exercise and diet remains to be the best strategy for establishing a healthy level of body-esteem among children and adolescents (World Health Organization (WHO), 2011).

PHYSICAL ACTIVITY AND CHILDHOOD OBESITY

Prevalence of Physical Activity and Current Recommendations

Decreased physical activity levels have been associated with an increased rate of obesity and obesity-related chronic diseases among youth (Nader, Bradley, Houts, McRitchie, & O'Brien, 2008). In fact, physical activity has been identified as one of the most important factors influencing individuals' weight status (AHA, 2010). As our society has become more sedentary, with computers, television, and video games playing

a major role in a lack of physical activity, data shows that approximately 43% of adolescents are inactive for 2 hours each day (USDHHS, 2007). The Center for Disease Control and Prevention recommends that children age 6 to 17 years old be active daily for a minimum of 60 minutes (Anderson, Economos, & Must, 2008). Activity can include moderate, vigorous, or moderate and vigorous levels of aerobic exercise, muscle strengthening, or bone strengthening exercises to meet the 60 minutes per day requirement (CDC, 2010). Moderate activity levels can be defined as any activity during which children expended 3-5.99 metabolic equivalents (METs) (Shriver et al., In Press). Vigorous activity can be defined as any activity with METs ≥6 (Shriver et al., In Press). Exercise intensity can be measured in several different ways before, during, and after performances.

The state of Oklahoma was ranked number 8 in 2008 for being one of the most obese states in the country due to lack of physical activity (Oklahoma City County Health Department (OCCHD), 2010). In 2005, 82.4% of children age 10-11 in Oklahoma were physically active on 3 or more days per week for at least 20 minutes (National Survey of Children's Health, 2006). 2008 BRFSS data indicates that 31% of adults in Oklahoma participate in no leisure-time physical activity (BRFSS Survey, 2008). Given the strong parental influence on children's behavior, it is likely that children from these families do not participate in the recommended amounts of physical activity on a regular basis.

Trends in Children's Physical Activity

Unhealthy diet and physical inactivity are predecessors of the rising prevalence of overweight and obesity in children (Simen-Kapeu & Veugelers, 2010). Having a lifestyle

with regular levels of physical activity has been related to several health benefits including “reduced risk of coronary heart disease, type 2 diabetes, obesity and associated health risks, cancer, arthritis, depression, anxiety, mood disorders, and cognitive impairment” (Iannotti, Kogan, Janssen, & Boyce, 2009, 493). It has been hypothesized that the steady decline in physical activity levels in all age groups has contributed to the increasing rates of obesity all around the world, and identifying sources of motivation to be active may help increase the physical activity levels of our youth (Dehgan, Akhtar-Danesh, & Merchant, 2005; Haverly & Davison, 2005).

The amount of time spent participating in sedentary activities such as television, computer game playing, and movie watching reduces the amount of daily energy being expended and past interventions suggest that there is a causal relationship between overweight and obesity and sedentary behaviors (Iannotti et al., 2009). Literature suggests that a substantial amount of young children in the United States are highly sedentary and engage in inadequate amounts of activity (Anderson et al., 2008). Family, peers, and school affect physical activity levels in children, as well as access to physical activity places (Strauss, Rodzilsky, Burack, & Colin, 2001). Physical activity levels also seem to decline with age. In a study of 9 to 15 years old in a diverse population of children from the United States were observed, and found to have a major decline in moderate and vigorous physical activity times as they aged. In 9 year olds, about 90% of children were above the amount of the recommended 60 minutes of moderate and vigorous physical activity most days of the week, but by the age of 15, only 31% met these guidelines (Nader et al., 2008). Other risk factors for low activity levels included

living in the Midwest or Southern areas of the United States, as well as higher BMI percentiles (Nader et al., 2008).

Important trends in sedentary behavior by age have been also identified in research. Cross-sectional studies indicate that between ages 10 to 12 years, physical activity begins to decline and sedentary behavior becomes more common (Brodersen, Steptoe, Boniface, & Wardle, 2007). Sedentary behavior is an important aspect of obesity and should be recognized has a separate behavior from physical activity (Wong & Leatherdale, 2009). The American Academy of Pediatrics recommends that children's media time, with entertainment media included, should be limited to 1 to 2 hours each day (Wong & Leatherdale, 2009). Numerous studies have indicated that sedentary behaviors, such as watching television and playing on the computer are related to the increase in the prevalence of obesity (Greiser et al., 2006). Parents have reported in several studies that they prefer to have their children stay at home and watch television rather than playing outside unattended because the parents are then able to watch their children while completing their own daily activities, such as chores (Dehghan et al., 2005; Grieser et al.,2006). As our society becomes less active and more sedentary, children observe their parents watching several hours of television at night, and as a result, they, too, become less active (USDHHS, 2001).

In addition to differences between age groups for physical activity and sedentary behavior, there are differences between genders. It has been reported in 12-15 year old youth, males are more active than females, and as both sexes reach adolescence, there is a decline in physical activity levels (Wenthe, Janz, & Levy, 2009). Girls are reported to be less engaged in physical activity and boys have typically reported less healthy diets

(Simen-Kapeu & Veugelers, 2010). Wong and Leatherdale (2009) reported that boys and girls have different activity and sedentary behaviors from one another, as boys are consistently highly active (90 minutes or greater of activity) as well as highly sedentary (2 hours or more of sedentary activity). Low activity levels combined with high sedentary behaviors in both boys and girls result in overweight and obesity, and research suggests that highly active and highly sedentary girls are more likely to be overweight than girls who are highly active and spend little time being sedentary (Wong & Leatherdale, 2009). Several psychological barriers to physical activity are also reported by girls of all ethnicities including being tired or out of breath, embarrassment, and sweating in front of people, which may help explain the lower levels of activity found among girls (Grieser et al., 2006). Overall, research suggests that boys consistently report more physical activity than girls, and as girls age, they experience a larger decline in physical activity than do boys (Brodersen et al., 2007).

Overweight and obese children who are active may also have better body-esteem and physical well being (AHA, 2011). Physical activity helps with controlling weight and improving psychological well-being (AHA, 2011). When compared with inactive people, both children and adults who are active have a higher self-concept and more self-esteem, therefore a higher quality of life (AHA, 2011).

RELATIONSHIP AMONG OBESITY, PHYSICAL ACTVITY AND BODY-ESTEEM

As discussed above, childhood obesity may be detrimental not only to physical health, but also psychological and social health of the child (Paxton, 2005). Children who

are overweight often feel socially inept due to bullying, social isolation, and subsequent negative self-perception (McCullough, Muldoon, & Dempster, 2009). Most children are aware at a young age that there is a "socially negative stigma" associated with being overweight, and with the awareness of negative views on obesity, their own self-esteem may decline (Paxton, 2005). Body dissatisfaction and weight and shape concerns have been found to be higher in overweight children as compared to healthy weight children, and the same children that have a high concern for body weight have lower levels of overall self-esteem and body-esteem (Allen et al., 2006).

Research has consistently linked higher physical activity levels to lower prevalence of obesity among both children and adolescents (Steinbeck, 2001). Most experts agree that physical activity is a critical component of obesity prevention and treatment because it helps maintain energy balance on a regular basis (Steinbeck, 2001). However, physical activity may represent additional benefits to children and adolescents. Previous studies have linked exercise to improved mood states, motivation, self-confidence, and improved cognitive functioning of children (Fox, 1999; Strauss et al., 2001; Tremblay, Inman, & Willms, 2000) (Table 1.1). An extensive meta-analysis has indicated that exercise has a positive impact on enhancing self-concept, self-esteem, and moods, and feelings of anger, depression, and anxiety tend to cease after an individual, particularly adolescents and young adults, partakes in exercise (Caruso & Gill, 1992).

