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A Comparison of the Physical Activity, Body Composition and Self-Esteem Levels of 5th and 6th Grade Students in Southwest Michigan

Rebevva C. Coady
Western Michigan University

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A COMPARISON OF THE PHYSICAL ACTIVITY, BODY COMPOSITION AND SELF-ESTEEM LEVELS OF 5TH AND 6TH GRADE STUDENTS IN SOUTHWEST MICHIGAN

by

Rebecca C. Coady

A Thesis
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
Degree of Master of Arts
Department of Health,
Physical Education and Recreation

Western Michigan University
Kalamazoo, Michigan
April 1996
A COMPARISON OF PHYSICAL ACTIVITY, BODY COMPOSITION AND SELF-ESTEEM LEVELS OF 5TH AND 6TH GRADE STUDENTS IN SOUTHWEST MICHIGAN

Rebecca C. Coady, M.A.
Western Michigan University, 1996

The problem of this study was to compare the physical activity levels, body fat percentage and self-esteem levels for children 10 to 12 years of age. Subjects were 5th and 6th grade students who attended Schoolcraft or Lawton Middleschools in Southwest Michigan. The instruments used for this study consisted of the Lohman 2-site skinfold test, the Harter "What I am Like" self-esteem questionnaire, and a physical activity checklist. Subjects were grouped according to body fat percentage and physical activity level.

Significant differences were found for males body fat groups for 4 of the 6 subscales of self-esteem: (1) athletic competence, (2) physical appearance, (3) social acceptance, and (4) global self-worth. No significant differences were found between the body fat groups for the females. No significant differences were found between the physical activity groups for males or for females. Thus, as the males body fat percentage increased their self-esteem decreased. This relationship was not true for females. Also, males scored higher than females on all but one of the self-esteem subscales.
ACKNOWLEDGMENTS

I would like to take this opportunity to thank Dr. Roger Zabik, Dr. Patricia Frye, Dr. Wayne Fuqua, Dr. Bill Simpson, and Dr. Scott Frazier. These people offered ideas and assistance through the most challenging times in the development and completion of this study. Without their selfless guidance, completion would have been impossible.

I would also like to lend special thanks to both the Lawton and Schoolcraft middleschools, the subjects, and parents or legal guardians for their gracious support and cooperation in welcoming me into their schools to collect data from their 5th and 6th grade students. Without their help, there would be no thesis.

Last but not least, the most special recognition goes to Dr. Mary Dawson, my committee chair, professor, and friend. I could never put down in words the assistance and inspiration she gave me at all times during the completion of this thesis.

I would like to dedicate this thesis to my parents John and Chris Coady in honor of their excellence in parenting. Without their love, support and interest in my field of study, I would never have had the courage to move away from home and pursue my masters degree in exercise science.

Rebecca C. Coady
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CHAPTER I

INTRODUCTION

From birth until the age of 8 years, a child's environment greatly influences his or her thoughts, activities, and attitudes about life, himself or herself, and his or her physical activity (Fox, 1988). The body is an instrument of action and communication for developing infants and children. Thus, a basic body concept emerges through environmental influences. Over time the body concept gradually evolves into a more global self-esteem. Self-esteem is the value we place on our self-image. Self-esteem is a basic element in a child's personality development and is believed to be a motivational springboard into future environmental experiences which, over time, shape personality into more definable constructs.

Many factors influence global self-esteem, including body composition and physical activity. Body composition, otherwise referred to in this study as body fat percentage, is now being used to determine the health status of children. Obesity is most common chronic disease among children and adolescents in the industrialized countries. For children ages 6 to 11 years of age the prevalence of obesity has increased 50% for boys and 63% for girls since the 1960s (Lohman, 1992). In the United States, as many as
25% of children can be considered obese, and the prevalence of childhood obesity seems higher in the lower socioeconomic groups (Davis et al., 1994). Research in the areas of children’s body composition, physical activity, and self-esteem has supported the assumption that children who live in a somewhat sedentary to completely sedentary environment tend to be overweight to obese and have lower self-perceptions or self-estees (Fox, 1988; Sonstroem & Morgan, 1989). However, no research has been found on the effect low weight or below normal percent fat has on children’s self-esteem. Studies completed prior to the late 1980s utilized height/weight charts for the determination of a child’s health status (Lohman, 1992). Not until the late 1980’s did the utilization of body composition become a standard component for assessing children’s wellness.

In the past 30 years, due to the increased prevalence of cardiovascular disease and obesity in children, many researchers and educators have united in efforts to increase the physical activity levels of youth. Information published by the American College of Sports Medicine (1995), American Alliance of Health, Physical Education, Recreation and Dance (AAHPERD, 1988), and the President's Council on Youth Fitness and Sports (Corbin, Pangrazi, & Welk, 1994) promotes a school of logic that strongly encourages higher levels of physical activity for children due to the derived physiological and psychological benefits. Promoting a child’s fitness results in changes in current fitness behaviors and instills a commitment to lifetime fitness. For children to be fit for life, they must learn how to develop
their own personal exercise programs, test for and interpret their own fitness status, and resolve their own fitness issues (Corbin et al., 1994). Biddle (1993), Malina (1988), and Sonstroem, Harlow and Josephs (1994) suggested that through increased physical activity levels, children can elicit higher self-esteem, which will assist in perpetuating healthy lifestyle habits which can result in happier, healthier more fulfilling lives.

Problem of the Study

The problem of this study was to compare the body composition, physical activity and self-esteem of pre-adolescents. The researcher compared self-esteem among: (a) four levels of body fat percentage: low, healthy, moderately-high, and high; and (b) four levels of physical activity: low, average, high, and very high.

Need for the Study

Self-esteem is composed of many different variables, including body composition and physical activity. There is ample literature supporting, that with increased physical activity levels, children attain healthier body compositions and higher self-esteem levels. The purpose and intent of this study was to compare these variables for 5th and 6th grade students that attended Lawton or Schoolcraft Middleschools in Southwest Michigan. This information could be utilized by parents and educators as evidence supporting the importance of more active lifestyles for children.
Delimitations

The following delimitations were established for this study:

1. The subjects were chosen from the 5th and 6th grade classes in the Schoolcraft and Lawton Middleschools in Southwest Michigan.

2. All subjects were grouped into 4 categories based on the Lohman body fat measurement protocol (triceps and calf): (1) low body fat percentage, (2) healthy body fat percentage, (3) moderately-high body fat percentage, (4) high body fat percentage.

3. All subjects were administered the Harter “What I Am Like” self-perception questionnaire (Harter, 1985).

4. All subjects were administered a physical activity checklist to determine the time spent in physical activity.

5. The data collection was administered for a period of 2 weeks during the month of December, 1995.

6. All body composition administrators were graduate students or faculty members at Western Michigan University in the department of Exercise Science, and who were trained in skinfold measurements by the investigator.

Limitations

This study was limited by the following:

1. Some middle school children may not understand all the questions
asked in the self-perception questionnaire.

2. The children were not selected randomly, and therefore, may not be representative of all 5th and 6th graders.

3. The children represent two middleschools in Southwest Michigan, and therefore, may not be representative of all middleschools.

Assumptions

The following assumptions have been made about the study:

1. All subjects completed the questionnaire honestly and correctly.

2. The test instruments were both reliable and valid measures of body composition, physical activity, and self-esteem.

3. The test administrators performed the body composition analysis accurately and reliably.

Hypotheses

The following hypotheses were made about the study:

1. The healthy body fat group will score higher than the low, moderately-high, and high groups on all 6 domains of the Harter self-esteem scale.

2. The moderate and high physical activity groups will score higher than the low physical activity level group on all 6 domains of the Harter self-esteem scale.

3. The low and the high body fat groups will score lower than healthy
and moderately-high body fat groups, on the Harter self-esteem scale and
the physical activity checklist.

Definition of Terms

The following are specific terms used throughout this study:

1. **Body Composition**: The division of the total body weight into two
   components: fat weight and lean weight.

2. **Fat Weight**: Subcutaneous adipose tissue.

3. **Healthy Body Fat Percentage**: Body fat percentage between 15% and 25% for girls and 11% and 20% for boys, for ages 10 to 12 years (Lohman, 1992).

4. **High Body Fat Percentage**: Body fat percentage that is over 30% for girls and over 25% for boys, for ages 10 to 12 years (Lohman, 1992).

5. **Essential Fat**: Adipose weight necessary for optimal health (for males, between 2% and 3%, and for females between 10% and 12% (Lohman, 1992).

6. **Low Body Fat Percentage**: Body fat percentage that is less than 10% for boys and 15% for girls, ages 10 to 12 years (Lohman, 1992).

7. **Moderately-high Body Fat Percentage**: Body fat percentage between 26% and 30% for girls and between 21% and 25% for boys, ages 10 to 12 years (Lohman, 1992).

8. **Obesity**: An excessive accumulation of fat weight; for this study above 25% fat for boys and above 30% fat for girls, for ages 10 to 12 years.
(ACSM, 1995; Lohman, 1992).

9. Physical Activity: Any exercise that protects and prevents against the development and or progression of chronic diseases and that promotes a healthy lifestyle (ACSM, 1995).
CHAPTER II

LITERATURE REVIEW

Introduction

It has been identified that lifestyle factors are responsible for 53% of the potential years of life lost before the age of 65 years (Metzler, 1991). The prevalence of known risk factors for chronic diseases among children is particularly disturbing. Risk factors such as smoking, obesity, hypertension, diabetes, stress, and Type A behaviors are all too common among children and youth (Dishman & Dunn, 1988).

One of the most underemphasized variables contributing to the increased prevalence of disease is inactivity. There are many reasons why children have become less and less active over the past 30 years, thus increasing the prevalence of early childhood illness and lower self-esteem levels. Several reasons include the increase in single-parent families and the "latchkey" phenomenon, concerns about childhood safety, cutbacks in school physical education program funding, and an increased interest in sedentary activities such as watching television, eating, and playing video games (Willis & Campbell, 1992). There are, however, several goals that have been developed in order to promote optimal health and fitness.
Researchers have recommended that children participate in activities that incorporate large muscle dynamic exercises, moving the body over distance and against gravity, some heavy resistive exercises, and flexibility exercises. Physical activities should be of moderate to vigorous intensity, last for at least 30 minutes, and be performed daily (Willis & Campbell, 1992).