Physical activity may also help to increase body-esteem in overweight children. Perceived physical self-esteem is a predictor for BMI, and a possible way to increase physical self-esteem has been proposed as a physical activity program (Raustorp, Mattsson, & Svensson, 2006). While most of the studies described were conducted with

normal weight children, Izzo (2000) suggested that obese children who are more physically active tend to have higher body-esteem than obese children who are less active. Furthermore, Cameron (1999) indicated that children with low self-esteem, whether they are obese or normal weight, are less likely to be active and partake in exercise, be adjusted socially, set goals like weight loss when it is needed, and have confidence. Thus, it is possible that there is a positive relationship between physical activity and self-esteem and/or body-esteem among children, regardless of their weight status (Izzo, 2000). The relationship between self-esteem and physical activity was examined in few previous studies (Fox, 1999; Izzo, 2000; Steinbeck, 2001; Strauss et al., 2001; Tremblay et al., 2001); however, most of these studies either included only normal weight children or examined the relationship between physical activity and body-esteem as part of obesity prevention/reduction interventions during which children were likely to decrease their body weight and thus increase their body-esteem (Table 1.1).

SUMMARY

Research demonstrates that the prevalence of childhood obesity has escalated in recent years, along with a significant decline in physical activity levels and an increase in sedentary behaviors among American youth. Obesity tends to impact young children in several ways, from physical health implications to psychological issues, including high body dissatisfaction and low body-esteem. Being overweight can cause lower self-concept in children as well as causing them to be less active and less likely to set goals, as they may feel that they will not succeed because they are socially inept. Also, gender plays a significant role in body-esteem, weight status, and physical activity, with girls

being more affected by increased BMI than boys, as research has indicated. Overall, current literature supports the idea that overweight children tend to be less physically active, and have lower self-esteem, than their normal weight peers. However, there is a lack of studies that have examined the complex relationships between weight status, physical activity, and body-esteem among school-age children in rural areas who are at a higher risk for obesity compared to their urban counterparts. The purpose of the proposed study was to examine the associations among weight status, physical activity, and body-esteem in a sample of 3rd grade children from rural Oklahoma.

CHAPTER III

METHODOLOGY

The purpose of this descriptive study was to examine the relationships among weight status, physical activity, and body-esteem using a sample of 3rd grade children living in rural Oklahoma. Data for this research project came from a study that was conducted in the spring of 2008 as part of a large multi-disciplinary project titled "Families and Schools for Health (FiSH)." The study protocol was reviewed and approved by the Institutional Review Board (IRB) at Oklahoma State University (OSU) prior to data collection (Appendix A). The current study utilized a secondary dataset and thus was considered to be a non-human research study by the IRB at OSU (Appendix B).

Procedures

The sample used in this study consisted of a subsample of the participants in the USDA funded FiSH Project (Harrist, Kennedy, Topham, Hubbs-Tait, & Page, 2005). FiSH is a public school-based, randomized control intervention study, with interventions designed to decrease rate of weight gain and enhance psychosocial functioning in children (Hubbs-Tait, Kennedy, Page, Topham, & Harrist, 2008). Participants were recruited from elementary schools in rural Oklahoma (Hubbs-Tait et al., 2008). A total of

20 schools participated in the FiSH project between 2005 and present. After consent was obtained from each school, children and parents were recruited to participate. Representatives from the project met with parents at back-to-school nights and other school events, as well as letters sent home with the children.

Participants

In the FiSH project, 2 cohorts consisting of 20 total schools were recruited for the study. A sub-sample of 3rd graders participating in this study was recruited from 12 rural schools randomly selected from a total of 20 schools in the physical activity and fitness assessment of the FiSH project in the spring of 2008. As part of the larger study, parents of the participating children were asked to sign an informed consent form prior to data collection. In addition, each child was asked for assent before any information was obtained from the child. For this study, data from the children were collected using anthropometric measurements, individual child interviews, and physical activity and fitness assessment sessions.

Anthropometrics (Height, Weight, and BMI-for-age)

Height and weight were measured for each child in order to calculate his/her BMI-for-age percentile. Children's anthropometrics (height, weight, BMI, and psychosocial questionnaires) were collected during the individual child interviews, class or recess, and the procedures are described elsewhere (Hubbs-Tait et al., 2008) and standard procedures for anthropometric measures were utilized (BMI-for-age) (CDC, 2009). Repeated measurements of height were taken two times during the same visit

using a portable board to measure each child's height to the nearest 0.2 cm. If the height was not within ±0.3 cm then it was measured a third time. The average of the two height measurements was the value used in analysis (Hubbs-Tait et al., 2008). Weight was determined to the nearest ±0.2 pounds using a portable digital scale. BMI-for-age percentile was used to categorize children into three categories: normal (<85th BMI percentile), overweight (≥85th to <95th BMI percentile), and obese (≥ 95th BMI percentile) (CDC, 2000, Shriver et al., In Press). BMI-for-age percentiles were calculated using the "Epi Info software program" (CDC, 2008).

Physical Activity

The modified Self-Administered Physical Activity Checklist (SAPAC) (Sallis et al., 1996) was used to measure the amount of moderate, vigorous, and combined moderate and vigorous physical activity among children (Appendix D). Prior to the analysis of the data, metabolic equivalents (METs) were assigned to all of the 24 activities recalled by the children using the "updated Compendium of Physical Activities" (Ainsworth et al., 2000). One MET "is defined as the amount of oxygen per kilogram of body weight per minute consumed when sitting quietly (3.5 ml/kg/min)" (Ainsworth et al., 2000). Levels of physical activity were defined as moderate (METs 3-5.99), vigorous (METs ≥6), and combined moderate and vigorous activity, and were calculated for each participant for use in analyses. The original SAPAC was previously validated with school-aged children with a moderate criterion validity (r=0.57-0.75) and a moderate test-retest reliability (r=0.60) (Sallis et al., 1996).

For the FiSH study, the original SAPAC was tailored to 3rd grade children and interviews were carried out to decrease error and increase accuracy related to the self-administration checklist (Shriver et al., In Press). The individual child interviews were performed by research assistants that had completed online video training and a pilot test with a group of 3rd grade children before the study began (Shriver et al., In Press). No SAPAC interviews were conducted on a Monday to ensure that data reflected children's normal physical activity levels during the week. The subjects were asked questions about any activity they participated in within the previous 24 hours, the length of time of each activity (in minutes), and the intensity of each activity (i.e., "did it make you breathe heavy "none," "some," or "most" of the time?") (Sallis et al., 1996). These reported activity levels were used as a continuous variable (Hypothesis #2) and a categorical variable (Hypothesis #3) in this study. Sedentary behaviors were also included in the SAPAC and the subjects were asked to report the amount of time they spent by watching TV, using the computer, or playing video games on the previous day (Sallis et al., 1996).

Body-Esteem

Children's body-esteem was assessed using the Mendelson and White Body-esteem Scale (BES) (Appendix C). The scale contains 20 items that are answered in a "yes" or "no" format designed to measure children's affective evaluations of their own body (Mendelson & White, 1993). There are equal numbers of "yes" and "no" responses for higher body-esteem in the first and second parts of the test, which were also seen in the odd and even numbered questions (Mendelson & White, 1993). The scale is scored by counting the number of items that indicate high body-esteem (Mendelson & White,

1993), with the minimum of 0, reflecting low body-esteem, and the highest score of 20, indicating a high body-esteem (Duncan et al., 2004).

The Mendelson and White body-esteem scale has multidimensional aspects, which includes appearance self-evaluations (BE-Appearance), weight self-evaluations (BE-Weight), and appearance evaluations attributed to others (BE-Attribution) (Mendelson & White, 1995). This scale has been used previously to assess body-esteem in children (Mendelson, White, & Mendelson, 1996; Mendelson & White, 1985) and psychometric properties have been established (Duncan et al., 2004). A pilot study and a subsequent study were conducted using the body-esteem scale in which body-esteem was found to be related to percent overweight (relative weight) and gender (Mendelson & White, 1993).