The Public Health Service has set health priorities and goals for the year 2000 for increasing physical activity and fitness for people in the United States. The following are areas in which risk reduction have been proposed (Willis & Campbell, 1992, p. 216):

1. Increase to 90%, the proportion of children and adolescents ages 6 to 17 years who participate in moderate physical activities three or more times a week for 20 minutes or more (78% in 1984).

2. Increase to at least 75% the proportion of children and adolescents who participate in vigorous physical activities that promote the development and maintenance of cardiovascular fitness three or more times a week for 20 minutes or more (66% in 1984).

3. Increase to at least 75% the proportion of children and adolescents ages 6 to 17 years who regularly perform physical activities that maintain muscular strength, muscular endurance and flexibility.

4. Reduce the percentage of overweight adolescents ages 12 to 17 years to less than 15% (15% in 1976-1980).

5. Increase to 75% the percentage of overweight adolescents ages 12 years and over who have adopted sound dietary practices combined with
physical activity to lose fat weight.

6. Increase to at least 45% the proportion of children and adolescents in grades 1 to 12 who participate in daily school physical education programs (36% in 1984 through 1986).

7. Increase to 70% the proportion of physical education teachers who spend 30% or more of class time on skills and activities that promote lifetime physical activity participation.

Children and Self-Esteem

The interactionist view of personality traits is expressed primarily as the product of both inherited dispositions and interaction with others and oneself. Self-Esteem has been defined by Biddle (1993) as the “totality of an individual’s thoughts and feelings with reference as himself as an object” (p. 207). This helps in defining and representing who one “is”. Self-esteem has been found to develop at a very young age through both hereditary and environmental variables. By the age of eight years, a child has developed the majority of his or her self-esteem (Sonstroem & Morgan, 1989). Rogers (1950) defined self-esteem as “an organized configuration of prescriptions of the self which are admissible to awareness” (p. 173). Thus, self-esteem has been described as the degree to which individuals feel positive about themselves or a “personal judgement of worthiness”.

Self-esteem is one of the primary building blocks of a child’s
psychological makeup and refers to one's perceptions and evaluations of self. This may encompass evaluations about behaviors (for example, academic, motor skills, emotional, physical appearance) or an assumption related to how others perceive those characteristics. Children's successes and their developing tolerance of failures provide a strong influence on self-esteem (Roberts, 1992). Movement has been identified as one of the primary influences on a child's self-esteem. Through movement, children are provided the opportunity to express emotions and identify with a group. Many studies have shown that there is a positive relationship between high positive peer-group acceptance for the highly proficient and average to low weight child, and less peer-group acceptance for the less proficient, overweight child (especially among males). There are other influencing factors. These include attitudes toward others (for example, the bully), intelligence to attempt a challenge, and a teacher's acceptance of the individual. A teacher who allows any child to be chosen last, for example, or openly criticizes poor performance may be adding to a child's negative self-esteem. The child may display one of two behaviors; he or she either becomes more introverted (quiet and withdrawn) or lives up to his or her negative self-image by becoming failures. Negative feelings like these are found and often acted out in aggressive behavior (Roberts, 1992).

Activities should be taught to meet the needs, interests, and physical capabilities of children at various developmental stages. Developmentally, appropriate activities should be used as a means of enhancing a child's
realistic concept of his or her abilities (Roberts, 1992). In the pre-adolescent years, children are taught either intentionally or unintentionally how to judge themselves according to their peer groups. Often due to this self judgment, they develop low self-esteem about their appearance, motor skills and behavior. This can and should be monitored carefully by children's parents and teachers in order to lessen the stereotypes formed by children. This may help children become exposed to positive social reinforcement in relation to body image and self-esteem (Brylinsky & Moore, 1994).

Self-esteem has been broken down and defined by several subscales according to Harter (1985). These include scholastic competence, social acceptance, athletic competence, physical appearance, behavioral conduct, and global self-worth. These scales are utilized in the "What I am Like" self-esteem questionnaire developed and revised by Susan Harter at the University of Denver in 1985. The 6 subscales are different from one another and when combined comprehensively describe a child's self-esteem. Because it becomes almost impossible to consider a picture of oneself without experiencing self-evaluation and affect, the two terms (self-esteem and self-concept) are often used synonymously (Sonstroem & Morgan, 1989). Acute levels of depression in America have repeatedly been associated with lower self-esteem. Low self-esteem has been implicated in problems of neurosis, child abuse, and adolescent interpersonal difficulties. Positive self-esteem has been associated with the possession of social skills and the achievement of leadership status (Sonstroem & Morgan, 1989).
Children and Physical Activity

Overall, today's children have lower than average physical activity levels. Many children find themselves in front of a television or computer screen during most of their free time out of school. A large number of research projects compiled over the past 10 years indicated that an average child spends approximately 27 hours per week participating in sedentary activities such as viewing television or playing video games (Raithel, 1988). Research supported the idea that due to lower physical activity levels the child tends to be more obese and therefore, is exposed to fewer physical activities (Gortmaker, Dietz, Sobol, & Wehler, 1987).

It has been found that approximately 97% of children are enrolled in physical education classes, but only 36% participate in those classes daily. The less time schools allow for physical education, the more time they allow for recess (Gortmaker et al., 1987). This suggests that schools are using recess as a substitute for physical education. The results of the North Carolina Youth Fitness Study (Davis et al., 1992) indicated that:

1. Half of all students were tested for fitness; however, schools generally used tests that measure motor performance rather than health-related fitness.

2. Schools are not promoting lifetime fitness to the degree desired by the federal government. As early as third grade, movement experiences and throwing and catching activities give way to competitive team sports, both in
physical education classes and after school.

3. Fewer than 33% of the parents of first through fourth graders participate in moderate to vigorous exercise 3 days a week, and about half never do. On average, parents exercise with their children less than 1 day a week.

4. Young children watch television an average of 2 hours a day on school days and 3.5 hours a day on weekends (Malina, 1988).

Research on children’s general motor abilities has suggested that, as a whole, children (especially girls) lack general athletic ability. Some studies suggested that, due to the parent’s and the schools’ lack of influence on children’s sports participation, children are simply not learning how to perform many activities and thus, perceive themselves as incompetent (Schmidt, 1991). Body figuration or physique is also a factor in many athletic activities. Bigger and stronger children who mature earlier have an obvious advantage when performing most athletic skills. These children tend to become exposed to more sports and develop interest and talent at a much younger age. General personality traits also tend to influence the exposure a child receives in sports. A very assertive extroverted child tends to develop motor skills faster than an introverted, soft-spoken child (Schmidt, 1991).

The American College of Sports Medicine (1995), United States Center for Disease Control and Prevention (1994), and the President’s Council on Physical Fitness and Sports (Corbin et al., 1994) worked together to devise the Children’s Lifetime Physical Activity Model (CLPAM). In the
model a range from minimal to optimal functioning standards was established. The model included the frequency, intensity, and duration a child should experience during physical activity. In the CLPAM, it was recommended that a child should be physically active daily, with three or more bouts of exercise each day. The exercise should include moderate to vigorous activity, alternating bouts of activity with rest periods as needed, or moderate activity such as walking or riding a bike to school. The exercise duration of activity should be at least 30 to 60 minutes or more of active play per day of moderate or sustained activity that may be distributed over three or more activity sessions daily. Essentially a child’s daily activity should be of a duration to burn between 6 to 8 calories per kilogram of body weight. Although programs using continuous high-intensity (high heart rate) activity are not physiologically harmful to children, they are not the most appropriate. Children need to perform or participate in physical activities that are enjoyable and encourage a lifetime of activity.

Physical Activity and Self-Esteem for Children

Biddle (1993) reiterated that some forms of physical activity can enhance psychological well-being and reduce the risk of some health problems, both physical and mental (Biddle, 1993). Particular aspects of physical activity have come to be known as “health related” components of physical fitness and exercise. These aspects are cardiorespiratory endurance, muscular strength and endurance, flexibility, and body
composition. Stress management also has an important role in health promotion and can include exercise interventions (Biddle, 1993).

The National Institute of Mental Health in the United States supports the view that exercise has beneficial emotional effects for children. However, the evidence to support such a statement is actually very limited. The NIMH stated that: (a) exercise is associated with reduced state anxiety, (b) exercise has been associated with a decreased level of mild to moderate depression, (c) long-term exercise is usually associated with reductions in traits such as neuroticism and anxiety, (d) exercise results in the reduction of various stress illnesses, and (e) exercise has beneficial emotional effects across all ages and in both sexes (Biddle, 1993). The NIMH stated,

It is clear that exercise can produce positive mental health changes but since the data are almost exclusively on adults, conclusions about children must be more tentative; however, there is no logical reason why such effects should be uniquely associated with the adult population (Biddle, 1993, p. 203).

Many studies, including works of Willis and Campbell (1992) and Sonstroem and Morgan (1989), suggested links between physical estimation and self-esteem. In several studies in which children experience physical interventions, the self-esteem scores rose nearly one-half of a standard deviation higher than equivalent children in control groups (Biddle, 1993).

Stated simply, it is assumed that involvement in physical activity increases physical ability, which therefore, raises one’s physical self-estimation and leads to higher levels of self-esteem. Because people with
higher self-esteem take pride in their bodies, they continue to exercise, thereby maintaining and increasing their fitness levels (Willis & Campbell, 1992).

**Children and Body Composition**

Obesity is an excess of body fat frequently resulting in a significant impairment of health. Because body fat content is not as readily estimated in the field as it should be, the level of fatness at which one is at greater risk for health impairment has not been clearly established by epidemiological research. However there has been research supporting that overfatness decreases overall health and longevity (Going, 1988).

The prevalence of obesity throughout childhood has not been well defined because of the variety of methods and procedures used to estimate body fatness. Three major measurement techniques are body mass index, skinfolds, and hydrostatic weighing. These methods involve different measurement scales. Prevalence of overfatness varies with geographical locations, ethnic groups, seasons of the year, and age of the child (maturation). It has been found that more children in the 1980s were obese than were obese in the 1960s, which indicates an increased prevalence of childhood obesity and cardiovascular disease (Lohman, 1992). Evidence indicating an increase in the prevalence of obesity in the United States population is further confirmed by data obtained in the 1980s as part of the National Children and Youth Fitness Study (NCYFS; Davis et al., 1992). The
NCYFS used the triceps and subscapular skinfolds as well as body mass index to test two hypotheses: (1) The prevalence of obesity was higher in the 1980s than it was in the 1960s, and (2) Children are fatter at all percentiles in the 1980s than in the 1960s. Both samples for this study had 500 subjects per age group for both boys and girls. This was the largest study of its kind. Lohman (1992) found that the prevalence of obesity for boys and girls 6 to 11 years of age has increased 62% and 65%, respectively since the 1960s. The body mass index findings were similar.