The BES for children used in this study is a 20-item scale that was derived from the original 24-tem BES (Mendelson & White, 1982). The updated 20-item scale assesses child self-perception with three subscales: BE-Appearance (general appearance and body-esteem, α=0.87), BE-Weight (satisfaction with weight, α=0.77), and BE-Attribution (attribution of positive evaluations to others, α=0.55). The item to total score correlations were positive for all of the 20 questions and a high internal reliability was seen at α= 0.88 (Mendelson & White, 1982). BE-Appearance shows a high internal consistency, BE-Weight indicates a good internal consistency, and BE-Attribution has a moderate internal consistency with the Physical Appearance Subscale of Harter Self-Perception scale (1985, 1988) which was the original scale used to measure self-perception in research.

In this study, the original 20-item global body-esteem scale and the individual subscales (BE-Appearance, BE-Weight, and BE-Attribution) were used to explore the

relationships between weight status, physical activity, and body-esteem. For this study, an overall BES score and three subscale scores were used in the analysis. The Cronbach α was also calculated for the global BES and each of the BES subscales.

Statistical Analysis

The statistical analyses were performed using the Statistical Package for Social Sciences for Windows (18.0, SPSS Inc., Chicago, IL, 2010). The level of statistical significance was set at $p<0.05$ for all tests. Descriptive statistics were used to describe the study sample in terms of body weight, physical activity, and body-esteem using means, standard deviations, and frequencies. Pearson's bivariate correlations were used to examine the nature of the relationships between physical activity as a continuous variable, BMI-for-age percentile and BES scores. Among overweight /obese children only, potential differences in body-esteem scores were explored by gender using one-way Analysis of Variance (ANOVA). The Fisher's Least Significant Difference tests (LSD) were performed to identify significant mean differences between individual groups.

Factorial ANOVA (a 3-way design; 3x3x2) was utilized to examine the main effects and interaction effects of weight status, physical activity, and gender on the global BES scores. For this analysis, global BES score served as the dependent variable with weight status, physical activity and gender serving as independent variables. The weight status variable consisted of three levels (1=normal weight; 2=overweight; 3=obese). The physical activity variable consisted of three levels (1=<60 min/day; 2=60-150 min/day; 3=>150 min/day). The three physical activity categories were created by splitting the sample into thirds according to the reported amount of time spent in physical activity,

using the current physical activity recommendation for children as a guide (0-60 min; >60 – 120 min; >120 min) (2005 Dietary Guidelines for Americans, U.S. Department of Health and Human Services (USDHHS), 2008). Currently, children are recommended to engage in at least 60 minutes of moderate or vigorous physical activity every day (USDHHS, 2008). The gender variable consisted of two levels (1=boys; 2=girls). The LSD post-hoc tests were performed to identify significant mean differences between individual groups of children.

Study Hypotheses

Hypothesis #1:

a) Normal weight children will score significantly higher on the global body-esteem scale (BES) and all three subscales (BE-Appearance, BE-Weight, and BE-Attribution) compared to both overweight and obese children in the sample.

b) Among overweight/obese children, girls will have significantly lower global body-esteem and lower BE-weight, BE-Attribution, BE-Appearance scores compared to boys.

c) Among normal weight children, girls will have significantly lower global body-esteem and lower BE-weight, BE-Attribution, BE-Appearance scores compared to boys.

Hypothesis #2: There will be a significant positive relationship between the amount of physical activity and the global body-esteem scale score as well as the three subscales in the sample of children.

Hypothesis #3: The effect of weight status on global BES score will vary significantly in the sample of 3rd grade children by the amount of physical activity children engage in. In other words, there will be a significant interaction effect between weight status and physical activity on global BES scores.

Hypothesis #4: The effect of weight status on global BES score will vary significantly in the sample of 3rd grade children by gender. In other words, there will be a significant interaction effect between weight status and gender on global BES scores.

CHAPTER IV

FINDINGS

DEMOGRAPHICS AND ANTHROPOMETRICS

A total of 214 3rd graders participated in the study, with 115 boys and 99 girls. The majority of the subjects (76.6%; *n*=164) were Caucasians, with 15.9% (*n*=34) being Native Americans, 1.9% (*n*=4) being African American, and 1.9% (*n*=4) being Hispanics. The participating children were 9.2±0.4 years old, with a mean BMI-for-age percentile of 66.8±28.3. The demographic and anthropometric characteristics of the sample, as well as the amount of reported physical activity, are summarized in Table 4.1.

The majority of the children were at normal weight, with 17.2% of the sample being overweight and 20.6% being obese (Table 4.2). More than one third of the study sample was overweight or obese (37.8%). The proportion of normal weight, overweight, and obese children was similar between boys and girls (Table 4.2). Nearly one third of the children (30.4%; n=65) did not meet the minimum recommended amount of physical activity (<60 min/day). Seventy-eight children (36.5%) engaged in 60-150 min/day of physical activity, and seventy-one children (33.1%) spent >150 min/day in physical activity.

Table 4.1. Demographic and Anthropometric Characteristics of the Sample[a]

Variable	Mean ±SD*	Minimum	Maximum
Age (years)	9.2±0.4	8.3	10.4
Weight (kg)	34.9±10.6	19.9	113.6
Height (in)	53.0±2.6	37.6	60.7
BMI-for-age Percentile	66.8±28.3	2	100
BMI z-score	0.6±1.1	-2.2	3.1
Physical Activity[b] (min)	124.0±102.49	0.00	405.0

[a]Results based on n=214
[b]The amount of combined moderate and vigorous activity children reported in the study in minutes
*SD = Standard Deviation

Table 4.2 Weight Status of the Sample by Gender[1]

	Boys	Girls	Total
	n (%)	n (%)	n (%)
Normal Weight [a]	71 (61.7%)*	62 (62.6%)*	133 (62.1%)
Overweight [b]	19 (16.5%)*	18 (18.2%)*	37 (17.2%)
Obese [c]	25 (21.7%)*	19 (19.2%)*	44 (20.6%)
Total n (%)	**115 (53.7%)**	**99 (46.3%)**	**214 (100%)**

1. N=214
*Percentage calculated from total of each gender, not total sample
a. Normal weight defined as <85th percentile for BMI-for-age
b. Overweight defined as BMI between ≥85th to ≤95th percentile for BMI-for-age
c. Obese defined as >95th percentile for BMI-for-age

BODY-ESTEEM AND WEIGHT STATUS

The mean global BES score of the sample was 17.0, ranging from 1.0 to 20.0. The internal consistency test indicated that the global BES scale had a high reliability with Cronbach's alpha of 0.88. The internal reliability was also good for the individual

subscales, with Cronbach's alphas of 0.77 for BE-Weight and 0.83 for BE-Appearance, with the exception of BE-Attribution (Cronbach's alpha=0.49).

Significant differences in BES scores were found among children according to weight status ($p<0.001$) (Table 4.3). Follow-up post-hoc analyses revealed that the global BES score differed significantly between normal weight and obese children ($p<0.001$), with obese children having significantly lower BES scores compared to normal weight children (17.8±2.9 vs. 14.7±5.0). The BES scores of obese children were also significantly lower than BES scores of overweight children (16.8±4.0 vs. 14.7±5.0; $p<0.01$). There was no significant difference in BES scores between normal weight and overweight children.

Significant differences in the scores between weight categories existed on two BES subscales. BE-Weight subscale showed a significant difference between normal weight (2.7±0.64) and overweight children (2.3±1.03), and also a significant difference between overweight (2.3±1.03) and obese children (1.6±1.30). BE-Appearance subscale had significant differences among normal weight and overweight children (10.7±1.85 vs. 10.3±2.50), and between overweight and obese children a significant difference in subscales scores was shown (10.3±2.50 vs. 9.1±3.15). BE-Attribution subscale did not indicate significant differences in scores between normal weight, overweight, or obese (2.6±0.72 vs. 2.6±0.75 vs. 2.5±0.83). As the results indicated, normal weight children had the highest body-esteem for global BES and two of the subscales when compared to both overweight and obese children. The only BES subscale that did not differ by weight status was the BE-Attribution, with all scores for each weight class being 2.5 or 2.6 (Table 4.3).