Research on children and youth, as well as on adults, needs to be conducted to develop body fat percentage standards in relation to health. Berenson, McMahon, and Voors (1980) studied children and youth for 20 years, relating skinfold measurements to cardiovascular risk factors including blood pressure levels and glucose tolerance. The studies clearly show that skinfold measures are related to an increased risk for higher levels of lipids and lipoproteins, higher blood pressure levels, and lower glucose tolerance. Also, they indicated that in children, cardiovascular risk factors develop faster in overfat children (over 25% body fat for males, and over 30% body fat for females), than in children with healthy body fat levels. These studies support the direct relationship between body fat percentage and risk of coronary heart disease in children (Lohman, 1992).

Body Composition and Youth Fitness

Educating children about the relationship of health to fitness and
physical activity has been an important priority for the physical education profession for the past 15 years. AAHPERD has been a pioneer in the development of youth fitness tests since the first nationally recognized test in 1961 (Lohman, 1992). From 1975 to 1980 various committees have dealt with this issue. Performance-related fitness was a major emphasis in the early youth fitness tests. A need to emphasize health-related fitness tests then evolved. AAHPERD recognized that in the U.S., physical inactivity contributed to obesity, cardiovascular disease, and lower back pain. A need to teach children about the health benefits of an active lifestyle also existed. The test developed by AAHPERD, in 1981, included four items: (1) skinfolds to assess body composition, (2) a mile run to assess cardiorespiratory endurance, (3) a sit and reach test to assess flexibility, and (4) situps to assess abdominal muscle strength. It was thought that if children could learn to maintain their body fatness within an optimal range for health and increase cardiorespiratory endurance, they would have acquired important knowledge for the prevention of these major diseases.

Body Composition Testing in Public Schools

Riley (1991) discussed the effectiveness of body fat testing in the public schools. Riley identified that skinfold testing did little to improve the health of children. "Skinfold testing is a relatively unimportant factor in alleviating the multifaceted problem of obesity. Improving self-esteem, teaching about proper nutrition and exercise, teaching movement skills, and
promotion of physical activity will reap far greater benefits" (Riley, 1991, p. 5).

At an AAHPERD conference in October of 1990, a poll was taken about the percentage of physical educators who use skinfold tests, and whether they felt that testing body composition reaped benefits for the child. The results supported the importance of skinfold testing. Sixty-three percent of those responding indicated that they used skinfolds, and 94% of those using skinfolds felt the child benefited from that knowledge. In contrast, 37% of the 38 individuals attending the conference did not administer skinfolds and questioned the validity and reliability of such testing (Lohman, 1992).

Children need to deal with their feelings about their fatness levels, fitness levels, self-and body image, and physical inactivity. Curriculum approaches need to be developed and tested to help children access and process their own feelings so they can remove impediments to their self-esteem in any of these areas. Such aspects of health need to be incorporated in the physical education or health classes to help a child make healthy decisions and gain a strong understanding of what is healthy and what is unhealthy (Lohman, 1992).

Summary

Bar-Or (1993) strongly supported the theory that exercise and physical activity have a definite role in the management of childhood obesity, particularly when combined with nutrition and behavior modification. Besides the effects on body fat percentage, lean body mass may be
preserved and/or increased as a result. This is an important consideration for the growing child. It is important that all physical activities prescribed or taught to youth be enjoyable. The greatest challenge ahead is how to educate parents and teachers on how to facilitate a level of involvement and enjoyment so these children will decrease their inactive free time (television, video games) and increase or maintain moderate to high levels of physical activity throughout a lifetime.

It has been documented that an increase in physical activity levels also directly relates to higher self-esteem levels in children, therefore increasing the chance of a greater sense of psychological well being and success over a lifetime (Sonstroem et al., 1994). So it is evident that if parents and teachers facilitate higher levels of physical activity levels, the child will be physically healthier (decreased body fat percentages and risk of disease) and have higher self-esteem levels, which improves the overall quality of life for the child into adulthood.
CHAPTER III

METHODS

Introduction

The problem of this study was to compare the physical activity levels, body fat percentages and self-esteem levels for children 10 to 12 years of age. The following areas were pertinent to how the study was designed and conducted: subjects, instruments and instructions, data collection procedures, and research design and analysis.

Subjects

The subjects used for this study were 5th and 6th grade students (ages 10 to 12 years) who attended either the Schoolcraft or Lawton Middle Schools in Southwest Michigan. All students in grades 5 and 6 were asked to participate in the study as long as they were 10 to 12 years of age. Prior to data collection, both an informed consent form and an assent form were used to educate the parents and subjects on the research being conducted. No subject participated in the study without prior consent from a parent or guardian. Appendix A and B contain the informed consent and assent form, and the Human Subjects Institutional Review Board approval, respectively.
Instruments and Instructions

The instruments used for this study consisted of the Lohman two-site skinfold test, the Harter “What I Am Like” self-perception questionnaire, and a physical activity checklist.

Skinfold Test

For the skinfold test, the Body Composition Estimation for Children was used (Lohman, 1992). The triceps and calf measurements recorded in millimeters were used to calculate the degree of body fat measured as a percentage.

Triceps

The following procedures for measuring the triceps brachii skinfold site were used in this study:

1. The triceps skinfold was measured on the right upper arm, midway between the elbow and the shoulder. The midpoint was measured on the back of the arm over the triceps brachii muscle.

2. Subjects were instructed to stand erect with their right arm relaxed, palm facing the lateral side of the leg.

3. The vertical skinfold was grasped between the thumb and index finger 0.5 in. or about 1 cm above the midpoint of the arm. The calipers were
placed at a depth of about 1 in., or 2 cm., at the site.

Calf

The following procedures for measuring the calf skinfold site were used in this study:

1. The calf skinfold was measured on the inside (medial side) of the right lower leg at the largest part of the calf girth.

2. To take the calf measurement the students placed their right foot on a bench (8 in).

3. The vertical skinfold was gently grasped and lifted with the thumb and index finger slightly above the largest part of the calf. The caliper was placed at the point where the girth was greatest.

The skinfold calipers used for this study were Fat Control, manufactured by Fat Control, Inc., Towson, MD. The reliability or consistency of this caliper is comparable to the accuracy of the more expensive brand calipers, with readings 1 to 4 mm higher than the well known Lange or Harpenden calipers (Lohman & Pollock, 1981).

Harter Questionnaire

The self-esteem questionnaire used in this study was developed by Susan Harter (1985) from the University of Denver. It is called the “What Am I Like” self-perception profile for children. The instrument measured 6 domains of self-esteem: (1) scholastic competence, (2) social acceptance,
(3) athletic competence, (4) physical appearance, (5) behavioral conduct, and (6) global self-worth.

The reliability or internal consistency for all 6 subscales, based on Cronbach's Alpha were: (1) scholastic competence, .82; (2) social acceptance, .77; (3) athletic competence, .85; (4) physical appearance, .80; (5) behavioral conduct, .74; and (6) global self-worth, .80 (Harter, 1985). This questionnaire was created specifically for preadolescents (grades 3 to 6). The questionnaire was suitable for the reading and comprehension levels of this group, and was based on children making their own self-judgments. Gender issues were found to play a role in differences among the subscales. Prior research reported that boys attained higher scores than girls for the athletic competence and physical appearance subscales, and girls scored higher than boys on the behavioral conduct subscale (Harter, 1985). Keyser and Sweetland (1992) discussed that although the Harter Questionnaire is very new, it has already proven very useful for generating information about children's self-esteesms and their correlates. "Few instruments for children have undergone such careful and systematic development, and this one seems to provide more information about how children view themselves than do the more well-established measures of self-esteem in children" (Keyser & Sweetland, 1992, p. 478).
Physical Activity Checklist

The physical activity checklist was designed by the researcher in order to gain an estimate of the children's cumulative annual physical activity. The checklist contained several activities that children participate in on a daily basis, after school, and on weekends (see Appendix D). The activities available on the checklist included: (a) sedentary activities, e.g., reading and homework; (b) team sports, e.g., rocket football, baseball, soccer, volleyball; (c) individual sports, e.g., gymnastics, karate, dance; and (d) nonsupervised sports, e.g., bike riding, tag. For each item on the checklist, the subjects were asked to: (a) indicate the amount of time they participated in each activity: (1) 0-30 min, (2) 30-60 min, or (3) 60+ min; and (b) indicate the number of times per week they participated in each activity.

Data Collection Procedures

Exercise science graduate students who attended Western Michigan University were recruited to assist with the skinfold testing. They were required to administer the skinfold test and answer any questions the children had during the testing. The researcher began by administering the questionnaire in the subjects classroom.

Immediately after the Harter questionnaire, the subjects filled out the physical activity checklist, and then the skinfold test was completed last. The researcher explained the body fat testing procedure to the subjects prior to
the test, and the assistants answered any questions during the testing.

Research Design and Analysis

Scoring

The scoring system for each item on the Harter questionnaire used numerical ranked data. All scores were entered into a computer, and a score was obtained for each of the 6 subscales. Scoring, thus, resulted in a total of 6 subscale means which defined a given subject's profile. The results from the scoring represent interval data.

Independent Variables

Percent Body Fat

Percentage of body fat was used to group subjects into 4 levels: (1) low body fat, for children 10 to 12 years of age was below 10% for boys and below 15% for girls; (2) healthy body fat, for children 10 to 12 years of age was between 15% and 25% for girls, and between 11% and 20% for boys; (3) moderately-high body fat, for children 10 to 12 years of age, was between 26% and 30% for girls and between 21% and 25% for boys, and (4) high body fat, for children 10 to 12 years of age, was over 25% for boys and over 30% for girls (Lohman, 1992).
Physical Activity Levels

Total hours of cumulative annual physical activity was used to group subjects into 4 levels: (1) low, (2) average, (3) high, and (4) very high. The specified levels of physical activity used to group subjects were determined after the data was collected. A frequency distribution that included all subjects was constructed. Natural breaks in the distribution were used to group subjects into 4 groups of approximately equal sizes. If the distribution lacked the necessary natural breaks then the distribution was divided into four equal groups by percentages.

Gender Effects

Results of previous research supported the assumption that gender plays a role in the determination of the mean scores for the 6 subscales. Previous studies reported that boys attained higher mean scores than girls for the athletic competence and physical appearance subscales, and girls scored higher than boys on the behavioral conduct subscale (Harter, 1985). Therefore, this study was designed to reflect the possibility of gender differences.

Dependent Variables

Six Subscales

In this study the investigator chose to use Susan Harter’s “What Am I
Like" self-perception questionnaire. The questionnaire breaks the total self-perception (self-esteem) into 6 subscales:

1. **Scholastic Competence**: This scale identifies the child's perception of his or her competence or ability within the realm of scholastic performance.

2. **Social Acceptance**: This scale identifies the degree to which the child feels accepted by peers or feels popular.

3. **Athletic Competence**: This scale identifies the degree the child is cognizant of sports or outdoor games.

4. **Physical Appearance**: This scale identifies the degree to which the child is happy with the way he or she looks.

5. **Behavioral Conduct**: This scale identifies the degree to which the child likes the way he or she behaves, does the right thing, acts the way he or she is supposed to, avoids getting into trouble, and does the things he/she is supposed to do (Harter, 1985).

6. **Global Self-Worth**: This scale identifies the extent to which the child likes himself or herself as a person, is happy with the way he or she is leading his or her life, and is generally happy with the way he or she is (Harter, 1985).

**Analysis of Variance**

Two-way analysis of variances (ANOVAs) were used to compare the differences among the levels of percent body fat and physical activity levels
for the 6 subscales at a significance level of .05. These analysis were conducted for both boys and girls. BMDP Statistical software, program 2V was used to run the two-way analyses of variance. The Tukey HSD test for multiple comparisons was used as the post hoc testing procedure.
CHAPTER IV

RESULTS AND DISCUSSION

Introduction

The problem of this study was to compare physical activity levels, body fat percentage and self-esteem levels for children 10 to 12 years of age. This chapter includes results, and discussion of all data collected, and analyzed for this study.

Results

This section begins with the comparative descriptive statistics of the means and standard deviations of both body fat and physical activity for males and females. In sections labeled males and females the ANOVAs are reported.

Descriptive

This section compares the males and females for each self-esteem subscale using the independent variable body fat percentage. The males in this investigation fell into three of the four body fat groups, healthy, moderately-high, and high. The female subjects were dispersed in all four
groups, low, healthy, moderately-high, and high. For the scholastic competence subscale (SCS) males in the healthy and moderately-high groups scored higher than the females in the respective groups. However, males in the high group scored lower than females in the high group. Males in the healthy, moderately-high, and high body fat groups scored higher than the females in the respective body fat groups for the social acceptance subscale (SAS), athletic competence subscale (ACS), and physical appearance subscale (PAS). However, for the behavioral conduct subscale (BCS), females scored consistently higher than males across all body fat groups. For the moderately-high body fat group, males and females were the same. For the global self-worth subscale (GSW), boys scored higher in the healthy and moderately-high body fat groups, and girls scored higher in the high body fat group. Table 1 provides a complete list of means and standard deviations for the body fat groups.

Subjects were grouped according to the number of times per week and hours per week they claimed to participate in physical activity. The groupings were as follows: (a) males were dispersed in all four groups previously described, low, average, high, and very high; (b) females were dispersed into only two of the four groups, low and average. Therefore, when comparing males’ and females’ physical activity groupings on self-esteem, only two groups were used, low and average. Males’ self-esteem scores were higher in the low and average groups than the females’ scores in the respective groups for all of the subscales except BCS. For BCS the
### Table 1

Percent Body Fat Means and Standard Deviations for Males and Females

<table>
<thead>
<tr>
<th>Body Fat</th>
<th>N/%</th>
<th>SCS</th>
<th>SAS</th>
<th>ACS</th>
<th>PAS</th>
<th>BCS</th>
<th>GSW</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Males</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthy</td>
<td>49</td>
<td>3.31</td>
<td>3.43</td>
<td>3.62</td>
<td>3.41</td>
<td>3.14</td>
<td>3.63</td>
</tr>
<tr>
<td>52%</td>
<td>0.60</td>
<td>0.58</td>
<td>0.45</td>
<td>0.54</td>
<td>0.64</td>
<td>0.45</td>
<td></td>
</tr>
<tr>
<td>Moderately-High</td>
<td>17</td>
<td>3.48</td>
<td>3.46</td>
<td>3.43</td>
<td>3.25</td>
<td>3.38</td>
<td>3.66</td>
</tr>
<tr>
<td>18%</td>
<td>0.61</td>
<td>0.47</td>
<td>0.46</td>
<td>0.49</td>
<td>0.57</td>
<td>0.44</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>29</td>
<td>2.95</td>
<td>2.81</td>
<td>3.06</td>
<td>2.82</td>
<td>2.95</td>
<td>3.06</td>
</tr>
<tr>
<td>31%</td>
<td>0.87</td>
<td>0.98</td>
<td>0.87</td>
<td>0.92</td>
<td>0.67</td>
<td>0.91</td>
<td></td>
</tr>
<tr>
<td><strong>Females</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>13</td>
<td>3.15</td>
<td>2.95</td>
<td>3.18</td>
<td>3.18</td>
<td>3.47</td>
<td>3.39</td>
</tr>
<tr>
<td>12%</td>
<td>0.73</td>
<td>0.69</td>
<td>0.82</td>
<td>0.67</td>
<td>0.50</td>
<td>0.73</td>
<td></td>
</tr>
<tr>
<td>Healthy</td>
<td>46</td>
<td>2.95</td>
<td>2.99</td>
<td>3.02</td>
<td>2.83</td>
<td>3.41</td>
<td>3.26</td>
</tr>
<tr>
<td>42%</td>
<td>0.75</td>
<td>0.89</td>
<td>0.68</td>
<td>0.89</td>
<td>0.56</td>
<td>0.67</td>
<td></td>
</tr>
<tr>
<td>Moderately-High</td>
<td>25</td>
<td>2.90</td>
<td>3.03</td>
<td>2.90</td>
<td>2.82</td>
<td>3.35</td>
<td>3.13</td>
</tr>
<tr>
<td>23%</td>
<td>0.87</td>
<td>0.74</td>
<td>0.78</td>
<td>0.67</td>
<td>0.63</td>
<td>0.59</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>25</td>
<td>3.20</td>
<td>2.79</td>
<td>2.72</td>
<td>2.59</td>
<td>3.57</td>
<td>3.23</td>
</tr>
<tr>
<td>23%</td>
<td>0.57</td>
<td>0.73</td>
<td>0.69</td>
<td>0.87</td>
<td>0.54</td>
<td>0.80</td>
<td></td>
</tr>
</tbody>
</table>

*Note. SD are below M.*
females scored higher than the males for both physical activity groups, low and average. Table 2 presents a complete list of descriptive statistics for the physical activity groups.

ANOVA

Two-way ANOVAs were used to analyze the data for this study. The two research variables were: (1) body fat percentage and (2) physical activity. The dependent variable was self-esteem levels broken down into 6 subscales: (1) scholastic competence, (2) social acceptance, (3) athletic competence, (4) physical appearance subscale, (5) behavioral conduct, and (6) global self-worth. Gender differences were also taken into consideration for this study, which resulted in running the ANOVAs separately for males and females.

Males

There were a total of 95 males who participated in this study. The male subjects were grouped into one of the following levels of body fat percentage: (a) healthy, between 11% and 20%; (b) moderately-high, between 21% and 25%; and (c) high, over 25%. Of the 95 males, only one was classified in the low group, body fat below 10% fat. For the purpose of statistical calculations, the lower two categories were combined into one, labeled healthy. There were four physical activity groups used for boys: (1) low, (2) average, (3) high, and (4) very high. The number of males in the
Table 2
Physical Activity Level Means and Standard Deviations for Males and Females

<table>
<thead>
<tr>
<th>PA Level</th>
<th>N/%</th>
<th>SCS</th>
<th>SAS</th>
<th>ACS</th>
<th>PAS</th>
<th>BCS</th>
<th>GSW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>21</td>
<td>3.10</td>
<td>3.16</td>
<td>3.29</td>
<td>3.19</td>
<td>3.14</td>
<td>3.46</td>
</tr>
<tr>
<td>22%</td>
<td></td>
<td>0.78</td>
<td>0.63</td>
<td>0.76</td>
<td>0.72</td>
<td>0.56</td>
<td>0.58</td>
</tr>
<tr>
<td>Average</td>
<td>46</td>
<td>3.24</td>
<td>3.26</td>
<td>3.40</td>
<td>3.18</td>
<td>3.08</td>
<td>3.45</td>
</tr>
<tr>
<td>48%</td>
<td></td>
<td>0.78</td>
<td>0.80</td>
<td>0.64</td>
<td>0.75</td>
<td>0.69</td>
<td>0.76</td>
</tr>
<tr>
<td>High</td>
<td>23</td>
<td>3.29</td>
<td>3.20</td>
<td>3.48</td>
<td>3.20</td>
<td>3.12</td>
<td>3.40</td>
</tr>
<tr>
<td>24%</td>
<td></td>
<td>0.60</td>
<td>0.87</td>
<td>0.62</td>
<td>0.71</td>
<td>0.61</td>
<td>0.65</td>
</tr>
<tr>
<td>Very High</td>
<td>5</td>
<td>3.43</td>
<td>3.60</td>
<td>3.77</td>
<td>3.43</td>
<td>3.50</td>
<td>3.90</td>
</tr>
<tr>
<td>5%</td>
<td></td>
<td>0.38</td>
<td>0.30</td>
<td>0.33</td>
<td>0.55</td>
<td>0.84</td>
<td>0.09</td>
</tr>
<tr>
<td>Females</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>46</td>
<td>2.99</td>
<td>2.88</td>
<td>2.91</td>
<td>2.78</td>
<td>3.45</td>
<td>3.29</td>
</tr>
<tr>
<td>42%</td>
<td></td>
<td>0.77</td>
<td>0.78</td>
<td>0.75</td>
<td>0.80</td>
<td>0.62</td>
<td>0.66</td>
</tr>
<tr>
<td>Average</td>
<td>63</td>
<td>3.04</td>
<td>3.00</td>
<td>2.97</td>
<td>2.85</td>
<td>3.43</td>
<td>3.20</td>
</tr>
<tr>
<td>58%</td>
<td></td>
<td>0.73</td>
<td>0.80</td>
<td>0.72</td>
<td>0.85</td>
<td>0.53</td>
<td>0.70</td>
</tr>
</tbody>
</table>

Note. SD are below M.
healthy, moderately-high, and high body fat groups were 49, 17, and 29, respectively. The number of males in the low, average, high, and very high physical activity groups were 21, 46, 23, and 5, respectively.