Table 4.3 Differences in BES-global and BES subscale Scores by Weight Status

Variable	Weight Status[e]			F	p-value[d]
	Normal Weight	Overweight	Obese		
	mean ±SD*	mean ± SD*	mean ± SD*		
BES-Global	17.8±2.90[a]	16.9±4.10[a]	14.8±4.93[b]	11.8	0.000[b]
BE-Weight	2.7± 0.64[a]	2.4±1.03[a]	1.6±1.30[b]	27.9	0.000[b]
BE-Attribution	2.6±0.72	2.6±0.72	2.5±0.83	0.7	0.491
BE-Appearance	10.7±1.85[a]	10.3±2.50[a,b]	9.2±3.09 [b, c]	8.3	0.000[b]

[a, b, c] Means with a common letter are not significantly different from each other
[d] Main significant effect at at p<0.001
[e] n=214 children
*SD=Standard Deviation

GENDER DIFFFERENCES IN BODY-ESTEEM

Gender differences in global BES and the three BES subscales were explored separately among overweight/obese and normal weight children in the sample (Hypothesis #1b & #1c). Among overweight/obese children only, girls scored significantly lower on the global BES as well as all three subscales for total BES scores when compared to boys (Hypothesis #1b). Mean score on the global BES score was 16.7±3.38 for boys and 14.6±5.69 for girls ($p<0.05$), respectively. The BE-Attribution and BE-Appearance were significantly different between boys and girls, with girls having lower scores on both ($p<0.05$). The BE-Weight was not significantly different between boys and girls. A summary of the BES scores and gender differences among overweight/obese children are presented in Table 4.4. Among normal weight children, girls scored higher on overall BES-Global scale as well as all three subscales when compared to boys, however no significant main effects of gender and weight status on global BES scores or any of the three subscales were found. Normal weight children in

this sample do not have significant differences in body-esteem. The results of the BES scores and gender differences among normal weight children are summarized in Table 4.5.

Table 4.4 Gender differences of BES scores and BES-subscales in overweight and obese children[a]

Variable	Boys	Girls	F	p-value[b]
	mean ± SD*	mean ± SD*		
BES-Global	16.7±3.38	14.6±5.69	4.09	0.047[b]
BE-Weight	2.1±0.95	1.8±1.30	1.29	0.260
BE-Attribution	2.7±0.54	2.3±0.97	5.51	0.021[b]
BE-Appearance	10.3±2.09	8.9±3.52	4.25	0.043[b]

*SD=Standard Deviation
a. Results based on N=79
b. P-value significant at p<0.05

Table 4.5 Gender differences in BES scores and BES-subscale scores in normal weight children[a]

Variable	Boys	Girls	F	p-value[b]
	mean± SD*	mean ± SD*		
BES-Global	17.5±3.23	18.2±2.43	2.02	0.158
BE-Weight	2.7±0.70	2.8±0.56	0.75	0.388
BE-Attribution	2.5±0.71	2.6±0.73	0.38	0.537
BE-Appearance	10.6±2.12	11.0±1.46	1.74	0.190

*SD=Standard Deviation
[a]Results based on N=133
[b].P-value significant at p<0.05

PHYSICAL ACTIVITY AND BODY-ESTEEM

The relationship between children's physical activity and body-esteem was explored using bivariate correlations (Hypothesis #2). The Pearson correlation test indicated no significant correlations between the total moderate and vigorous physical

activity levels and global body-esteem scores in this sample of children ($p<0.05$). Table 4.6 summarizes the results.

Table 4.6 Physical activity relationship to Body-esteem in Whole Sample (N=214)

BES variable	Physical Activity variable	
	R	**p-value***
BES-Global	-0.04	0.74
BE-Weight	0.14	0.22
BE-Attribution	-0.15	0.20
BE-Appearance	-0.81	0.48

*p-values non-significant at $p<0.05$

EFFECT OF WEIGHT STATUS, PHYSICAL ACTIVITY AND GENDER ON BODY-ESTEEM

The 3-way ANOVA was utilized to examine the relationships among weight status (normal weight, overweight, and obese categories), physical activity (0-60 min, >60-120 min, and >120 min categories) and gender (girls and boys) on global BES scores (Hypothesis #3). The results of the factorial ANOVA indicated that there was a significant main effect of weight status on the global BES scores ($p<0.001$). While the main effect of gender and physical activity on global BES scores was not significant, it approached significance in the case of gender ($p=0.054$). Additional analyses revealed that physical activity had no significant interaction effect when combined with gender ($p=0.680$) or weight status ($p=0.545$) on BES scores. There was a significant interaction effect between weight status and gender on global BES score in the sample ($p=0.032$; $p<0.05$).

The significant interaction effect of weight status and gender on global BES was explored further using the LSD post-hoc tests. The findings indicated that normal weight boys had similar global BES scores compared to overweight boys (p=0.653); however, the BES scores of obese boys were lower from the scores of both normal weight (p=0.026) and overweight boys (p=0.037) (15.8±3.76 vs. 17.5±3.23 vs. 17.8±2.41). In contrast, the BES scores of overweight girls were lower compared to normal weight girls in the sample (p=0.028; 15.8±5.20 vs. 18.2±2.43). In addition, obese girls had significantly lower BES scores than normal weight (p=0.000) and the lower BES scores approached significance compared to overweight girls at p=0.064 (13.4±6.01 vs. 18.2±2.43 vs. 15.8±0.93).

CHAPTER V

DISCUSSION AND CONCLUSIONS

The main purpose of this study was to explore the relationships among weight status, physical activity, and body-esteem among school-aged children living in rural Oklahoma. The results of the study indicated that rural children in our sample suffer from high prevalence of obesity and their body-esteem differed significantly between normal weight, overweight and obese children. Furthermore, interesting differences in body-esteem not only by weight status, but also by gender were identified in our study.

The prevalence of obesity in this study is comparable to the national prevalence of obesity among 6 to 11 year old children, as well as obesity rates found in other regional studies. The Center for Disease Control (2010) reported that 19.6% of 6 to 11 year old children are currently obese in the U.S. In our sample, 20.6% of children were considered obese as indicated by their BMI-for-age percentiles, which is higher than the national estimate. Furthermore, 37.8% of children in the sample were either overweight or obese, which is also slightly higher than the national average (36.7% overweight and obese age 2 to 19) (CDC, 2010; AHA, 2010). Within each weight category, gender differences in obesity prevalence were identified in our sample. Research indicates that obesity among

boys aged 2 to 19 years is estimated at 31.9%, and obesity among girls of the same age is at 34.6% (Ogden et al., 2011; AHA, 2011). In our sample, boys had a higher rate of obesity compared to girls (21.7% vs. 19.2%). However, the prevalence of overweight was higher among girls compared to boys (18.2% and only 16.5%).

The overall prevalence of overweight and obesity in our sample was slightly higher than the national average for children of the same age (CDC, 2010; Ogden et al., 2010). This finding could be explained by the fact that our study focused on a unique sample of rural children. Our results support the findings from previous studies that were conducted in rural areas. Simen-Kapeu and Veugelers, (2010) suggested that the risk of overweight in rural schools is highly present and that it could be contributed to problems with accessing healthy food or a lack of resources for healthy foods in the rural areas (Tambalis, Panagiatakos, & Sidossis, 2010). Research conducted on adults in rural Oklahoma also indicated that obesity prevalence has increased from 5.6-7.6% to 20.2-22.7% between years 1996 to 2001 (Jackson et al., 2005). Similarly, the prevalence of obesity in boys (8.1% to 12.4%) and girls (7.2% to 11.3%) increased more in rural areas when compared to urban areas (Tambalis et al., 2010). Given the increasing obesity rates among adults (Anderson & Butcher, 2006), researchers expect the childhood obesity rates to continue rising in rural areas in the near future (Jackson et al., 2005).