**Scholastic Competence Subscale.** The dependent variable SCS indicated the level of confidence perceived by the individual with respect to academic ability. For the three body fat groups, the difference in SCS means for the healthy, moderately-high, and high groups, $M = 3.31$, $M = 3.48$, and $M = 2.95$, respectively, were not significant, $F(2, 84) = 2.02$, $p = .14$. The SCS means for the physical activity groups, low, average, high, and very high, $M = 3.10$, $M = 3.24$, $M = 3.29$, and $M = 3.43$, respectively, were not significant, $F(3, 84) = 0.65$, $p = .58$. The two-way interaction effect between body fat and physical activity was not significant, $F(2, 84) = 0.63$, $p = .68$. Table 3 provides the complete ANOVA summary for the SCS.

**Social Acceptance Subscale.** The dependent variable SAS indicated the level of confidence perceived by the individual with respect to their feeling of belonging. See Table 4 for the ANOVA summary for SAS. For the three body fat groups the SAS means for the healthy, moderately-high, and high groups, $M = 3.43$, $M = 3.46$, and $M = 2.81$, respectively, were significantly different, $F(2, 84) = 6.53$, $p = .00$. The Tukey HSD multiple comparison test was conducted to determine which of the pairwise comparisons were significant. Significant differences existed between: (a) the healthy and high body fat groups and (b) the moderately-high and high
body fat groups. The results of the Tukey HSD multiple comparison test are reported in Table 5. The SAS means for the physical activity groups, low, average, high, and very high, \( M = 3.16, M = 3.26, M = 3.20, \) and \( M = 3.60, \) respectively, were not significant, \( F(3, 84) = 0.36, p = .79. \) The two-way interaction between body fat and physical activity was also not significant, \( F(2, 84) = 0.18, p = .97. \)

Table 3

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Fat (BF)</td>
<td>2.03</td>
<td>2</td>
<td>1.02</td>
<td>2.02</td>
<td>.14</td>
</tr>
<tr>
<td>Physical Activity (PA)</td>
<td>0.98</td>
<td>3</td>
<td>0.33</td>
<td>0.65</td>
<td>.58</td>
</tr>
<tr>
<td>BF X PA</td>
<td>1.58</td>
<td>5</td>
<td>0.32</td>
<td>0.63</td>
<td>.68</td>
</tr>
<tr>
<td>Residual</td>
<td>42.21</td>
<td>84</td>
<td>0.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>47.95</td>
<td>94</td>
<td>0.51</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Athletic Competence Subscale. The dependent variable ACS indicated the level of confidence perceived by the individual with respect to his or her perceived athletic abilities. An ANOVA summary is presented in Table 6. For the three body fat groups the ACS means for the healthy, moderately-high, and high groups, \( M = 3.62, M = 3.43, \) and \( M = 3.06, \) respectively, were significant, \( F(2, 84) = 5.88, p = 0.00. \)
Table 4

ANOVA Summary Table for the Social Acceptance Subscale for Males

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Fat (BF)</td>
<td>7.05</td>
<td>2</td>
<td>3.53</td>
<td>6.53</td>
<td>.00</td>
</tr>
<tr>
<td>Physical Activity (PA)</td>
<td>0.58</td>
<td>3</td>
<td>0.19</td>
<td>0.36</td>
<td>.79</td>
</tr>
<tr>
<td>BF X PA</td>
<td>0.50</td>
<td>5</td>
<td>0.10</td>
<td>0.18</td>
<td>.97</td>
</tr>
<tr>
<td>Residual</td>
<td>45.45</td>
<td>84</td>
<td>0.54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>54.77</td>
<td>94</td>
<td>0.58</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5

Tukey HSD Multiple Comparisons for the Social Acceptance Subscale for Males

<table>
<thead>
<tr>
<th>Body Fat Groups</th>
<th>M</th>
<th>Moderately-High</th>
<th>Healthy</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>2.80</td>
<td>0.62*</td>
<td>0.66*</td>
</tr>
<tr>
<td>Healthy</td>
<td>3.43</td>
<td></td>
<td>0.04</td>
</tr>
<tr>
<td>Moderately High</td>
<td>3.46</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. HSD = .13, * p < .05.

The Tukey HSD multiple comparison test was conducted to determine which of the pairwise comparisons were significant. A significant difference existed between the healthy and high body fat groups. The results of the
Tukey HSD multiple comparison test are reported in Table 7. The differences in the ACS means for the physical activity groups, low, average, high, and very high, $M = 3.29$, $M = 3.40$, $M = 3.48$, and $M = 3.77$, respectively, were not significant, $F(3, 84) = 0.09$, $p = .96$. The interaction effect between body fat and physical activity was not significant, $F(2, 84) = 0.41$, $p = .84$.

Table 6
ANOVA Summary Table for the Athletic Competence Subscale for Males

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Fat (BF)</td>
<td>4.64</td>
<td>2</td>
<td>2.32</td>
<td>5.88</td>
<td>.00</td>
</tr>
<tr>
<td>Physical Activity (PA)</td>
<td>0.11</td>
<td>3</td>
<td>0.04</td>
<td>0.09</td>
<td>.96</td>
</tr>
<tr>
<td>BF X PA</td>
<td>0.81</td>
<td>5</td>
<td>0.16</td>
<td>0.41</td>
<td>.84</td>
</tr>
<tr>
<td>Residual</td>
<td>33.16</td>
<td>84</td>
<td>0.40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>39.99</td>
<td>94</td>
<td>0.43</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Physical Appearance Subscale. The dependent variable PAS indicated the level of confidence perceived by the individual with respect to the extent that they feel they are “good looking”. An ANOVA table for PAS is presented in Table 8. For the three body fat groups the PAS means for the healthy, moderately-high, and high groups, $M = 3.41$, $M = 3.25$, and $M = 2.82$, respectively, were significant, $F(2, 84) = 6.08$, $p = .00$. 
### Table 7
Tukey HSD Multiple Comparisons for the Athletic Competence Subscale for Males

<table>
<thead>
<tr>
<th>Body Fat Groups</th>
<th>M</th>
<th>Moderately-High</th>
<th>Healthy</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>3.06</td>
<td>0.37</td>
<td>0.55*</td>
</tr>
<tr>
<td>Moderately-High</td>
<td>3.43</td>
<td></td>
<td>0.18</td>
</tr>
<tr>
<td>Healthy</td>
<td>3.62</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* HSD = .13, *p* < .05.

The Tukey HSD multiple comparison test was conducted to determine which of the pairwise comparisons were significant. Significant differences existed between: (a) the healthy and high body fat groups and, (b) the moderately-high and high body fat groups. The results of the Tukey HSD test are reported in Table 9. The PAS means for the physical activity groups, low, average, high and very high, $M = 3.18$, $M = 3.19$, $M = 3.20$, and $M = 3.43$, respectively, were not significant, $F (3, 84) = 0.19$, $p = 0.91$. The two-way interaction between body fat and physical activity was not significant, $F (2, 84) = 0.39$, $p = .86$.

**Behavioral Conduct Subscale.** The dependent variable BCS indicated the level of confidence perceived by the individual with respect to the extent that they feel they behave, or do the “right thing”.
Table 8
ANOVA Summary Table for the Physical Appearance Subscale for Males

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Fat (BF)</td>
<td>5.85</td>
<td>2</td>
<td>2.92</td>
<td>6.08</td>
<td>.00</td>
</tr>
<tr>
<td>Physical Activity (PA)</td>
<td>0.27</td>
<td>3</td>
<td>0.09</td>
<td>0.19</td>
<td>.91</td>
</tr>
<tr>
<td>BF X PA</td>
<td>0.93</td>
<td>5</td>
<td>0.19</td>
<td>0.39</td>
<td>.86</td>
</tr>
<tr>
<td>Residual</td>
<td>40.38</td>
<td>84</td>
<td>0.48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>47.98</td>
<td>94</td>
<td>0.51</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 9
Tukey HSD Multiple Comparisons for the Physical Appearance Subscale for Males

<table>
<thead>
<tr>
<th>Body Fat Groups</th>
<th>M</th>
<th>Moderately-High</th>
<th>Healthy</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>2.82</td>
<td>0.44*</td>
<td>0.59*</td>
</tr>
<tr>
<td>Moderately-High</td>
<td>3.26</td>
<td></td>
<td>0.15</td>
</tr>
<tr>
<td>Healthy</td>
<td>3.41</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. HSD = .13, *p < .05.

For the 3 body fat groups, the BCS means for the healthy, moderately-high, and high groups, M = 3.14, M = 3.38, and M = 2.95, respectively, were not significant, F(2, 84) = 1.77, p = .18. The BCS means for the physical
activity groups, low, average, high, and very high, $M = 3.14$, $M = 3.08$, $M = 3.12$, and $M = 3.50$, respectively, were not significant, $F(3, 84) = 0.38$, $p = .77$. The two-way interaction effect between body fat and physical activity was not significant, $F(2, 84) = 1.14$, $p = .35$. The results of the ANOVA for BCS are reported in Table 10.

Table 10

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Fat (BF)</td>
<td>1.45</td>
<td>2</td>
<td>0.73</td>
<td>1.77</td>
<td>.18</td>
</tr>
<tr>
<td>Physical Activity (PA)</td>
<td>0.47</td>
<td>3</td>
<td>0.16</td>
<td>0.38</td>
<td>.77</td>
</tr>
<tr>
<td>BF X PA</td>
<td>2.33</td>
<td>5</td>
<td>0.47</td>
<td>1.14</td>
<td>.35</td>
</tr>
<tr>
<td>Residual</td>
<td>34.52</td>
<td>84</td>
<td>0.41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>39.44</td>
<td>94</td>
<td>0.42</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Global Self-Worth Subscale.** The dependant variable GSW indicated the level of confidence perceived by the individual with respect to how they view themselves as a whole. The results of the ANOVA are reported in Table 11. For the healthy, moderately-high, and high body fat groups the GSW means were $M = 3.63$, $M = 3.66$, and $M = 3.06$, respectively. These means were significant, $F(2, 84) = 5.28$, $p = 0.03$. A Tukey HSD multiple comparison test was conducted to determine which of the pairwise comparisons were
significant. Significant differences existed between: (a) the healthy and high body fat groups and, (b) the moderately-high and high body fat groups. The results of the Tukey HSD multiple comparison test are reported in Table 12.