Body-esteem is an important component of overall self-esteem and plays an important role in the way children view themselves and their bodies (Cecil & Stanley, 1997). Body-esteem is a variable that is linked to several negative behaviors, such as depression, obesity, and eating disorders in children as young as 7, 8, and 9 (Duncan et al., 2004). Research indicates that overweight children are at the highest risk for having

low body-esteem when compared to their normal weight peers (Allen et al., 2006). Body-esteem is also known as body image, and it may be one of the first characteristics that children recognize as a part of self-concept (Wood et al., 1996). Beginning around age 5, children start recognizing the negative social effects of obesity (Wood et al., 1996). In a sample of 8 to 10 year old children, Wood et al., found that 55% of girls were dissatisfied with their bodies and 35% of boys were dissatisfied with their body size (1996). These results are similar to our study, which indicated that overweight and obese children had lower global body-esteem scores than normal weight children. Overweight and obese children also had lower body-esteem in terms of their weight (BE-Weight) and appearance (BE-Appearance), but not attribution (BE-Attribution), compared to normal weight children. Our findings related to global body-esteem and BE-weight are consistent with the very few previous studies with children. A study by Griffiths and Page (2008) found that overweight children were more likely to have lower global body-esteem compared to normal weight children. In addition, Mendelson & White (1996) found that children's weight status had an important influence on their BE-weight and BE-Appearance. Just as in previous research (Mendelson & White, 1996), children's BE-Attribution scores were not significantly different by weight status. One possible explanation of this finding may be the fact that the BE-Attribution scale had a weak internal reliability (α=0.49) and did not represent a strong measure for accurately assessing the attribution dimension of the global body-esteem in our sample.

Among normal weight children only, no significant differences in global body-esteem or the three BE subscales were found between boys and girls. Girls typically exhibit lower body-esteem, self-esteem, and tend to have a greater desire to be thin than

boys (Wood et al., 1996). On the other hand, boys seem to have a higher athletic competence which increases their desire to be heavier rather than lighter (Mendelson & White, 1996). Given the lack of previous research examining BES and gender differences among both normal and overweight children, our study contributes significantly to the current literature and further studies on differences in body-esteem between boys and girls by weight status is warranted.

Among overweight and obese children only, significant differences between boys and girls were found in global body-esteem, BE-Attribution and BE-Appearance, but not in BE-Weight. Girls reported significantly lower body-esteem than boys on the overall scale. Some of these results are consistent with previous studies where girls exhibited greater negative opinion of their appearance compared to boys (Mendelson & White, 1996). However, previous studies have not found significant differences in BE-Attribution between boys and girls. A research study by Wood and colleagues (1996) also found significant differences in weight satisfaction between girls and boys. The study indicated that 8-10 year old children were in tune with negative social effects of obesity at a young age, and that 55% of girls were dissatisfied with their weight and only 35% of boys were dissatisfied with their weight. Our results related to BE-Weight and BE-Attribution are not consistent with previous research. Because only a few studies on body-esteem were conducted so far and they utilized different methodologies, instruments, as well as samples of children, a direct comparison between our findings and the previous studies is not possible.

Experts agree that children should engage in at least 60 minutes of moderate physical activity on most days of the week (USDHHS, 2008). Children in our sample

reported to engage in approximately 2 hours of combined moderate and vigorous physical activity. While this amount of activity as a group mean meets the minimum recommendations of physical activity, nearly one third of children in our sample did not engage in at least 60 minutes of exercise. Physical activity is related to body-esteem, and may help to enhance body-esteem in overweight children. Perceived physical self-esteem, or body-esteem, is a predictor for BMI, and as past research indicates physical activity programs may be a way to increase self-esteem (Raustorp et al., 2006). Izzo (2000) suggested that obese children who are more physically active tend to have higher body-esteem than obese children who are less active. In 1999, children with low self-esteem, regardless of weight status, were less likely to be active or set weight loss goals (Cameron, 1999). Although it appears that physical activity may have a positive impact on body-esteem, much of the evidence comes from obesity-focused intervention studies that may have resulted indirectly in increased body-esteem through improved BMI (Strauss et al., 2001; Caruso & Gill, 1992; Raustrop et al., 2006). Thus, the positive self-esteem or body-esteem changes that occurred during the interventions could be due to weight loss that happened from the increased physical activity. Furthermore, only one study has examined the relationship between self-esteem and/or body-esteem and physical activity among normal weight children (Fox, 1999).

The relationship between weight status, physical activity and body-esteem is complex and has not been investigated extensively in previous research, especially among at-risk child populations. Perceived physical self-esteem is a predictor for BMI, and physical activity has been suggested as a way to enhance physical self-esteem (Raustorp et al., 2006). The American Heart Association suggests that overweight and

obese children may see beneficial effects on self-esteem and body-esteem with increased levels of physical activity (2011). Some studies indicate that obese children who are more physically active have a higher body-esteem than obese children who are less active (Izzo, 2000). However, children with lower body-esteem are likely to suffer from lower self-esteem, and in turn may not be as active due to the negative consequences of low self-esteem (social stigmas, peer influences) (Paxton, 2005). Among adults, physical activity alone may be associated with a higher body esteem, but may not be the case among children, as kids are more focused on body weight (BMI), and simply increasing physical activity may not translate into higher body esteem levels for children (Caruso & Gill, 1992). Few studies have indicated a positive relationship between physical activity and body-esteem in overweight and obese children, but there is a possible positive relationship between physical activity and body/self-esteem, regardless of weight status (Izzo, 2000). Although a positive relationship among physical activity and body esteem has been indicated in previous research regardless of weight status, the results of our study showed that physical activity was not significantly correlated with children's body-esteem in our sample.

Although physical activity was not identified as a significant correlate of body-esteem among rural children in our sample, our study suggests that a combination of weight status and gender may have an important influence on rural children's body-esteem. The interaction effect of gender and weight status on body-esteem was significant, with higher weight and girls having lower body-esteem scores. We also found that normal weight boys had similar body-esteem scores as overweight boys, but important differences in global body-esteem were found between overweight and obese

boys. In contrast, body-esteem scores of normal weight girls were significantly higher compared to not only obese, but also overweight girls in the sample. Normal weight and overweight boys had similar body-esteem scores possibly due to the fact that boys may not be as affected by BMI status and social pressures as girls (Wood et al., 1996; Paxton, 2005). In boys, being obese did have a significant negative effect on body-esteem scores as compared to normal weight boys; however, overweight boys did not show the same decline in body-esteem as obese boys. This finding suggests that obese, but not overweight, boys may start experiencing social pressures from being significantly heavier than their peers similar to overweight and obese girls (Paxton, 2005). Girls differed significantly across all three weight categories, possibly due to the fact that they experience negative pressure from society, beginning at ages as young as 5 for being overweight (Wood et al., 1996). The finding that girls tend to be more sensitive to weight status is consistent with previous studies, along with girls wanting to be thin (Wood et al., 1996) and experiencing negative social stigmas with increased BMI status (Paxton, 2005).

While our study has multiple strengths, it also has several limitations that should be discussed and addressed in future studies. First, self-reported physical activity instrument that was used in the study is a practical and useful tool for estimating physical activity levels; however, it does not represent an objective measure of regular physical activity among children. In our study, the physical activity data represent a snapshot of children's actual physical activity levels. Thus, future studies should utilize an objective measure of PA (e.g., accelerometers or pedometers) and/or use multiple instruments to estimate PA levels as accurately as possible.

Second, although the BES scale was developed for use with children in previous studies (Mendelson & White, 1985), it was validated for use with children at least 8 years old, which was the age of many children in our sample. Thus, some children in our sample may not have been mature enough to accurately report feelings about their weight and body. Third, body-esteem only was evaluated among children in our sample. Because body-esteem represents only one component of overall self-esteem (Mendelson and White, 1996), future studies with rural children should utilize a measure of self-esteem in order to further explain the potential relationships between body weight, body-esteem and overall self-esteem.

While previous research has established a negative relationship between children's BMI and overall self-esteem, to date, little is known about the relationship between weight status, body-esteem and the role of physical activity on body-esteem (Table 1.1). Our study fills an important gap in this area, especially given our unique sample of rural school-aged children. The results of our study indicate that overweight and obese children living in rural areas have lower global body-esteem as well as lower esteem in terms of weight, attribution and appearance compared to normal weight children. While we found no significant relationship between physical activity and body-esteem, we identified an important interaction between weight status and gender on body-esteem in our sample. It appears that the body-esteem of overweight and obese girls tend to be more negatively influenced by their weight status compared to normal weight girls as well as overweight or obese boys. Furthermore, this finding is alarming because our sample consisted of 8-10 year old children who should still be somewhat protected from social, cultural and peer pressures related to weight and appearance (Wood et al., 1996).

The results of our study with 3rd grade children may be useful for school teachers, parents as well as health professionals working with children in rural areas. The prevention and reduction of childhood obesity should be one of the top priorities in rural areas, as more than one third of rural children in our sample were overweight or obese. The obesity prevention efforts should include not only parents, but also school staff and health professionals in rural areas. While parents can make gradual changes in their lifestyle habits, schools should focus on improving availability of healthy foods in the school environment and promoting regular physical activity among children. PE teachers and health professionals, such as dietitians and nutritionists, should be aware that overweight and obese children tend to have lower body-esteem than their normal weight peers. Since obese children with a low self-esteem have elevated levels of loneliness, sadness, and nervousness (Izzo, 2000), new obesity-focused programs should focus not only on improving dietary habits and physical activity, but also on positively influencing children's body-esteem and overall self-esteem regardless of their weight status.

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APPENDICES

APPENDIX A

Oklahoma State University Institutional Review Board

Date:	Wednesday, September 19, 2007 Protocol Expires: 3/13/2008
IRB Application No:	HE0520
Proposal Title:	Intervening in Family and Peer Contexts to Decrease Child Overweight
Reviewed and Processed as:	Full Board **Modification**

Status Recommended by Reviewer(s): **Approved**

Principal Investigator(s):

Amanda W Harrist 323 HES Stillwater, OK 74078	Lenka Humenikova 308 HES Stillwater, OK 74078	Glade Topham 233 HES Stillwater, OK 74078

The requested modification to this IRB protocol has been approved effective 7/11/07. Please note that the original expiration date of the protocol has not changed. The IRB office MUST be notified in writing when a project is complete. All approved projects are subject to monitoring by the IRB.

X The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

The reviewer(s) had these comments:

The modification updating letters and forms for year 3 of the research and adding the FITNESSGRAM test is approved.

Signature:

Sue C. Jacobs, Chair, Institutional Review Board

Wednesday, September 19, 2007
Date

APPENDIX B.

Oklahoma State University Institutional Review Board

Request for Determination of Non-Human Subject or Non-Research

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Federal regulations and OSU policy require IRB review of all research involving human subjects. Some categorie of research are difficult to discern as to whether they qualify as human subject research. Therefore, the IRB has established policies and procedures to assist in this determination.

1. **Principal Investigator Information**

First Name: Michelle	Middle Initial: M	Last Name: Moulton
Department/Division: Nutritional Sciences		College: Human Environmental Sciences Grad College
Campus Address: 301 HES		Zip+4: 74078
Campus Phone:	Fax:	Email: michelle.moulton@okstate.edu
Complete if PI does not have campus address:		
Address: 729 Oak Ridge Drive		City: Sand Springs
State: OK	Zip: 74063	Phone: 918-645-6676

2. **Faculty Advisor (complete if PI is a student, resident, or fellow)** ☐ NA

Faculty Advisor's name: Lenka H. Shriver		Title: Assistant Professor
Department/Division: Nutritional Sciences		College: Human Environmental Sciences Grad College
Campus Address: 301 HES		Zip+4: 74078
Campus Phone: 744-8285	Fax:	Email: lenka.humenikova@okstate.edu

3. **Study Information:**

A. Title

The relationship among body esteem, weight status, and physical activity in 3rd grade children from rural Oklahoma

B. Give a brief summary of the project. (See instructions for guidance)

The purpose of the proposed study is to examine the relationship among physical activity, body weight, and body esteem in school-aged children from rural Oklahoma.

There is little research conducted on rural areas about lifestyle behaviors, and since 1980, rural residents were more likely to be obese than urban dwellers (Jackson et al., 2005). With the prevalence of obesity being higher in rural areas, this suggests important interventions in rural public health planning (Jackson et al., 2005).

A critical oversight in many of these studies conducted in rural children is the relationship between weight status, body esteem, and physical activity levels, and how each of these factors relates to each other. Although prior studies have addressed the issue of childhood obesity and self-esteem, relatively few studies have focused on examining the links between activity and body weight on self-esteem. Given that the influence of physical activity and weight status on body esteem among children is not well understood, the proposed study will examine the nature of the relationship between physical activity and weight status to body esteem in a sample of 3rd grade children living in rural Oklahoma.

C. Describe the subject population/type of data/specimens to be studied. (See instructions for guidance)

Data from a sub-sample of 214 children who participated in the physical activity and fitness assessment as part of the FiSH project in the Spring of 2008, 3rd grade children from rural Oklahoma, will be included in the analysis. BMI-for-age percentile will be used to categorize children into three categories. Normal, at risk for overweight, and overweight will be the three categories used to indicate children's weight status (Center for Disease Control, 2000).

Physical Activity. The modified Self-Administered Physical Activity Checklist (Sallis et al., 1993) will be used to measure the amount of moderate, vigorous, and combined moderate and vigorous physical activity among children.

Body Esteem Scale (BES). The Mendelson and White Body Esteem Scale for children will be used in this study to examine the relationship between physical activity, body esteem, and weight status (Mendelson & White, 1982). The BES for children (Mendelson & White, 1982) is a 20-item scale assessing child self-perception with three subscales: BE-Appearance (general appearance and body-esteem), BE-Weight (satisfaction with weight), and BE-Attribution (attribution of positive evaluations to others). For this study, an overall score and subscale scores will be used in the analysis.

Proposed Analysis

The sample will be described in terms of body weight, physical activity, and body esteem using descriptive statistics (e.g., means, standard deviations, frequencies). Bivariate correlations will be used to examine the nature of the relationship between physical activity, body esteem, and BMI-for-age percentile. Independent t-tests will be used to compare body esteem to weight status and physical activity. Significant predictors of body esteem scores will be identified using regression analysis where the body esteem score will serve as the dependent variable and physical activity, gender, and BMI-for-age will serve as the independent variables.

4. **Determination of "Research".**
45 CFR 46.102(d): *Research* means a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge. Activities which meet this definition constitute research for purposes of this policy whether or not they are conducted or supported under a program which is considered research for other purposes.

One of the following must be "no" to qualify as "non-research":

A. Will the data/specimen(s) be obtained in a systematic manner?
☒ No ☐ Yes

The data was already collected as part of a larger study and thus, no data will be obtained in a systematic matter for this study. The proposed study is using secondary data to answer the main research questions.

B. Will the intent of the data/specimen collection be for the purpose of contributing to generalizable knowledge (the results (or conclusions) of the activity are intended to be extended beyond a single individual or an internal program, e.g., publications or presentations)?
☐ No X Yes

5. **Determination of "Human Subject".**
45 CFR 46.102(f): *Human subject* means a living individual about whom an investigator (whether professional or student) conducting research obtains: (1) data through intervention or interaction with the individual or (2) identifiable private information. Intervention includes both physical procedures by which data are gathered (for example venipuncture) and manipulations of the subject or the subject's environment that are performed for research purposes. Interaction includes communication or interpersonal contact between investigator and subject. Private information includes information about behavior that occurs in a context in which an individual can reasonably expect that no observation or recording is taking place, and information which has been provided for specific purposes by an individual and which the individual can reasonably expect will not be made public (for example, a medical record). Private information must be individually identifiable (i.e., the identity of the subject is or may be ascertained by the investigator or associated with the information) in order for obtaining the information to constitute research involving human subjects.