Table 11

ANOVA Summary Table for the Global Self-Worth Subscale for Males

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Fat (BF)</td>
<td>4.20</td>
<td>2</td>
<td>2.10</td>
<td>5.28</td>
<td>.03</td>
</tr>
<tr>
<td>Physical Activity (PA)</td>
<td>0.42</td>
<td>3</td>
<td>0.14</td>
<td>0.35</td>
<td>.79</td>
</tr>
<tr>
<td>BF X PA</td>
<td>1.85</td>
<td>5</td>
<td>0.37</td>
<td>0.93</td>
<td>.46</td>
</tr>
<tr>
<td>Residual</td>
<td>33.40</td>
<td>84</td>
<td>0.40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>42.91</td>
<td>94</td>
<td>0.46</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 12

Tukey HSD Multiple Comparisons for the Global Self-Worth Subscale for Males

<table>
<thead>
<tr>
<th>Body Fat Groups</th>
<th>M</th>
<th>Moderately-High</th>
<th>Healthy</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>3.10</td>
<td>0.60*</td>
<td>0.58*</td>
</tr>
<tr>
<td>Moderately-High</td>
<td>3.66</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthy</td>
<td>3.63</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. HSD = .13, * p < .05.
The GSW means for the physical activity groups, low, average, high and very high, $M = 3.46$, $M = 3.45$, $M = 3.40$, and $M = 3.90$, respectively, were not significant, $F(3, 84) = 0.35$, $p = 0.79$. The two-way interaction effect between body fat and physical activity was not significant, $F(2, 84) = 0.93$, $p = 0.46$.

**Females**

There were a total of 109 females who participated in this study. The female subjects were grouped into one of the following groups based on body fat percentage: (a) low, below 15%; (b) healthy, between 15% and 25%; (c) moderately-high, between 26% and 30%; and (d) high, over 30%. There were two physical activity groups used for girls: (1) low and (2) average. Of the 109 females, only one was classified in the high physical activity group. For the purpose of statistical calculations the average group and the one subject in the high physical activity group were combined into one, labeled average. The number of females in the low, healthy, moderately-high, and high body fat groups were 13, 46, 25, and 25, respectively. The number of females in the low and average physical activity groups were 46 and 63, respectively.

**Scholastic Competence Subscale.** The dependent variable SCS indicated the level of confidence perceived by the individual with respect to academic abilities. For the four body fat groups the SCS means for the low,
healthy, moderately-high, and high groups were $M = 3.15$, $M = 2.95$, $M = 2.90$ and $M = 3.20$, respectively. The difference in means were not significant, $F(3, 101) = 1.03$, $p = .38$. The SCS means for the physical activity groups, low and average, $M = 2.99$ and $M = 3.04$, respectively, were not significant, $F(1, 101) = 0.64$, $p = .43$. The two way interaction effect between body fat and physical activity was not significant, $F(3, 101) = 0.36$, $p = .79$. The results of the SCS ANOVA are reported in Table 13.

Table 13

ANOVA Summary Table for the Scholastic Competence Subscale for Females

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Fat (BF)</td>
<td>1.75</td>
<td>3</td>
<td>0.58</td>
<td>1.03</td>
<td>.38</td>
</tr>
<tr>
<td>Physical Activity (PA)</td>
<td>0.36</td>
<td>1</td>
<td>0.36</td>
<td>0.64</td>
<td>.43</td>
</tr>
<tr>
<td>BF X PA</td>
<td>0.60</td>
<td>3</td>
<td>0.20</td>
<td>0.36</td>
<td>.79</td>
</tr>
<tr>
<td>Residual</td>
<td>57.10</td>
<td>84</td>
<td>0.57</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>59.52</td>
<td>94</td>
<td>0.55</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Social Acceptance Subscale. The dependent variable SAS indicated the level of confidence perceived by the subjects with respect to how they feel they "fit in". For the four body fat groups, the difference in the SAS means for the low, healthy, moderately-high, and high groups, $M = 2.95$, $M =$
2.99, \( M = 3.03 \), and \( M = 2.79 \), respectively, were not significant, \( F(3, 101) = 0.60, p = .62 \). The difference in the SAS means for the physical activity groups, low and average, \( M = 2.88 \) and \( M = 3.00 \), respectively, were not significant, \( F(1, 101) = 2.00, p = .16 \). The two-way interaction effect between body fat and physical activity was significant, \( F(3, 101) = 3.33, p = .02 \). The ANOVA for SAS is presented in Table 14. A simple main effects test was conducted between the body fat and physical activity groups due to the significant interaction effect. The SAS means for the physical activity groups for body fat groups low and healthy were the same, however, the SAS mean was significantly higher for the moderately-high group. The results of the simple main effects test are reported in Table 15.

**Athletic Competence Subscale.** The dependent variable ACS indicated the level of confidence perceived by the individual with respect to his or her athletic abilities. For the four body fat groups, the differences in the ACS means for the low, healthy, moderately-high, and high groups, \( M = 3.18, M = 3.02, M = 2.90, \) and \( M = 2.27 \), respectively, were not significant, \( F(3, 101) = 1.96, p = .13 \). The differences in the ACS means for the physical activity groups, low and average, \( M = 2.91 \) and \( M = 2.97 \), respectively, were not significant, \( F(1, 101) = 1.15, p = .29 \). The two-way interaction effect between body fat and physical activity was not significant, \( F(3, 101) = 2.36, p = .08 \). Table 16 contains the ANOVA summary for ACS.
Table 14

ANOVA Summary Table for the Social Acceptance Subscale for Females

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Fat (BF)</td>
<td>1.08</td>
<td>3</td>
<td>0.36</td>
<td>0.60</td>
<td>.62</td>
</tr>
<tr>
<td>Physical Activity (PA)</td>
<td>1.08</td>
<td>1</td>
<td>1.20</td>
<td>2.00</td>
<td>.16</td>
</tr>
<tr>
<td>BF X PA</td>
<td>5.97</td>
<td>3</td>
<td>1.99</td>
<td>3.33</td>
<td>.02</td>
</tr>
<tr>
<td>Residual</td>
<td>60.37</td>
<td>101</td>
<td>0.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>67.53</td>
<td>108</td>
<td>0.63</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 15

Simple Main Effects for Social Acceptance Subscale for Females

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA</td>
<td>1.20</td>
<td>1</td>
<td>1.20</td>
<td>2.00</td>
</tr>
<tr>
<td>PA at B1</td>
<td>0.54</td>
<td>1</td>
<td>0.54</td>
<td>0.90</td>
</tr>
<tr>
<td>PA at B2</td>
<td>1.72</td>
<td>1</td>
<td>1.72</td>
<td>2.88</td>
</tr>
<tr>
<td>PA at B3</td>
<td>3.90</td>
<td>1</td>
<td>3.90</td>
<td>6.52*</td>
</tr>
<tr>
<td>BF</td>
<td>1.08</td>
<td>3</td>
<td>0.36</td>
<td>0.60</td>
</tr>
<tr>
<td>BF at PA1</td>
<td>3.75</td>
<td>3</td>
<td>1.25</td>
<td>2.10</td>
</tr>
<tr>
<td>BF at PA2</td>
<td>3.07</td>
<td>3</td>
<td>1.02</td>
<td>1.71</td>
</tr>
<tr>
<td>W. Cell</td>
<td>60.37</td>
<td>101</td>
<td>0.60</td>
<td></td>
</tr>
</tbody>
</table>

(1,101) = 3.92
(3,101) = 2.68

Note. *p < .05.
Table 16
ANOVA Summary Table for the Athletic Competence Subscale for Females

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Fat (BF)</td>
<td>2.99</td>
<td>3</td>
<td>1.00</td>
<td>1.96</td>
<td>.13</td>
</tr>
<tr>
<td>Physical Activity (PA)</td>
<td>0.58</td>
<td>1</td>
<td>0.58</td>
<td>1.15</td>
<td>.29</td>
</tr>
<tr>
<td>BF X PA</td>
<td>3.60</td>
<td>3</td>
<td>1.20</td>
<td>2.36</td>
<td>.08</td>
</tr>
<tr>
<td>Residual</td>
<td>51.26</td>
<td>101</td>
<td>0.51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>57.23</td>
<td>108</td>
<td>0.53</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Physical Appearance Subscale.** The dependent variable PAS indicated the level of confidence perceived by the subjects with respect to the degree they think they are “good looking”. For the four body fat groups the differences in the PAS means for the low, healthy, moderately-high, and high groups, $M = 3.18$, $M = 2.83$, $M = 2.82$, and $M = 2.59$, respectively, were not significant, $F(3, 101) = 1.36$, $p = .26$. The difference in the PAS means for the physical activity groups, low and average, $M = 2.78$, and $M = 2.85$, respectively, were not significant, $F(1, 101) = 0.00$, $p = .95$. The two-way interaction effect between body fat and physical activity was not significant, $F(3, 101) = 0.82$, $p = .74$. The ANOVA summary for PAS is reported in Table 17.
Table 17

ANOVA Summary Table for the Physical Activity Subscale for Females

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Fat (BF)</td>
<td>2.81</td>
<td>3</td>
<td>0.94</td>
<td>1.36</td>
<td>.26</td>
</tr>
<tr>
<td>Physical Activity (PA)</td>
<td>0.00</td>
<td>1</td>
<td>0.00</td>
<td>0.00</td>
<td>.95</td>
</tr>
<tr>
<td>BF X PA</td>
<td>0.85</td>
<td>3</td>
<td>0.28</td>
<td>0.82</td>
<td>.74</td>
</tr>
<tr>
<td>Residual</td>
<td>69.37</td>
<td>101</td>
<td>0.69</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>72.33</td>
<td>108</td>
<td>0.68</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Behavioral Conduct Subscale.** The dependent variable BCS indicated the level of confidence perceived by the subjects with respect to the degree they do what they are "suppose to". For the four body fat groups, the differences in the BCS means for the low, healthy, moderately-high, and high groups, M = 3.47, M = 3.41, M = 3.35, and M = 3.57, respectively, were not significant, $F(3, 101) = 0.87, p = .46$. The differences in the BCS means for the physical activity groups, low and average, M =3.45 and M =3.43, respectively, were not significant, $F(1,101) = 0.23, p = .63$. The two-way interaction effect between body fat and physical activity was not significant, $F(3, 101) = 1.40, p = .25$. Table 18 contains the ANOVA summary for BCS.