A. Does the research involve obtaining information about living individuals?
☒ No ☐ Yes
The study will be using a secondary dataset with data that were already collected for a larger project. Thus, the proposed study does not involve obtaining information from living individuals.
If no, then research does not involve human subjects, no other information is required.
If yes, proceed to the following questions.

Oklahoma State University Institutional Review Board

Request for Determination of Non-Human Subject or Non-Research

All of the following must be "no" to qualify as "non-human subject":

B. Does the study involve intervention or interaction with a "human subject"?
☒ No ☐ Yes

C. Does the study involve access to identifiable private information?
☒ No ☐ Yes

D. Are data/specimens received by the Investigator with identifiable private information?
☒ No ☐ Yes

E. Are the data/specimen(s) coded such that a link exists that could allow the data/specimen(s) to be re-identified?
☒ No ☐ Yes
If "*Yes*," is there a written agreement that prohibits the PI and his/her staff access to the link?
☐ No ☐ Yes

The PI of this study will never have access to any information that would allow to identify the subjects in her dataset.

6. Signatures

Signature of PI Michelle Mouton **Date** 2·28·11

Signature of Faculty Advisor (If PI is a student) Sue M. Brower **Date** 2/28/2011

☒ Based on the information provided, the OSU-Stillwater IRB has determined that this project **does not** qualify as human subject research as defined in 45 CFR 46.102(d) and (f) and **is not subject to oversight by the OSU IRB.**

☐ Based on the information provided, the OSU-Stillwater IRB has determined that this research **does** qualify as human subject research and **submission of an application for review by the IRB is required.**

Shelia M. Kennison
Dr. Shelia Kennison, IRB Chair

3/1/11
Date

APPENDIX C.

Body-Esteem Scale for Children

1.	I like what I look like in pictures	Yes	No
2.	Kids my own age like my looks	Yes	No
3.	I'm pretty happy about the way I look	Yes	No
4.	Most people have a nicer body than I do	Yes	No
5.	My weight makes me unhappy	Yes	No
6.	I like what I see when I look in the mirror	Yes	No
7.	I wish I were thinner	Yes	No
8.	There are lots of things I'd change about my looks if I could	Yes	No
9.	I'm proud of my body	Yes	No
10.	I really like what I weigh	Yes	No
11.	I wish I looked better	Yes	No
12.	I often feel ashamed of how I look	Yes	No
13.	Other people make fun of the way I look	Yes	No
14.	I think I have a good body	Yes	No
15.	I'm looking as nice as I'd like to	Yes	No
16.	I often wish I looked like someone else	Yes	No
17.	My looks upset me	Yes	No
18.	I'm as nice looking as most people	Yes	No
19.	My parents like my looks	Yes	No
20.	I worry about the way I look	Yes	No

Subscale	Factor Loadings		
<u>BE-Appearance</u>			
1. I like what I look like in pictures.	.58		
3. I'm pretty happy about the way I look.	.61		
6. I like what I see when I look in the mirror.	.65		
8. There are lots of things I'd change about my looks if I could	.51		
9. I'm proud of my body.	.58		
11. I wish I looked better.	.63		
14. I think I have a good body.	.59		
15. I'm looking as nice as I'd like to.	.59		
16. I often wish I looked like someone else.	.61		
17. My looks upset me.	.44		
18. I'm as nice looking as most people.	.47		
20. I worry about the way I look.	.61		
<u>BE-Weight</u>			
5. My weight makes me unhappy.		.75	
7. I wish I were thinner.		.79	
10. I really like what I weigh.		.81	
<u>BE-Attribution</u>			
2. Kids my own age like my looks.			.66
12. I often feel ashamed of how I look.			.53
13. Other people make fun of the way I look.			.77
<u>Not used</u>			
4. Most people have a nicer body than I do.			
19. My parents like my looks.			

APPENDIX D.

Modified Self-Administered Physical Activity Checklist (SAPAC)

I want to learn what kind of physical activity you did yesterday. I am going to read a list of activities to see if you did any of them yesterday before, during, or after school. I also want to know for how long you did them. The CLOCK will help you tell me-this whole clock is 60 minutes. For how long do you brush your teeth every morning? (<5 minutes); How long is your favorite show?

For each activity you did, I also want to know whether it made you breathe hard and feel tired, NONE, SOME, OR MOST of the time. There are no right or wrong answers. I just want to know the physical activities you did yesterday. It is important to be very honest. Okay? Let's go.

1. What was the most recent day you went to school?

○ Monday ○ Tuesday ○ Wednesday ○ Thursday ○ Friday

2. Did you participate in physical education class yesterday? ○ YES ○ NO

*Interviewer: For each question, if the child did not participate in the activity (i.e., says "no" to the question), record No (not applicable) and move on to the next question (leaving Before, During, After School, Min., and Intensity cicles blank). If the child says "yes" to the question, record whether they did the activity before, during or after school, for how many minutes, and whether the activity made them breathe and feel tired none, some, or most of the time. Please **don't** record any activities that lasted for less than 5 minutes.*

1. Did you ride a bicycle? ○ No
If yes ○ Before school ○ During school ○ After school Minutes ▶ 0 1 2 3 4 5 6 7 8 9
Intensity ○ None ○ Some ○ Most

2. Did you swim laps? ○ No
If yes ○ Before school ○ During school ○ After school Minutes ▶ 0 1 2 3 4 5 6 7 8 9
Intensity ○ None ○ Some ○ Most

3. Did you play in the water (pool or lake depending on the time of the year)? ○ No
If yes ○ Before school ○ During school ○ After school Minutes ▶ 0 1 2 3 4 5 6 7 8 9
Intensity ○ None ○ Some ○ Most

4. Did you play basketball? ○ No
If yes ○ Before school ○ During school ○ After school Minutes ▶ 0 1 2 3 4 5 6 7 8 9
Intensity ○ None ○ Some ○ Most

5. Did you play baseball or softball? ○ No
If yes ○ Before school ○ During school ○ After school Minutes ▶ 0 1 2 3 4 5 6 7 8 9
Intensity ○ None ○ Some ○ Most

6. Did you play football? ○ No
If yes ○ Before school ○ During school ○ After school Minutes ▶ 0 1 2 3 4 5 6 7 8 9
Intensity ○ None ○ Some ○ Most

7. Did you play soccer? ○ No
If yes ○ Before school ○ During school ○ After school Minutes ▶ 0 1 2 3 4 5 6 7 8 9
Intensity ○ None ○ Some ○ Most

8. Did you play any of the following games: four square, dodge ball, kickball? ○ No
If yes ○ Before school ○ During school ○ After school Minutes ▶ 0 1 2 3 4 5 6 7 8 9
Intensity ○ None ○ Some ○ Most

9. Did you play something like chase, tag, or hopscotch? ○ No
If yes ○ Before school ○ During school ○ After school Minutes ▶ 0 1 2 3 4 5 6 7 8 9
Intensity ○ None ○ Some ○ Most 0 1 2 3 4 5 6 7 8 9

10. Did you play outside and play hide and seek with someone or climb trees? ○ No
0 1 2 3 4 5 6 7 8 9
If yes ○ Before school ○ During school ○ After school Minutes ▶ 0 1 2 3 4 5 6 7 8 9
Intensity ○ None ○ Some ○ Most 0 1 2 3 4 5 6 7 8 9

11. Did you do gymnastics, for example tumbling or bars? ○ No
0 1 2 3 4 5 6 7 8 9
If yes ○ Before school ○ During school ○ After school Minutes ▶ 0 1 2 3 4 5 6 7 8 9
Intensity ○ None ○ Some ○ Most 0 1 2 3 4 5 6 7 8 9