**Global Self-Worth Subscale.** The dependent variable GSW indicated the level of confidence perceived by the subjects with respect to the degree
they like who they are.

Table 18
ANOVA Summary Table for the Behavioral Conduct Subscale for Females

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Fat (BF)</td>
<td>0.84</td>
<td>3</td>
<td>0.28</td>
<td>0.87</td>
<td>.46</td>
</tr>
<tr>
<td>Physical Activity (PA)</td>
<td>0.07</td>
<td>1</td>
<td>0.07</td>
<td>0.23</td>
<td>.63</td>
</tr>
<tr>
<td>BF X PA</td>
<td>1.35</td>
<td>3</td>
<td>0.45</td>
<td>1.40</td>
<td>.25</td>
</tr>
<tr>
<td>Residual</td>
<td>32.40</td>
<td>101</td>
<td>0.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>34.42</td>
<td>108</td>
<td>0.32</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For the four body fat groups the differences in the GSW means for the low, healthy, moderately-high, and high groups, $M = 3.39$, $M = 3.26$, $M = 3.13$, and $M = 3.23$, respectively, were not significant, $F(3, 101) = 0.50$, $p = .69$. The differences in the GSW means for the physical activity groups, low and average, $M = 3.29$ and $M = 3.20$, respectively, were not significant, $F(1,101) = 0.69$, $p = .41$. The two-way interaction between body fat and physical activity was not significant, $F(3, 101) = 1.05$, $p = .37$. The complete ANOVA summary for GSW is reported in Table 19.
Table 19

ANOVA Summary Table for the Global Self-Worth Subscale for Females

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Fat (BF)</td>
<td>0.71</td>
<td>3</td>
<td>0.24</td>
<td>0.50</td>
<td>.69</td>
</tr>
<tr>
<td>Physical Activity (PA)</td>
<td>0.33</td>
<td>1</td>
<td>0.33</td>
<td>0.69</td>
<td>.41</td>
</tr>
<tr>
<td>BF X PA</td>
<td>1.50</td>
<td>3</td>
<td>0.50</td>
<td>1.05</td>
<td>.37</td>
</tr>
<tr>
<td>Residual</td>
<td>47.95</td>
<td>101</td>
<td>0.48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>50.24</td>
<td>108</td>
<td>0.47</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Discussion

Males

No significant differences were found among the levels of the independent variables for the dependent variables, scholastic competence and behavioral conduct. Significant differences were found in body fat for the dependent variables, social acceptance, athletic competence, physical appearance, and global self-worth sub-scales. The independent variable physical activity was not significant for any of the six subscales for self-esteem investigated for males.

The significant findings for the social acceptance subscale showed differences between the healthy and high groups and between the
moderately-high and the high groups. No differences existed between the two low body fat groups, healthy and moderately-high. The high body fat group had a significantly lower social acceptance mean score than the healthy or the moderately-high body fat groups. This supported the idea that as body fat increases the level of perceived social acceptance decreases.

Sonstroem and Morgan (1989) suggested that a child by the age of 8 years has developed the majority of his or her self-esteem. Social acceptance is developed primarily through inherited dispositions and interactions with others. Therefore, the more positive the interactions are at an early age, the higher one perceives oneself accepted by others. Positive interactions can be through physical, mental, and or emotional channels (Biddle, 1993). The highly overfat child may not be interacting or receiving positive feedback at a young age, which may adversely affect that child's perceived social acceptance. The child who is at a healthy or even moderately-high body fat level may tend to have a higher perceived social acceptance because he or she does not stand out in a negative way to others. Males with healthy or moderately-high body fat tend to be more involved in social and daily activities, for example: physical, education class, recess, group games, and after school activities or sports.

Our society exhibits a negative stigma when it comes to obesity in general. Those children who were in the high body fat group may be responding to the negative stigma they are living with due to excess adipose tissue. Thus, their perception of social acceptance may be lower. Examples
contributing to this lower social acceptance might include: (a) getting picked last for group activities, (b) receiving verbal and nonverbal abuse and (c) being subjected to media which portrays a negative connotation to the overfat person. Roberts (1992) stated that through movement, children are provided the opportunity to express emotions and identify with a group. For males, many studies have found significant relationships between peer group acceptance, proficient motor skills and average to low body weight. Therefore, a teacher who allows a child to be chosen last, or openly criticizes poor performance may be adding to the child's negative social acceptance and self-esteem (Roberts, 1992).

A significant finding for this investigation occurred between the healthy and high body fat groups for the athletic competence subscale. For this study findings suggested that boys in the healthy body fat group had a higher perceived athletic competence than boys in the high body fat group. Lohman (1992) suggested that children need to deal with their feelings about their fatness levels, fitness levels, self-and body image, and physical inactivity. Curriculum approaches in schools need to be developed and tested to help children evaluate their feelings so they can remove impediments to their self-esteem in any of these areas. Such aspects of health need to be incorporated into the physical education or health classes and at home with parents, to help children make healthy decisions and gain a strong understanding of what is healthy and what is unhealthy. Although it is true that responsibility falls on the educator to present children with a
comprehensive hands on physical education learning experience, it is even more critical that the parent play the main role in facilitating their children to become more physically active (Roberts, 1992). The amount of time spent participating in sedentary activities like viewing television or playing video games can be decreased, thus, increasing the amount of time available for physical activity. Not only will this help to increase athletic competence, but it will also help decrease the problem of underfitness and overfatness in so many youth today (Raithel, 1988).

The significant differences for the physical appearance subscale were found between the healthy and high body fat groups and between the moderately-high and high body fat groups. The data for this study supported the idea that a boy with healthy or moderately-high body fat will have a higher perceived physical appearance than a boy with a high body fat level. Boys who look thinner and or do not stand out as overfat are considered more acceptable than the boy who carries more adipose tissue and whose appearance may not be as appealing to the eye. Males at this age are for the most part pre-pubescent and could be accumulating fat weight to assist the growth spurt that comes between the ages of 13 to 16 years. These males may be considered overfat now at the age of 10 to 12 years, but at the age of 13 to 14 years, they will be the ones who have started their growth spurt.

The significant findings for global self-worth were found between the healthy and high body fat groups and between the moderately-high and
high body fat groups. These findings suggested that as males' body fat percentage increases, their global self-worth decreases. Because global self-worth is a measure of overall feelings and perception about oneself, the previous discussion applies to this subscale as well.

**Females**

The investigator found no significant differences among any of the independent variables for any dependent variable used in this study. An interaction effect occurred for the social acceptance subscale between physical activity and body fat. The simple main effects test indicated a difference existed between physical activity and the moderately-high body fat group. The investigator believed this interaction effect was caused by two subgroups within the moderately-high body fat group: (1) overfat subjects and (2) the early maturer. It can be assumed that between the ages of 10 to 12 years, some females have started to develop secondary sex characteristics that may contribute to a higher body fat percentage. However, some females between the ages of 10 to 12 years, have no signs of early maturation and are still moderately overfat. The females who have started to develop sexually may have a higher body fat percentage due to sex-related fat, but may be more physically active and have a higher perceived social acceptance, than the female who is not developed and is less physically active. Thus, in the moderately-high body fat group the social acceptance subscale will be higher due to the diversity of the females that fall within that
group compared to the scores for the other body fat groups.

The value that society places on females in sport could be a factor when discussing the lack of significant findings for the females in this study compared to the findings of the males. More school and community funding is directed to organized sports for males than for females. The opportunity for females to participate in as many sports as males is not supported or accessible and therefore, not commonly available in most rural areas. The lack of opportunity and/or interest at an early age deemphasizes the competitive or ego-oriented female and encourages a more compliant mastery-oriented female. These are possible reasons why there are no differences among body fat groups or between the physical activity groups. Also, the type of physical activities offered by schools and communities do not satisfy the needs of the demeanor of the average female. Perhaps female participation would increase if non-aggressive, non-competitive activities were offered, for example, aerobic dance, jump rope, and rhythmic gymnastics.

Males and Females

In previous studies, Harter (1985) found that males attained higher mean scores than females for the athletic competence and physical appearance subscales, and females scored higher than males on the behavioral conduct subscale for the "What I am Like" questionnaire. In this study the investigator's data supported Harter's findings for both
independent variables, physical activity and body fat percentage. For this investigation, data showed that males scored consistently higher than the females on all subscales with the exception of the behavioral conduct subscale. This can be explained through the assumption that females are brought up by their parents and educators to behave and not to cause trouble. Females realize at an early age that they are rewarded for good behavior and thus tend to act out less than males. Therefore, their perception of how they behave would be expected to be higher than that of the males. Males, on the other hand, are brought up to be aggressive, assertive, and competitive. These characteristics tend to be in conflict with an acceptable level of behavioral conduct. These characteristics are often the catalyst for getting boys into trouble, and their behavior tends to be viewed as “boys will be boys”. Therefore, the males' perceived behavioral conduct will be lower than the females'.

Another factor that could be influencing the difference found between males and females in this investigation is the idea of role models within the family. Studies have found that male children tend to bond to other males as role models such as fathers or brothers, whereas female children look to other females such as mothers or sisters, as role models. Payne and Isaacs (1995) indicated that children, both male and female receive most of their support and encouragement for sport participation from their fathers and not their mothers. If this is true and the first-born is a boy, the father will bond and take the time with the male rather than the female child, therefore,
decreasing the amount of attention the female child receives from the father. However, if a female is the first-born child, the father will make a greater attempt to influence that child to become sport oriented or a "tomboy". This recognizes the need for parents to play an equal role in providing their children, both males and females, with the same opportunities, encouragement, and influences, in order to facilitate a more well rounded upbringing.
CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of the study was to compare the body composition, physical activity and self-esteem for pre-adolescents. The researcher compared self-esteem among: (a) four levels of body fat percentage: low, healthy, moderately-high, and high; and (b) four levels of physical activity: low, average, high, and very high. The subjects used for this study were 5th and 6th grade students, ages 10 to 12 years, who attended either the Schoolcraft or Lawton Middleschools in Southwest Michigan. The instruments used in this study consisted of the Lohman two-site skinfold test, the Harter "What I Am Like" self-esteem questionnaire, and a physical activity checklist.

Exercise Science Graduate students who attended Western Michigan University were recruited to assist with the skinfold testing. The investigator administered both the questionnaire and physical activity checklist. The data collection for a total of 204 subjects was accomplished within a 2-week period of time (95 males and 109 females).

The dependent variable was the self-esteem questionnaire, which consisted of six subscales. Each subscale was scored separately on a scale
of 1 as the lowest, to 4 as the highest score possible. The independent variables were body fat percentage, and physical activity. Subjects were grouped into four body fat groups: (1) low, (2) healthy, (3) moderately-high, and (4) high. The physical activity variable consisted of four groups: (1) low, (2) average, (3) high, and (4) very high.

Previous research indicated that gender played a role in the determination of the mean scores in the 6 subscales for the Harter questionnaire. Therefore, this study was designed to reflect the possibility of gender differences using both the independent and dependent variables. Two-way ANOVAs were used to determine the differences among the levels of body fat percentage and physical activity levels for each of the 6 subscales. These analyses were conducted for males and for females. The BMDP Statistical software, program 2V was used to run the two-way ANOVAs. The Tukey HSD test for multiple comparisons was used as the post hoc testing procedure.

Findings

The pertinent findings for this study were:

1. For males, the researcher discovered no significant differences among the levels of the independent variable, body fat percentage, for the two dependent variables, scholastic competence and behavioral conduct.

2. For males, significant differences were found among the body fat groups for the dependent variables social acceptance, \( F(2, 84) = 6.53, p = \)
3. For both males and females, there were no significant differences among the levels of activity for any of the six subscales of self-esteem.

4. For females, there were no significant differences among the body fat groups for any of the six subscales of self-esteem.

5. For females, an interaction effect occurred for the social acceptance scale, \( F(3, 101) = 3.33, p = .02 \), between the physical activity and the moderately-high body fat group.

Conclusions

The above findings led the investigator to suggest the following conclusions:

1. Low body fat did not affect the self-esteem levels for females. Of the 95 male subjects, only one was classified in the low body fat group.

2. Males' self-esteem was higher than the females' self-esteem for the social acceptance, scholastic competence, physical appearance, and global self-worth subscales.

3. Females' self-esteem was higher than the males' for the behavioral conduct subscale.

4. For males, as body fat increased, self-esteem tended to decrease for all self-esteem subscales.

5. For females, body fat was not related to self-esteem for any of the
6. Physical activity was not related to self-esteem for the males or for the females.

Recommendations

Based on the results of this study, the following are recommendations for further research:

1. Further studies in the area of childhood obesity, self-esteem, and physical activity should continue to use body fat percentage rather than height and weight charts in deciphering a child’s health status.

2. Similar studies should consider somatotype to determine differences between the subjects’ body types or maturational levels.

3. A longitudinal study of physical activity, body composition, and self-esteem is also recommended.

4. Lastly, a study that measures self-esteem before and after a treatment, in which the treatment includes both an educational and an exercise component, is warranted.
Appendix A

Informed Consent and Assent Forms
Dear Parent:

Fifth and sixth grade students in both Schoolcraft and Lawton Middle schools have been invited to participate in a survey at their respective schools to be administered during school hours. Students will be asked to answer written questions about their self-perception, physical activity levels and have their body fat measurement. The body fat testing consists of measuring with a small, safe, plastic caliper, the amount of adipose tissue above the muscle. The sites that will be used for this study are the back of the right arm, and the inside of the lower right leg. A test of this sort will in no way cause discomfort to your child, the measurements will be taken gently and are administered by trained exercise specialists. The self-perception questionairre and physical activity checklist will take approximately 40 minutes to complete. In order to maintain anonymity of the child, the researcher will assign each student a number and destroy all written tests immediately after data is recorded on scan sheets.

Although the purpose of this study is to help fulfill the researcher’s thesis requirement, it is hoped that the information form the survey may also be used to help both parents and educators encourage higher levels of physical activity for their students. The researcher will be able to provide information to students who have questions relating to body fat percentage and self-esteem, and will provide conclusions of the study to the school administration and any interested faculty.

Participation in this activity is entirely voluntary, and will in no way effect your students grades. Students who do not participate will be given the opportunity to study or work on an alternate assignment, and will not be penalized in any way. Any student may decide not to participate at any time. This form must be signed and returned for the student to participate in the study.

If you have any questions or concerns pertaining to this study, you may contact either Becky C. Coady, at 343-0941, Dr. Mary Dawson, at 387-2711, or the University Human Subject Institutional Review Board, at 387-8293.

I give permission for my son/daughter ___________________________ to participate in the above survey. 

(please print name)

Parent’s signature ___________________________ Date ___________

(If permission is denied, please sign here ___________________________________)

INFORMED CONSENT
Western Michigan University
Department of Health, Physical Education and Recreation

Relationship Between Body Fat Percentages and Self-Esteem for 5th and 6th Grade Students

Becky C. Coady
Mary Dawson, Ph.D.
For the subject:

I understand that I have been asked to participate in a study to find out how I feel about myself, what activities I like to do, and what portion of my body is made up of fatty tissue. The purpose of the study is to see the relationship these topics have to one another in order to support my teachers and parents in encouraging healthy lifestyle choices for myself.

I understand that if I agree, I will be given the “What I Am Like” questionnaire, an Activity Checklist, and have my body make-up estimated sometime during the months of November or December in 1995. If I choose to participate, I understand that I will not get any extra credit, and if I don’t wish to participate, there will be no effect on my school grades. Even if I agree today to participate by signing this form, I can change my mind any time when we begin testing or at any time during testing.

I understand that you would like to use my information in comparing it to other people my age, and if I sign below I give you permission to do so. If I choose to be tested, no one will find out my results.

I understand that after the data is collected and score sheets are matched, my name will be cut off all the answer sheets. You will use a code number instead of using my name.

If I have any questions or concerns about this study, I may contact either Becky Coady at (616)343-0941 or Dr. Mary Dawson at (616)387-2711.

My signature below indicates that I agree
1) to complete the “What Am I Like” self-esteem questionnaire;
2) to complete the Activity Checklist;
and
3) to have my body make-up tested.

Print name here ________________________________________

Sign name here ________________________________________ Date __________
Appendix B

Human Subjects Institutional Review Board Approval
Date: November 3, 1995
To: Becky Coady
From: Richard Wright, Chair
Re: HSIRB Project Number 95-11-16

This letter will serve as confirmation that your research project entitled "Effect of body composition and physical activity levels on self-esteem for 5th and 6th grade students in rural southwest Michigan" has been approved under the exempt category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note that you must seek specific approval for any changes in this design. You must also seek reapproval if the project extends beyond the termination date. In addition if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: November 3, 1996

xc: Mary Dawson
Appendix C

Physical Activity Checklist
<table>
<thead>
<tr>
<th>Activity</th>
<th>How many times per week</th>
<th>How long each time (minutes)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td>0-3_ 4-6_ 7+</td>
<td>0-15_ 15-30_ 30-60_ 60+</td>
</tr>
<tr>
<td>Biking</td>
<td>0-3_ 4-6_ 7+</td>
<td>0-15_ 15-30_ 30-60_ 60+</td>
</tr>
<tr>
<td>Baseball</td>
<td>0-3_ 4-6_ 7+</td>
<td>0-15_ 15-30_ 30-60_ 60+</td>
</tr>
<tr>
<td>Homework</td>
<td>0-3_ 4-6_ 7+</td>
<td>0-15_ 15-30_ 30-60_ 60+</td>
</tr>
<tr>
<td>Swimming</td>
<td>0-3_ 4-6_ 7+</td>
<td>0-15_ 15-30_ 30-60_ 60+</td>
</tr>
<tr>
<td>Watch T.V.</td>
<td>0-3_ 4-6_ 7+</td>
<td>0-15_ 15-30_ 30-60_ 60+</td>
</tr>
<tr>
<td>Running/ tag</td>
<td>0-3_ 4-6_ 7+</td>
<td>0-15_ 15-30_ 30-60_ 60+</td>
</tr>
<tr>
<td>Walking</td>
<td>0-3_ 4-6_ 7+</td>
<td>0-15_ 15-30_ 30-60_ 60+</td>
</tr>
<tr>
<td>Eat (snacks)</td>
<td>0-3_ 4-6_ 7+</td>
<td>0-15_ 15-30_ 30-60_ 60+</td>
</tr>
<tr>
<td>Play Nintendo</td>
<td>0-3_ 4-6_ 7+</td>
<td>0-15_ 15-30_ 30-60_ 60+</td>
</tr>
<tr>
<td>Foot ball</td>
<td>0-3_ 4-6_ 7+</td>
<td>0-15_ 15-30_ 30-60_ 60+</td>
</tr>
<tr>
<td>Chores (clean room, raking, shoveling snow)</td>
<td>0-3_ 4-6_ 7+</td>
<td>0-15_ 15-30_ 30-60_ 60+</td>
</tr>
<tr>
<td>Talk on phone</td>
<td>0-3_ 4-6_ 7+</td>
<td>0-15_ 15-30_ 30-60_ 60+</td>
</tr>
<tr>
<td>Go shopping</td>
<td>0-3_ 4-6_ 7+</td>
<td>0-15_ 15-30_ 30-60_ 60+</td>
</tr>
<tr>
<td>Karate/Judo</td>
<td>0-3_ 4-6_ 7+</td>
<td>0-15_ 15-30_ 30-60_ 60+</td>
</tr>
<tr>
<td>Dance/Gymnastics</td>
<td>0-3_ 4-6_ 7+</td>
<td>0-15_ 15-30_ 30-60_ 60+</td>
</tr>
<tr>
<td>Rollerblading/ skiing/ iceskating</td>
<td>0-3_ 4-6_ 7+</td>
<td>0-15_ 15-30_ 30-60_ 60+</td>
</tr>
<tr>
<td>Other</td>
<td>0-3_ 4-6_ 7+</td>
<td>0-15_ 15-30_ 30-60_ 60+</td>
</tr>
<tr>
<td>Other</td>
<td>0-3_ 4-6_ 7+</td>
<td>0-15_ 15-30_ 30-60_ 60+</td>
</tr>
</tbody>
</table>
BIBLIOGRAPHY