12. Did you jump on a trampoline? ○ No
0 1 2 3 4 5 6 7 8 9
If yes ○ Before school ○ During school ○ After school Minutes ▶ 0 1 2 3 4 5 6 7 8 9
Intensity ○ None ○ Some ○ Most 0 1 2 3 4 5 6 7 8 9

13. Did you jump rope, or do push-ups, or sit-ups? ○ No
0 1 2 3 4 5 6 7 8 9
If yes ○ Before school ○ During school ○ After school Minutes ▶ 0 1 2 3 4 5 6 7 8 9
Intensity ○ None ○ Some ○ Most 0 1 2 3 4 5 6 7 8 9

14. Did you play tennis, or badminton, or paddleball? ○ No
0 1 2 3 4 5 6 7 8 9
If yes ○ Before school ○ During school ○ After school Minutes ▶ 0 1 2 3 4 5 6 7 8 9
Intensity ○ None ○ Some ○ Most 0 1 2 3 4 5 6 7 8 9

15. Did you do judo, karate, or competitive wrestling? ○ No
0 1 2 3 4 5 6 7 8 9
If yes ○ Before school ○ During school ○ After school Minutes ▶ 0 1 2 3 4 5 6 7 8 9
Intensity ○ None ○ Some ○ Most 0 1 2 3 4 5 6 7 8 9

16. Did you dance? ○ No
0 1 2 3 4 5 6 7 8 9
If yes ○ Before school ○ During school ○ After school Minutes ▶ 0 1 2 3 4 5 6 7 8 9
Intensity ○ None ○ Some ○ Most 0 1 2 3 4 5 6 7 8 9

17. Did you do anything outside like mowing, raking leaves, or do gardening? ○ No
0 1 2 3 4 5 6 7 8 9
If yes ○ Before school ○ During school ○ After school Minutes ▶ 0 1 2 3 4 5 6 7 8 9
Intensity ○ None ○ Some ○ Most 0 1 2 3 4 5 6 7 8 9

18. Did you clean your room/house and mop, vacuum, or sweep? ○ No
0 1 2 3 4 5 6 7 8 9
If yes ○ Before school ○ During school ○ After school Minutes ▶ 0 1 2 3 4 5 6 7 8 9
Intensity ○ None ○ Some ○ Most 0 1 2 3 4 5 6 7 8 9

19. Did you skateboard/scooter? ○ No
0 1 2 3 4 5 6 7 8 9
If yes ○ Before school ○ During school ○ After school Minutes ▶ 0 1 2 3 4 5 6 7 8 9
Intensity ○ None ○ Some ○ Most 0 1 2 3 4 5 6 7 8 9

20. Did you roller skate or roller blade? ○ No
0 1 2 3 4 5 6 7 8 9
If yes ○ Before school ○ During school ○ After school Minutes ▶ 0 1 2 3 4 5 6 7 8 9
Intensity ○ None ○ Some ○ Most 0 1 2 3 4 5 6 7 8 9

21. Did you run in addition to running during the activities that we already talked about? ○ No
0 1 2 3 4 5 6 7 8 9
If yes ○ Before school ○ During school ○ After school Minutes ▶ 0 1 2 3 4 5 6 7 8 9
Intensity ○ None ○ Some ○ Most 0 1 2 3 4 5 6 7 8 9

22. Did you go for a walk? Or did you walk anywhere for more than 5 minutes (for example Walmart)? ◯ No

If yes ◯ Before school ◯ During school ◯ After school Minutes ▶ 0 1 2 3 4 5 6 7 8 9

Intensity ◯ None ◯ Some ◯ Most

23. Did you do any mixed walking/running?* ◯ No

If yes ◯ Before school ◯ During school ◯ After school Minutes ▶ 0 1 2 3 4 5 6 7 8 9

Intensity ◯ None ◯ Some ◯ Most

24. Did you watch TV (including video or DVD)? ◯ No

If yes ◯ Before school ◯ During school ◯ After school Minutes ▶ 0 1 2 3 4 5 6 7 8 9

Intensity ◯ None ◯ Some ◯ Most

25. Did you play video or computer games while sitting or laying down? ◯ No

If yes ◯ Before school ◯ During school ◯ After school Minutes ▶ 0 1 2 3 4 5 6 7 8 9

Intensity ◯ None ◯ Some ◯ Most

26. Did you play Wii or any other active video/computer games while moving around? ◯ No

If yes ◯ Before school ◯ During school ◯ After school Minutes ▶ 0 1 2 3 4 5 6 7 8 9

Intensity ◯ None ◯ Some ◯ Most

* We walk and/or run many times throughout the day, often for less than 5 minutes at a time. A good example of this is going from class to lunch. Sometimes we do a combination of walking and running, where we walk some and run some. We call this mixed walking and running. *

Please record any comments/issues that may have affected children's physical activity on the previous day (e.g., sickness, field trip, medical condition, etc.).

VITA

Michelle M. Moulton

Candidate for the Degree of

Master of Science

Thesis: THE RELATIONSHIPS AMONG WEIGHT STATUS, PHYSICAL ACTIVITY, AND BODY ESTEEM IN 3RD GRADE CHILDREN FROM RURAL OKLAHOMA

Major Field: Nutritional Sciences

Biographical:

Education:

Completed the requirements for the Master of Science in Nutritional Sciences at Oklahoma State University, Stillwater, Oklahoma in July, 2011.

Completed the requirements for the Bachelor of Science in Nutritional Sciences at Oklahoma State University, Stillwater, Oklahoma in 2009.

Experience:

Graduate Teaching Assistant (TA): Oklahoma State University, Nutritional Sciences Department, Spring 2010 to Spring 2011

Oklahoma State University Dietetic Intern, 2009 to 2011

Professional Memberships:

American Dietetic Association Student Member

Oklahoma Dietetic Association Member and Volunteer at ODA conventions in Spring 2009 and Fall 2010

Name: Michelle M. Moulton Date of Degree: July, 2011

Institution: Oklahoma State University Location: Stillwater, Oklahoma

Title of Study: THE RELATIONSHIPS AMONG WEIGHT STATUS, PHYSICAL ACTIVITY, AND BODY ESTEEM IN 3RD GRADE CHILDREN FROM RURAL OKLAHOMA

Pages in Study: 69 Candidate for the Degree of Master of Science

Major Field: Nutritional Sciences

Scope and Method of Study:

Currently, 37% of children ages 6 to 11 years are either overweight or obese in the U.S. Overweight children have an increased risk for chronic diseases and lower self-esteem than normal weight children. Some studies indicate that rural residents are more likely to be obese than their urban counterparts. While some studies have examined child obesity rates in rural areas, a critical gap still exists in our understanding of the relationship between body weight, physical activity, and body-esteem. Thus, the main purpose of this study was to examine the associations among weight status, physical activity, and body-esteem in a sample of 3rd grade children from rural Oklahoma.

This exploratory study used secondary data that were collected from 241 children participating in a school-based physical activity and fitness assessment in Spring of 2008. The assessment was conducted in 12 rural Oklahoma schools as part of a large project called the Families and Schools for Health (FiSH) that was funded by the United States Department of Agriculture (USDA). Anthropometrics (height, weight, and BMI-for-age) were measured for each child. The Self-Administered Physical Activity Checklist (Sallis et al., 1996) was used to determine children's activity levels. Body-esteem was measured using the 20-item Body-Esteem Scale for Children by Mendelson and White (1982). Statistical analyses included descriptive statistics, bivariate correlations, one-way ANOVA, and factorial ANOVA. The level of significance was $p<0.05$.

Findings and Conclusions:

Physical activity was not significantly correlated with children's body-esteem. Overweight and obese children had significantly lower BES scores compared to normal weight children. There were no significant differences in normal-weight children on BES-Global and BES-subscale scores in boys or girls. Gender and weight status had a significant interaction effect on body-esteem. Both overweight and obese girls had significantly lower BES than normal-weight girls, while only obese boys had a significantly lower BES than normal-weight boys.

ADVISER'S APPROVAL: Dr. Lenka H. Shriver